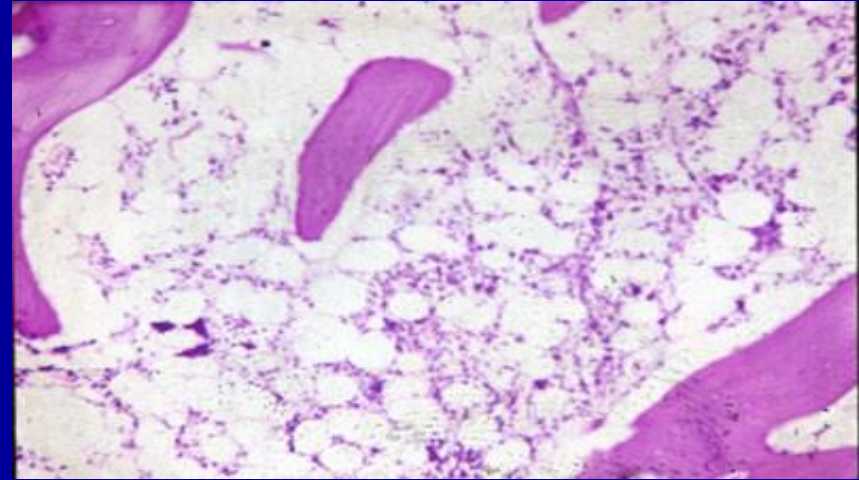
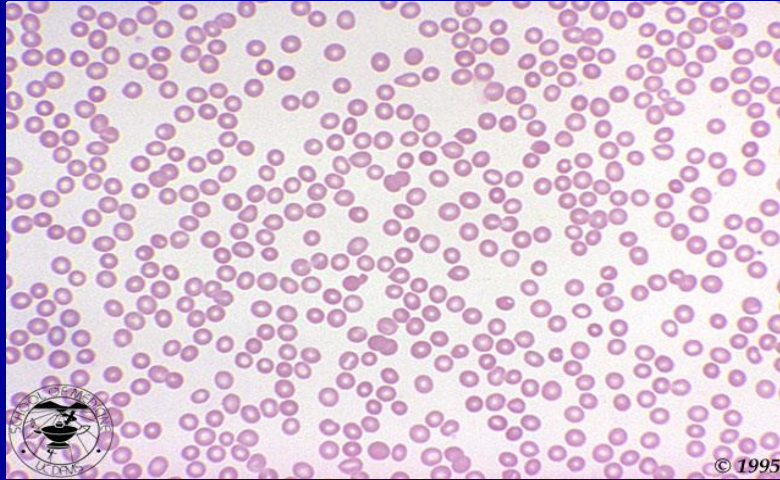


# How to Approach Inpatients Who have Low Blood Counts

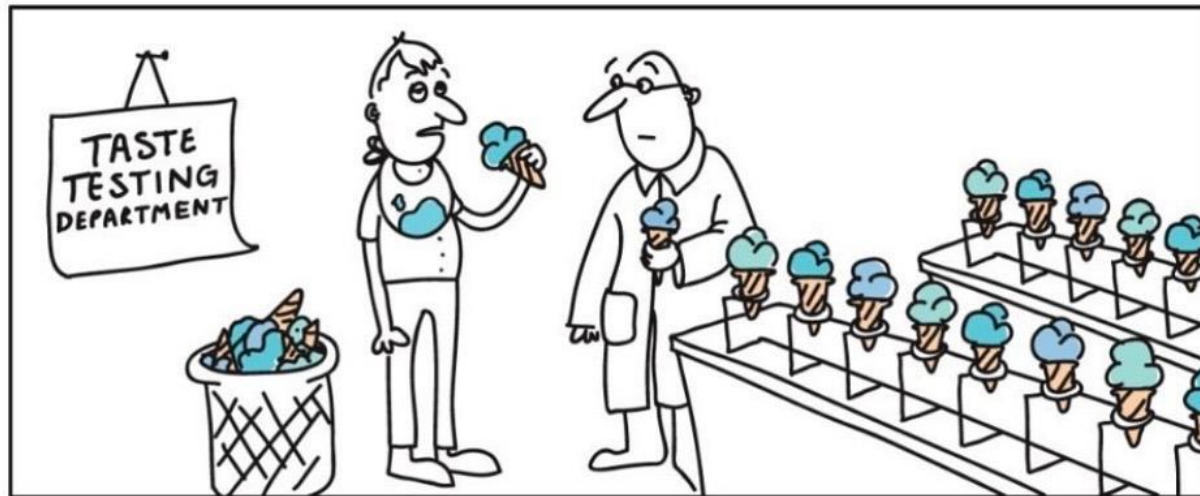


Steven Fein, MD, MPH  
Hematologist  
Heme On Call

# Objectives

- Evaluate the causes of low blood counts, including pancytopenia, among inpatients
- Discuss the management of inpatients who have non-malignant causes of low blood counts:
  - acute and chronic ITP
  - aplastic anemia
  - leukopenia
  - chemo-associated pancytopenia
  - other pancytopenia

# Following your passion



BY THE FIFTH YEAR, JIM REALLY REGRETTED FOLLOWING HIS CHILDHOOD PASSION FOR ICE CREAM...

# Finding your purpose



# Doctors wear many hats

- Master diagnostician
- Salesman for medical or surgical therapies
- Educator of patients, families, others
- Permanent student
- Communicator of good or bad news
- Responsible for good or bad outcomes
- Self-promoting salesperson amongst peers
- Member of a noble respected profession
- Wage earner and family member

# How to be a good doctor

- Listen to the patient
- Know when *not* to listen to the patient
- Notice everything
- Learn to determine who can be interrupted
- Turn off all distracting noises so you can become the center of attention
- Find a way for five minutes to seem like 15
- Touch patients and hug family members

# How to be a good doctor

- Take a “social history” first
- Try to remember something unique about each patient
- Learn how to determine whether somebody looks younger or older than their actual age
- Recognize the spiritual component required for people to “heal”

# Johns Hopkins Hospital atrium





## How to be a good doctor

Patients don't care how much you know until they know how much you care

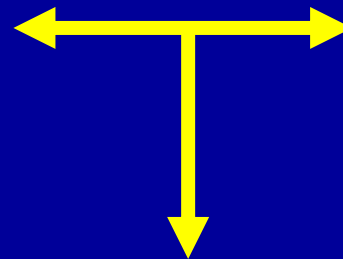
# Hematology overview

## Non-malignant heme

- Clotting/anticoagulants
- Bleeding
- Iron defic/women's health
- Abnormal blood counts
  - Sickle cell disease
- ITP
- TMA
- Rare heme

## Heme malignancy

- Acute leukemias
- Chronic leukemias
- Lymphoma
- Multiple myeloma
- Plasma cell disorders



## “Quasi-malignant heme”

- Myeloproliferative disorders
  - Polycythemia vera
  - Essential thrombocytosis
  - Idiopathic myelofibrosis
- Hypereosinophilic syndrome
- Systemic mastocytosis

# Hematology disorders

	Low	High
RBC	Anemia	Polycythemia
WBC	Leukopenia neutropenia	Leukocytosis Leukemia
Platelets	Thrombocytopenia	Thrombocytosis
Clotting	Bleeding and Coagulopathy	Thrombophilia

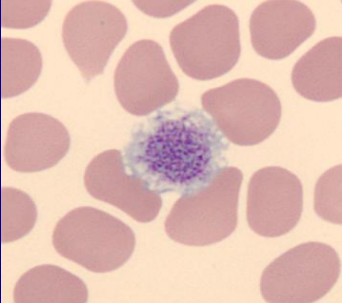
# Important heme conditions that I won't be discussing

- TMA (thrombotic microangiopathy)
- Heme malignancy, including APL leukemia
- Heme quasi-malignancy, including MDS
- AIHA and non-autoimmune hemolytic anemia
- Sickle cell disease/hemolytic anemia
- Rare pancytopenia, including Gaucher's Disease

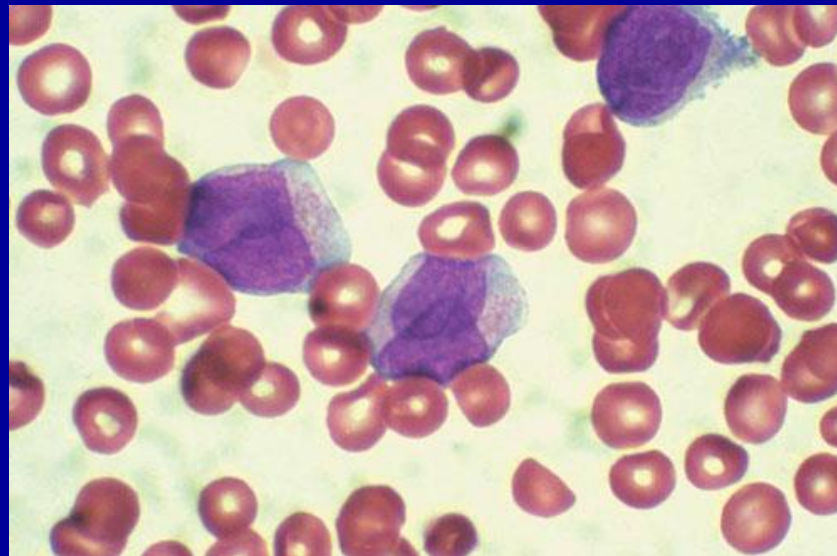
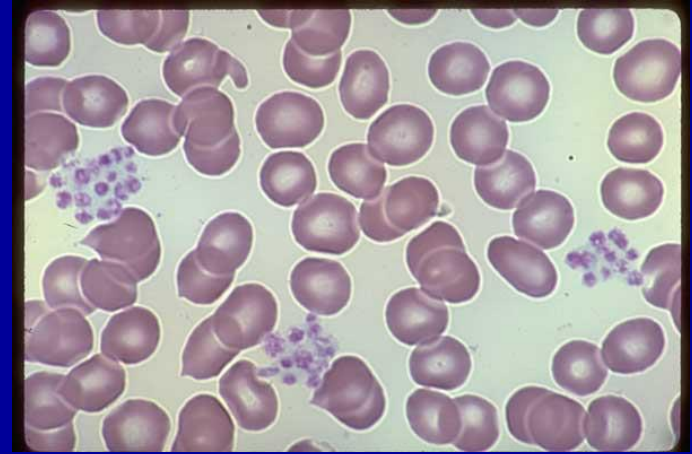
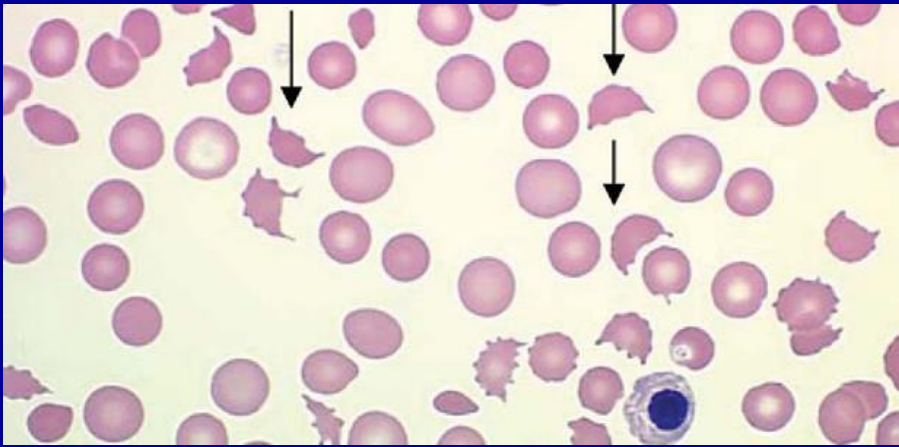
# Objectives

- Evaluate the causes of low blood counts, including pancytopenia, among inpatients
- Discuss the management of inpatients who have non-malignant causes of low blood counts:
  - acute and chronic ITP
  - aplastic anemia
  - leukopenia/neutropenia
  - chemo-associated pancytopenia
  - other pancytopenia

# What causes low platelets?

<p>Large platelets High MPV</p> 	<p>ACUTE (days-weeks) <i>Acute</i> ITP “consumption” Thrombosis Bleeding/hematoma DIC, HIT, APL, TTP</p>	<p>CHRONIC <i>Chronic</i> ITP Hypersplenism</p>
<p>Small platelets</p>	<p>BM suppression Infection Medications, chemo</p>	<p>BM dysfunction MDS, AA</p>

# These are not ITP



# Case 1: Severe low blood counts

65yo man with h/o abnormal blood counts for several years  
Sometimes severe anemia, presumed to have chronic GI tract bleeding

Now hospitalized again for fatigue, abnormal blood counts

ER transfusions did not increase his counts enough

	01/18/21 09:56	01/19/21 13:00	01/19/21 20:10	01/20/21 07:41	01/20/21 13:54	01/21/21 05:15
WBC		2.8 L	3.5 L		8.3	15.3 H
RBC		1.75 L	2.34 L		2.53 L	2.67 L
Hgb	6.3 L	4.5 L*	6.3 L	7.4 L	7.3 L	7.5 L
Hct	19.0 L*	14.3 L*	19.5 L*	21.8 L	21.2 L	23.2 L
MCV		82 L	84		84	87
MCH		26 L	27 L		29	28
MCHC		31 L	32		35 H	32
RDW		24.9 H	21.7 H		18.1 H	19.1 H
Plt Count	14 L*	21 L	24 L		37 L	105 L Δ
Add Manual Diff						



# How to evaluate inpatients who have low plt counts

- Review clinical presentation
- Review plt trend/chronicity if possible
- Look at MPV to determine BM vs. ITP/liver
- Look for “ITP pattern” vs. “liver pattern”
- Decide whether to do abdomen ultrasound (note nuclear spleen scan used for chronic)
- Decide whether to do BM biopsy
- Platelet transfusion is a diagnostic test

# Case 2: Abnormal blood counts

36yo woman with no prior medical problems

now with heavy menstrual bleeding

	04/26/21 19:16	04/27/21 06:38
WBC	7.9	8.1
RBC	3.13 L	2.69 L
Hgb	9.7 L	8.2 L
Hct	29.0 L	24.4 L
MCV	93	91
MCH	31	30
MCHC	34	34
RDW	18.9 H	18.4 H
Plt Count	19 L*	16 L*
Lymph % (Auto)	32.7	
Mono % (Auto)	6.3	
Eos % (Auto)	2.4	
Baso % (Auto)	0.6	
Lymph # (Auto)	2.6	
Mono # (Auto)	0.5	
Eos # (Auto)	0.2	
Baso # (Auto)	0.1	
Seg Neutrophils %	58.0	
Seg Neutrophils #	4.6	
Percent Retic		9.13 H

	04/27/21 05:32
PT	14.0
INR	1.10
APTT	38.4 H
Fibrinogen	439

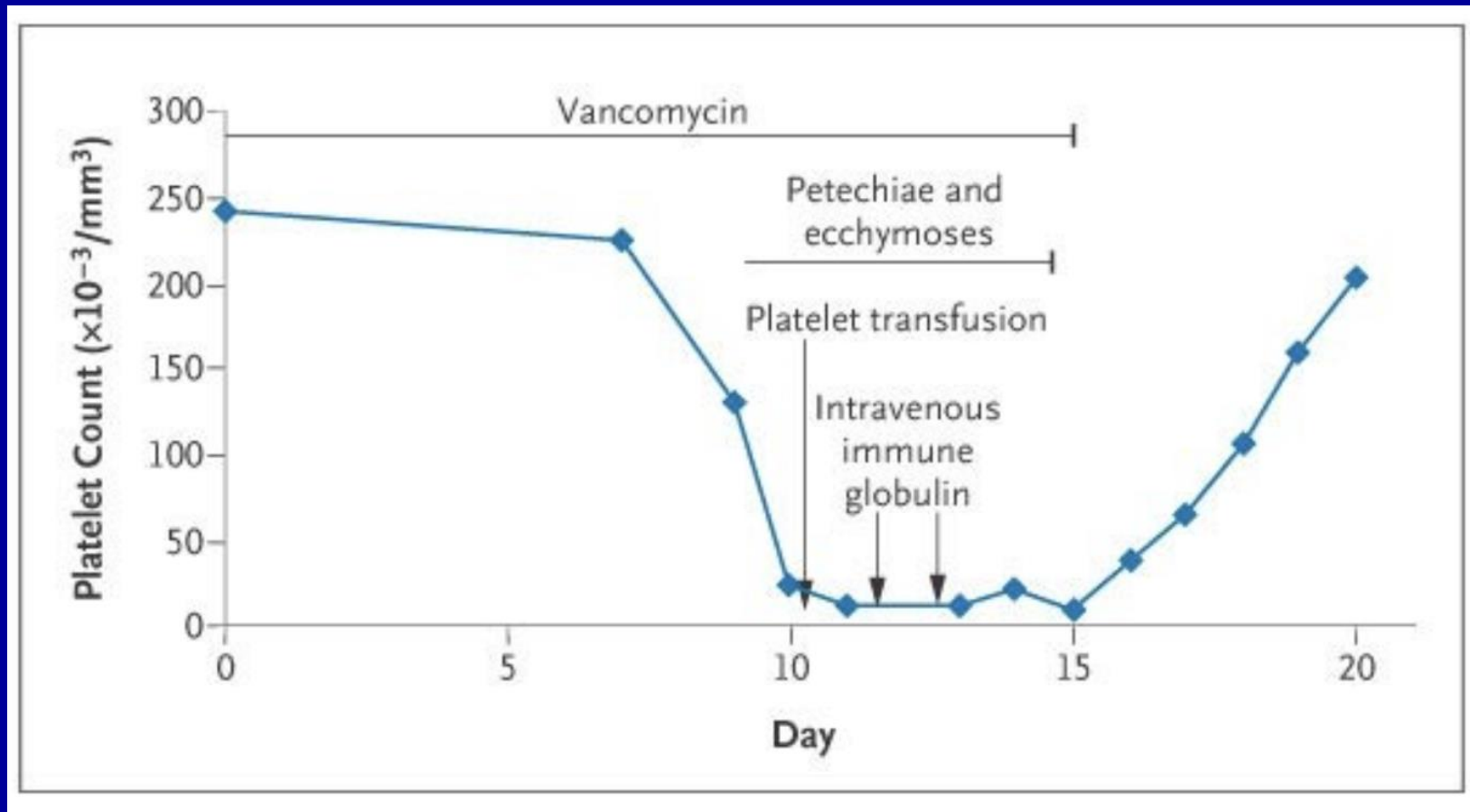
# How to manage inpatients who have presumed acute ITP

- “Isolated”  $\text{plt} < 20$  is usually acute ITP
- Decide whether they have life-threatening bleed
- Decide whether to test fibrinogen to r/o APL
- Decide whether they “need” plt transfusion
- Consider steroid pulse (I prefer solumedrol)
- Consider IVIG or Romiplostim (inpatient)
- Consider aminocaproic acid or TXA prevention
- Wait it out: acute ITP can take weeks to resolve

# How to manage inpatients who have challenging ITP

- When steroids don't work, plan a fast taper
- Each day, make plans for the next day
- Consider redosing IVIG if it helped
- Consider starting/redosing Romiplostim
- Consider inpatient Rituximab
- Try to avoid “urgent” splenectomy
- Stay in hospital until trend up and  $plt > 50$

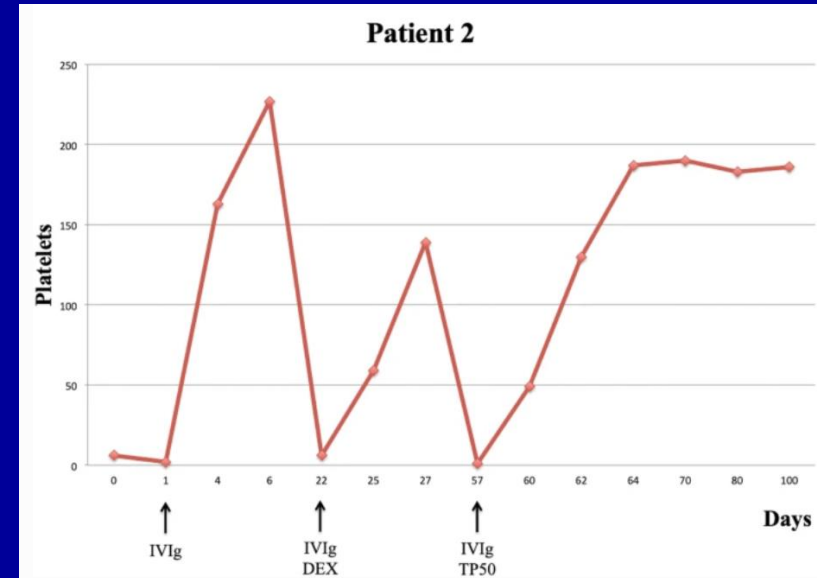
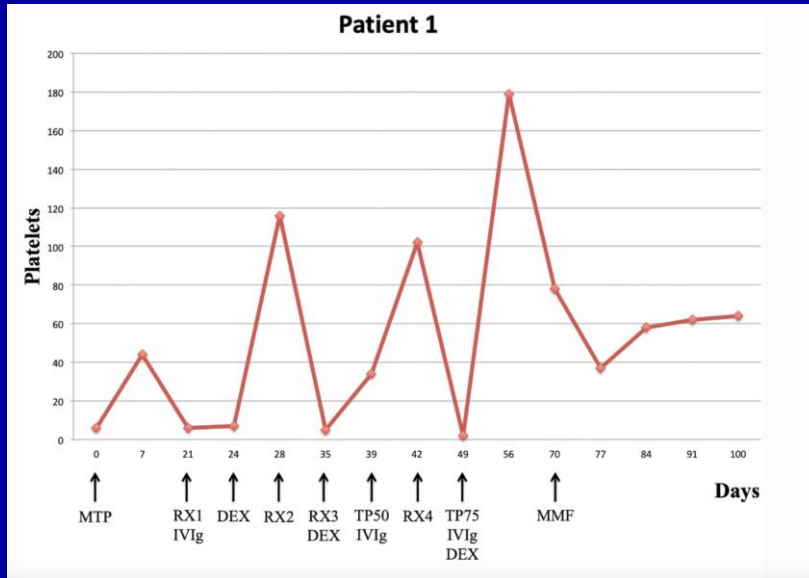
# Vancomycin-induced ITP



March 1, 2007

N Engl J Med 2007; 356:904-910

# Covid-induced ITP



## Frequently Relapsing Post-COVID-19 Immune Thrombocytopenia

[Claudia Serrano](#) ✉, [Ignacio Español](#), [Almudena Cascales](#) & [José M. Moraleda](#)

# Covid vaccine-induced ITP

## Four Key Points: COVID-19 Vaccination and Immune Thrombocytopenia

De Novo ITP Risk	<i>De novo</i> ITP is not associated with mRNA-based COVID-19 vaccines (Pfizer-BioNTech and Moderna) in adults, but there is a possible slightly increased risk during the immediate post-vaccination period following adenoviral vector vaccines (Oxford-AstraZeneca and Janssen).
Acute ITP Exacerbation Risk	There is a 5-15% risk of provoking a clinically-relevant acute ITP exacerbation with COVID-19 vaccination in adult patients with pre-existing ITP. The risk is similar irrespective of the type of COVID-19 vaccine.
Treatment and Natural History of Post-COVID-19 Vaccine ITP	Both <i>de novo</i> ITP and acute ITP exacerbations occurring in adults following COVID-19 vaccination are usually readily treated with typical ITP therapies. Their natural history appears similar to ITP episodes not associated with COVID-19 vaccination.
Subsequent COVID-19 Vaccinations	The occurrence of an acute ITP exacerbation following COVID-19 vaccination does not preclude the adult patient from receiving further COVID-19 vaccinations, although the risk of acute exacerbation in these individuals appears to be modestly higher than the baseline 5-15% overall risk.

COVID-19 vaccination and immune thrombocytopenia: Cause for vigilance, but not panic

Hanny Al-Samkari, MD  

**rp<sup>th</sup>**  
research and practice  
in thrombosis and haemostasis®

# Case 3: Abnormal blood counts and bleeding

67yo man with ESRD requiring hemodialysis

Fell at home, developed a scalp wound with persistent bleeding

	10/03/20 09:13	10/03/20 16:27	10/03/20 Unknown	10/04/20 08:33	10/04/20 08:33	10/04/20 22:51
WBC	5.4	5.7	5.1	5.9		
RBC	1.94 L	2.45 L	2.04 L	2.07 L		
Hgb	6.7 L	8.2 L	7.0 L	6.9 L		6.5 L
Hct	18.6 L*	25.2 L $\Delta$	19.6 L*	19.6 L*		18.4 L*
MCV	96 H	103 H	96 H	94		
MCH	35 H	33 H	34 H	33 H		
MCHC	36 H	33	36 H	35 H		
RDW	15.2	16.0 H	15.5 H	15.0		
Plt Count	9 L*	12 L*	16 L*	16 L*		
Mono % (Auto)			Np			
Add Manual Diff		Complete	Complete	Complete		
Total Counted		100	100	100		
Seg Neutrophils %			Np			
Seg Neuts % (Manual)		69.0	11.0 L	16.0 L		
Band Neutrophils %		0	1.0	0		
Lymphocytes % (Manual)		28.0	48.0 H	34.0		
Reactive Lymphs % (Man)		0	1.0	20.0		



# Case 3: Abnormal blood counts and bleeding

67yo man with ESRD requiring hemodialysis

Fell at home, developed a scalp wound with persistent bleeding

	10/03/20 09:13	10/03/20 16:27	10/03/20 Unknown	10/04/20 08:33	10/04/20 08:33	10/04/20 22:51
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Hct	18.6 L*	25.2 L Δ	19.6 L*	19.6 L*		18.4 L*
MCV	96 H	103 H	96 H	94		
MCH	35 H	33 H	34 H	33 H		
MCHC	36 H	33	36 H	35 H		
RDW	15.2	16.0 H	15.5 H	15.0		
Plt Count	9 L*	12 L*	16 L*	16 L*		
Mono % (Auto)			Nn			
Add Manual Diff						
Total Counted						
Seg Neutrophils %						
Seg Neuts % (Manual)						
Band Neutrophils %						
Lymphocytes % (Manual)						
Reactive Lymphs % (Man)						

	10/03/20 Unknown	10/04/20 08:33	10/04/20 10:52	10/05/20 04:25
PT	22.0 H			
INR	1.88 H			
APTT	39.5 H			34.9
Fibrinogen			150 L	134 L

# Case 3: Abnormal blood counts and bleeding

67yo man with ESRD requiring hemodialysis

Fell at home, developed a scalp wound with persistent bleeding

	10/03/20 09:13	10/03/20 16:27	10/03/20 Unknown	10/04/20 08:33	10/04/20 08:33	10/04/20 22:51
WBC	5.4	5.7	5.1	5.9		
RBC	1.94 L	2.45 L	2.04 L	2.07 L		
Hgb	6.7 L	8.2 L	7.0 L	6.9 L		6.5 L
Hct	18.6 L*	25.2 L Δ	19.6 L*	19.6 L*		18.4 L*
MCV	96 H	103 H	96 H	94		
MCH	35 H	33 H	34 H	33 H		
MCHC	36 H	33	36 H	35 H		
RDW	15.2	16.0 H	15.5 H	15.0		
Plt Count	9 L*	12 L*	16 L*	16 L*		
Mono % (Auto)			Nn			
Add Manual Diff						
Total Counted						
Seg Neutrophils %						
Seg Neuts % (Manual)						
Band Neutrophils %						
Lymphocytes % (Manual)						
Reactive Lymphs % (Man)						

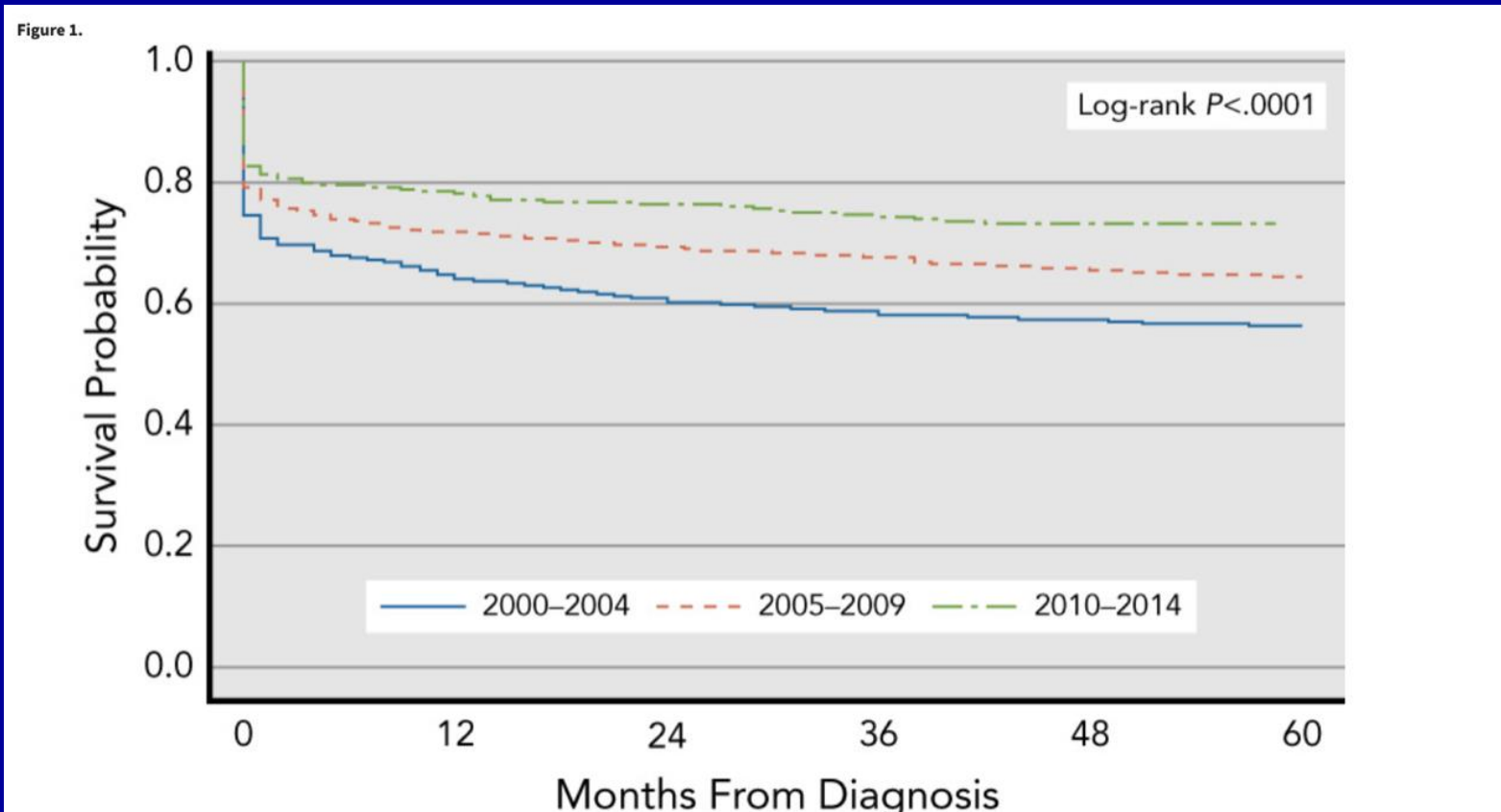
	10/03/20 Unknown	10/04/20 08:33
PT	22.0 H	
INR	1.88 H	
APTT	39.5 H	
Fibrinogen		

**Results: Abnormal**

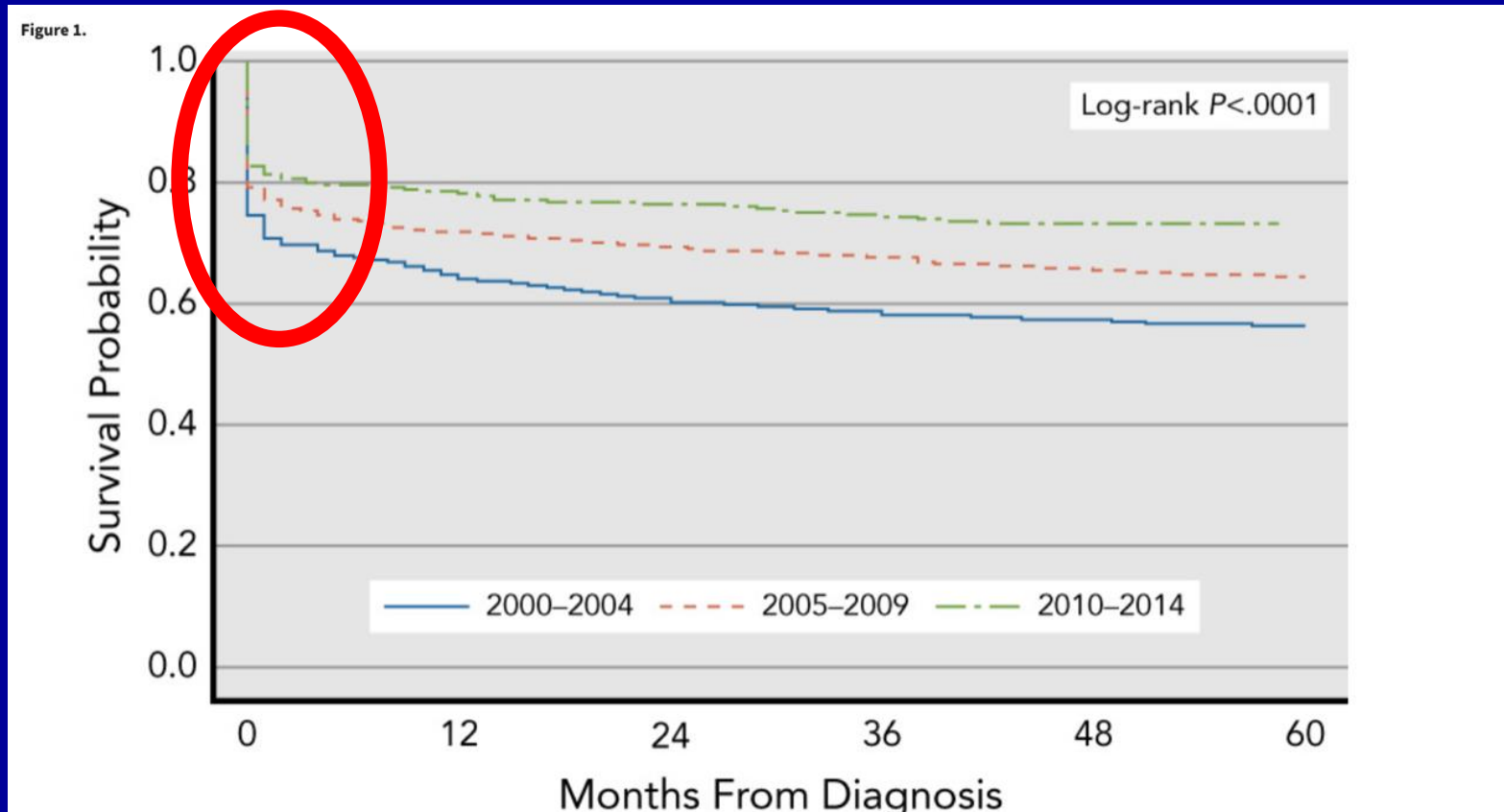
**Interpretation:**

t(15;17): DETECTED

# Acute promyelocytic leukemia (APL)



# Acute promyelocytic leukemia (APL)



# How to manage inpatients who have presumed chronic ITP

- If plt  $> 50$  then probably no treatment needed
  - OK for any anticoagulants if no visible bleeding
- If plt  $< 50$  then consider inpatient treatment
  - Decide whether surgery or procedure is anticipated
  - Decide whether home anticoagulants are anticipated
  - Decide whether pt is high risk for ICH (e.g. cirrhosis)
  - Consider steroid pulse (I prefer solumedrol)
  - Consider IVIG or Romiplostim or Rituximab (inpatient)
  - Consider low-dose anticoagulants if no visible bleeding

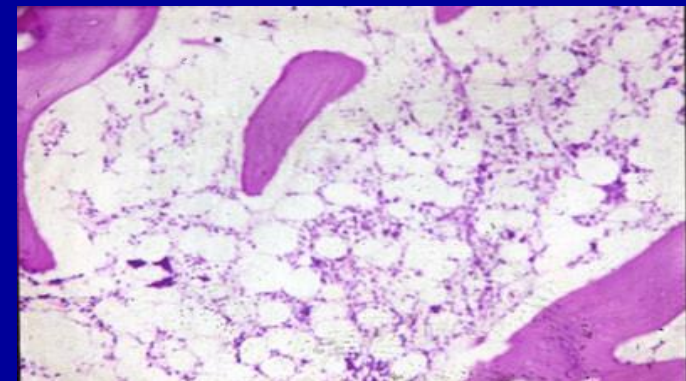
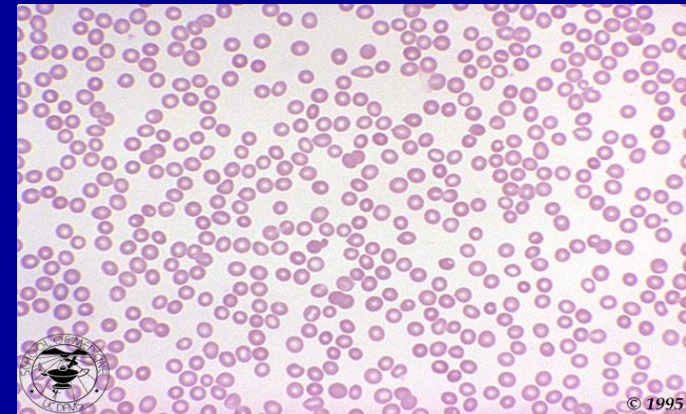
# Objectives

- Evaluate the causes of low blood counts, including pancytopenia, among inpatients
- Discuss the management of inpatients who have non-malignant causes of low blood counts:
  - acute and chronic ITP
  - aplastic anemia
  - leukopenia/neutropenia
  - chemo-associated pancytopenia
  - other pancytopenia

# Case 4: Pancytopenia

51yo man with recent h/o bruising and bleeding

Lab View	3/25/2023 16:00 - 03:59 EDT	3/24/2023 16:00 - 03:59 EDT	3/24/2023 04:00 - 15:59 EDT	3/23/2023 16:00 - 03:59 EDT	3/21/2023 04:00 - 15:59 EDT
<b>Hematology</b>					
<input type="checkbox"/> WBC Count	3.4 (L)	3.5 (L)		3.6 (L)	3.3 (L)
<input type="checkbox"/> RBC Count	2.10 (L)	2.11 (L)		2.05 (L)	2.29 (L)
<input type="checkbox"/> Hemoglobin	7.7 (L)	7.7 (L)		7.6 (L)	8.5 (L)
<input type="checkbox"/> Hematocrit	23.0 (L)	23.4 (L)		22.5 (L)	24.7 (L)
<input type="checkbox"/> MCV	109.5 (H)	110.9 (H)		109.8 (H)	107.9 (H)
<input type="checkbox"/> MCH	36.7 (H)	36.5 (H)		37.1 (H)	37.1 (H)
<input type="checkbox"/> MCHC	33.5	32.9		33.8	34.4
<input type="checkbox"/> RDW-CV	15.6 (H)	16.0 (H)		16.0 (H)	16.4 (H)
<input type="checkbox"/> Platelet	16 * (l)	25 (L)		16 * (l)	8 * (l)
<input type="checkbox"/> MPV	8.8 (L)	12.4			NM
<input type="checkbox"/> IPF				3	3
<input type="checkbox"/> NRBC%	0.0 [2]	0.0 [2]		0.0	0.0 [2]
<input type="checkbox"/> NRBC(Abs)	0.00 [2]	0.00 [2]		0.00	0.00 [2]
<input type="checkbox"/> Neutrophil (%)	32.5 (L)	41.8			44.1
<input type="checkbox"/> Segmented Neutrophil (%)				32.3	
<input type="checkbox"/> Lymphocyte (%)	60.7 (H)	51.3 (H)			46.5 (H)
<input type="checkbox"/> Lymphocyte (%).				63.6 (H)	
<input type="checkbox"/> Monocyte (%)	5.9 (L)	5.7 (L)		4.1 (L)	7.0
<input type="checkbox"/> Eosinophil (%)	0.9	0.9			1.8
<input type="checkbox"/> Basophil (%)	0.0	0.0			0.3
<input type="checkbox"/> Immature Granulocyte (%)	0.0	0.3			0.3
<input type="checkbox"/> Absolute Neutrophil	1.1 (L)	1.5 (L)			1.4 (L)
<input type="checkbox"/> Absolute Lymphocyte	2.0	1.8		2.3	1.5

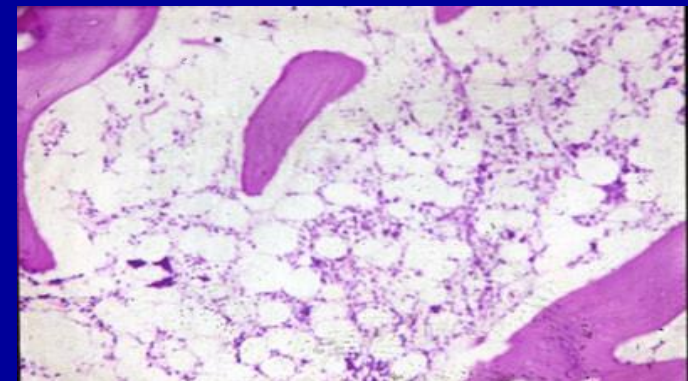
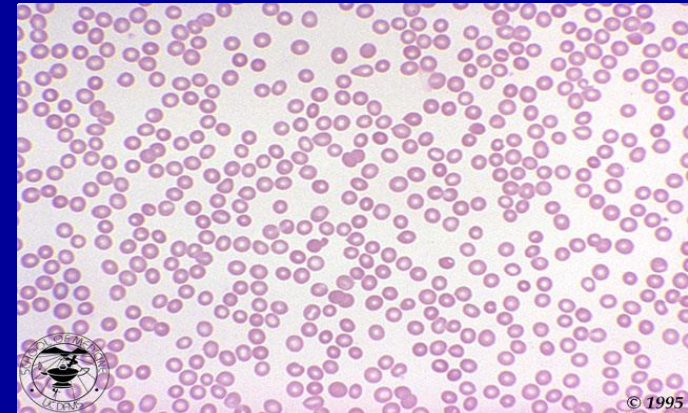


# Case 4: Pancytopenia

51yo man with recent h/o bruising and bleeding

**Dx: Mild aplastic anemia**

Lab View	3/25/2023 16:00 - 03:59 EDT	3/24/2023 16:00 - 03:59 EDT	3/24/2023 04:00 - 15:59 EDT	3/23/2023 16:00 - 03:59 EDT	3/21/2023 04:00 - 15:59 EDT
<b>Hematology</b>					
<input type="checkbox"/> WBC Count	3.4 (L)	3.5 (L)		3.6 (L)	3.3 (L)
<input type="checkbox"/> RBC Count	2.10 (L)	2.11 (L)		2.05 (L)	2.29 (L)
<input type="checkbox"/> Hemoglobin	7.7 (L)	7.7 (L)		7.6 (L)	8.5 (L)
<input type="checkbox"/> Hematocrit	23.0 (L)	23.4 (L)		22.5 (L)	24.7 (L)
<input type="checkbox"/> MCV	109.5 (H)	110.9 (H)		109.8 (H)	107.9 (H)
<input type="checkbox"/> MCH	36.7 (H)	36.5 (H)		37.1 (H)	37.1 (H)
<input type="checkbox"/> MCHC	33.5	32.9		33.8	34.4
<input type="checkbox"/> RDW-CV	15.6 (H)	16.0 (H)		16.0 (H)	16.4 (H)
<input type="checkbox"/> Platelet	16 * (l)	25 (L)		16 * (l)	8 * (l)
<input type="checkbox"/> MPV	8.8 (L)	12.4			NM
<input type="checkbox"/> IPF				3	3
<input type="checkbox"/> NRBC%	0.0 [2]	0.0 [2]		0.0	0.0 [2]
<input type="checkbox"/> NRBC(Abs)	0.00 [2]	0.00 [2]		0.00	0.00 [2]
<input type="checkbox"/> Neutrophil (%)	32.5 (L)	41.8			44.1
<input type="checkbox"/> Segmented Neutrophil (%)				32.3	
<input type="checkbox"/> Lymphocyte (%)	60.7 (H)	51.3 (H)			46.5 (H)
<input type="checkbox"/> Lymphocyte (%).				63.6 (H)	
<input type="checkbox"/> Monocyte (%)	5.9 (L)	5.7 (L)		4.1 (L)	7.0
<input type="checkbox"/> Eosinophil (%)	0.9	0.9			1.8
<input type="checkbox"/> Basophil (%)	0.0	0.0			0.3
<input type="checkbox"/> Immature Granulocyte (%)	0.0	0.3			0.3
<input type="checkbox"/> Absolute Neutrophil	1.1 (L)	1.5 (L)			1.4 (L)
<input type="checkbox"/> Absolute Lymphocyte	2.0	1.8		2.3	1.5





# How to manage inpatients who have “aplastic anemia” picture

51yo man with recent h/o bruising and bleeding  
Bone marrow biopsy c/w aplastic anemia  
Dx: “mild” aplastic anemia

## PLAN:

Transfusion parameters

whenever plt < 20 transfuse one dose plt

ATG/Csa vs. “urgent” stem cell transplant

# Case 5: Pancytopenia

27yo young woman with recent fever, fatigue

Lab View	3/13/2023 11:00 - 18:59 EDT	3/13/2023 03:00 - 10:59 EDT	3/12/2023 19:00 - 02:59 EDT
<input type="checkbox"/> WBC Count	1.5 (L)	1.6 (L) [3] [[L	1.1 * (L)
<input type="checkbox"/> RBC Count	2.66 (L)	2.95 (L) [3]	0.96 (L)
<input type="checkbox"/> Hemoglobin	7.9 (L)	8.8 (L) [3] [[L	2.8 * (L)
<input type="checkbox"/> Hematocrit	22.4 (L)	24.7 (L) [3]	8.3 (L)
<input type="checkbox"/> MCV	84.2	83.7 [3]	86.5
<input type="checkbox"/> MCH	29.7	29.8 [3]	29.2
<input type="checkbox"/> MCHC	35.3 (H)	35.6 (H) [3]	33.7
<input type="checkbox"/> RDW-CV	14.7	14.6 [3]	15.2 (H)
<input type="checkbox"/> Platelet	20 (L)	12 * (L) [3] [[L	14 * (L)
<input type="checkbox"/> MPV	9.7	9.6 [3]	9.5
<input type="checkbox"/> IPF		4	----
<input type="checkbox"/> NRBC%	0.0 [2]	0.0 [5]	0.0 [2]
<input type="checkbox"/> NRBC(Abs)	0.00 [2]	0.00 [5]	0.00 [2]
<input type="checkbox"/> Neutrophil (%)	21.8 (L)	18.1 (L) [2]	10.1 (L)
<input type="checkbox"/> Segmented Neutrophil (%)		5.2	
<input type="checkbox"/> Band Neutrophil (%)			
<input type="checkbox"/> Lymphocyte (%)	74.8 (H)	78.8 (H) [2]	71.8 (H)
<input type="checkbox"/> Lymphocyte (%).		87.8 (H)	
<input type="checkbox"/> Monocyte (%)	2.0 (L)	1.3 (L) [3] [[L	13.6 (H)
<input type="checkbox"/> Eosinophil (%)	0.0	0.6 [3]	0.9
<input type="checkbox"/> Basophil (%)	0.7	0.6 [3]	0.9
<input type="checkbox"/> Immature Granulocyte (%)	0.7	0.6 [2] [[H]	2.7 (H)

# Case 5: Pancytopenia

27yo young woman with recent fever, fatigue

Lab View	3/13/2023 11:00 - 18:59 EDT	3/13/2023 03:00 - 10:59 EDT	3/12/2023 19:00 - 02:59 EDT
WBC Count	1.5 (L)	1.6 (L) [3][L]	1.1 * (L)
RBC Count	2.66 (L)	2.95 (L) [3][L]	0.96 (L)
Hemoglobin	7.9 (L)	8.8 (L) [3][L]	2.8 * (L)
Hematocrit	22.4 (L)	24.7 (L) [3][L]	8.3 (L)
MCV	84.2	83.7 [3]	86.5
MCH	29.7	29.8 [3]	29.2
MCHC	35.3 (H)	35.6 (H) [3]	33.7
RDW-CV	14.7	14.6 [3]	15.2 (H)
Platelet	20 (L)	12 * (L) [3][L]	14 * (L)
MPV	9.7	9.6 [3]	9.5
IPF		4	----
NRBC%	0.0 [2]	0.0 [5]	0.0 [2]
NRBC(Abs)	0.00 [2]	0.00 [5]	0.00 [2]
Neutrophil (%)	21.8 (L)	18.1 (L) [2][L]	10.1 (L)
Segmented Neutrophil (%)		5.2	
Band Neutrophil (%)			
Lymphocyte (%)	74.8 (H)	78.8 (H) [2]	71.8 (H)
Lymphocyte (%).		87.8 (H)	
Monocyte (%)	2.0 (L)	1.3 (L) [3][L]	13.6 (H)
Eosinophil (%)	0.0	0.6 [3]	0.9
Basophil (%)	0.7	0.6 [3]	0.9
Immature Granulocyte (%)	0.7	0.6 [2][H]	2.7 (H)

BONE MARROW, CORE BIOPSY (PART A), ASPIRATE SMEARS (PART B), ILIAC CREST:  
B-LYMPHOBLASTIC LEUKEMIA/LYMPHOMA, BLASTS 95%. SEE COMMENT.

# Objectives

- Evaluate the causes of low blood counts, including pancytopenia, among inpatients
- Discuss the management of inpatients who have non-malignant causes of low blood counts:
  - acute and chronic ITP
  - aplastic anemia
  - leukopenia/neutropenia
  - chemo-associated pancytopenia
  - other pancytopenia

# Case 6: Severe neutropenia

- 33yo woman with follicular lymphoma, BRx 6 (2021)
- Maintenance Rituximab every 6 months
- c/o fatigue, possible fever, found to have low WBC

12/5/22 23:12	11/28/22 16:40	11/21/22 16:37	11/14/22 16:24	11/7/22 15:22
1.62 ▼	1.53 ▼	2.40 ▼	6.28	6.96
31.2 ▼	35.3	41.9	36.0	38.7
240	212	272	287	339
0.0	5.9	19.2	65.8	71.0
50.4	47.9	35.0	19.7	16.4
0.00 ☹	0.09 ☹	0.46 ☹	4.13	4.94

# Case 6: Severe neutropenia

- 33yo woman with follicular lymphoma, BRx 6 (2021)
- Maintenance Rituximab every 6 months
- c/o fatigue, possible fever, found to have low WBC
- PLAN: daily filgrastim, IV Abx, acyclovir, fluconazole

12/14/22 10:36	12/13/22 08:07	12/12/22 09:14	12/11/22 09:32	12/10/22 08:34
35.33 ^	16.67 ^	4.22	2.50 v	1.86 v
31.6 v	30.3 v	33.1 v	31.4 v	31.3 v
422 ^	See Com...	399 ^	390 ^	340
72.9	54.4	17.9	0.0	0.0
6.8	14.0	36.6	48.7	60.3
25.76 ^	9.07 ^	0.76 v	0.00 v	0.00 v

12/5/22 23:12	11/28/22 16:40	11/21/22 16:37	11/14/22 16:24	11/7/22 15:22
1.62 v	1.53 v	2.40 v	6.28	6.96
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0.00 v	0.09 v	0.46 v	4.13	4.94

# Cause of neutropenia

- Drug-induced
  - Bactrim/Sulfa
  - PTU & Methimazole
  - Clozapine
  - Chloramphenicol
  - Furosemide
- Presumed autoimmune neutropenia
- "Idiopathic"
- "Cyclic" neutropenia
- "Ethnic" neutropenia

# How to evaluate inpatients who have low WBC/neutropenia

- Review clinical presentation, r/o acute infection
- Determine chronicity, if possible
- Review recent new medications
- Review WBC differential
- Consider autoimmune testing and HIV testing
- You don't need flow cytometry unless it looks like lymphoma
- You probably don't need urgent BM biopsy



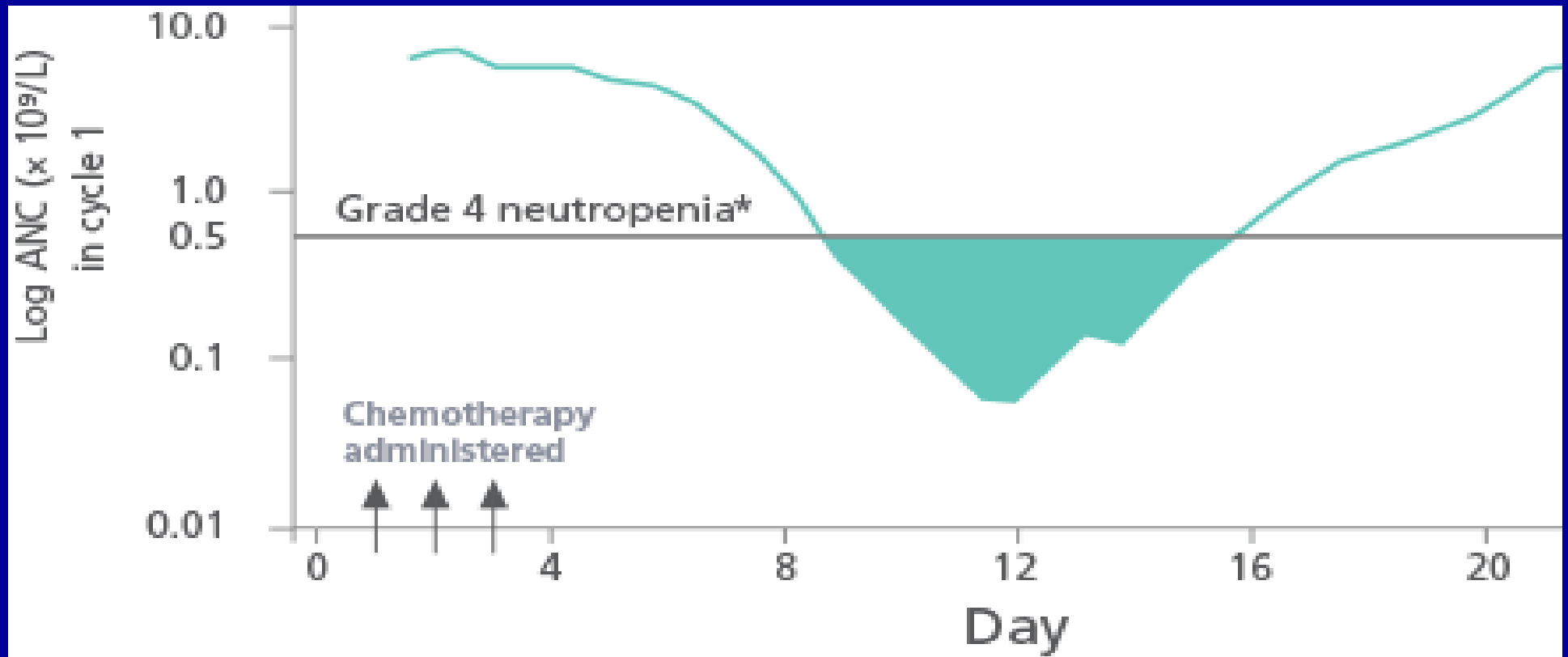
# What to do for pts with low WBC

- Try to discontinue all nonessential meds
- Consider “trial of filgrastim”
- Decide IV Abx and acyclovir and fluconazole
- Make a plan for when you will consider BMBx
- Consider trial of steroids→IVIg→Rituxan

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  - leukopenia/neutropenia
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  - other pancytopenia

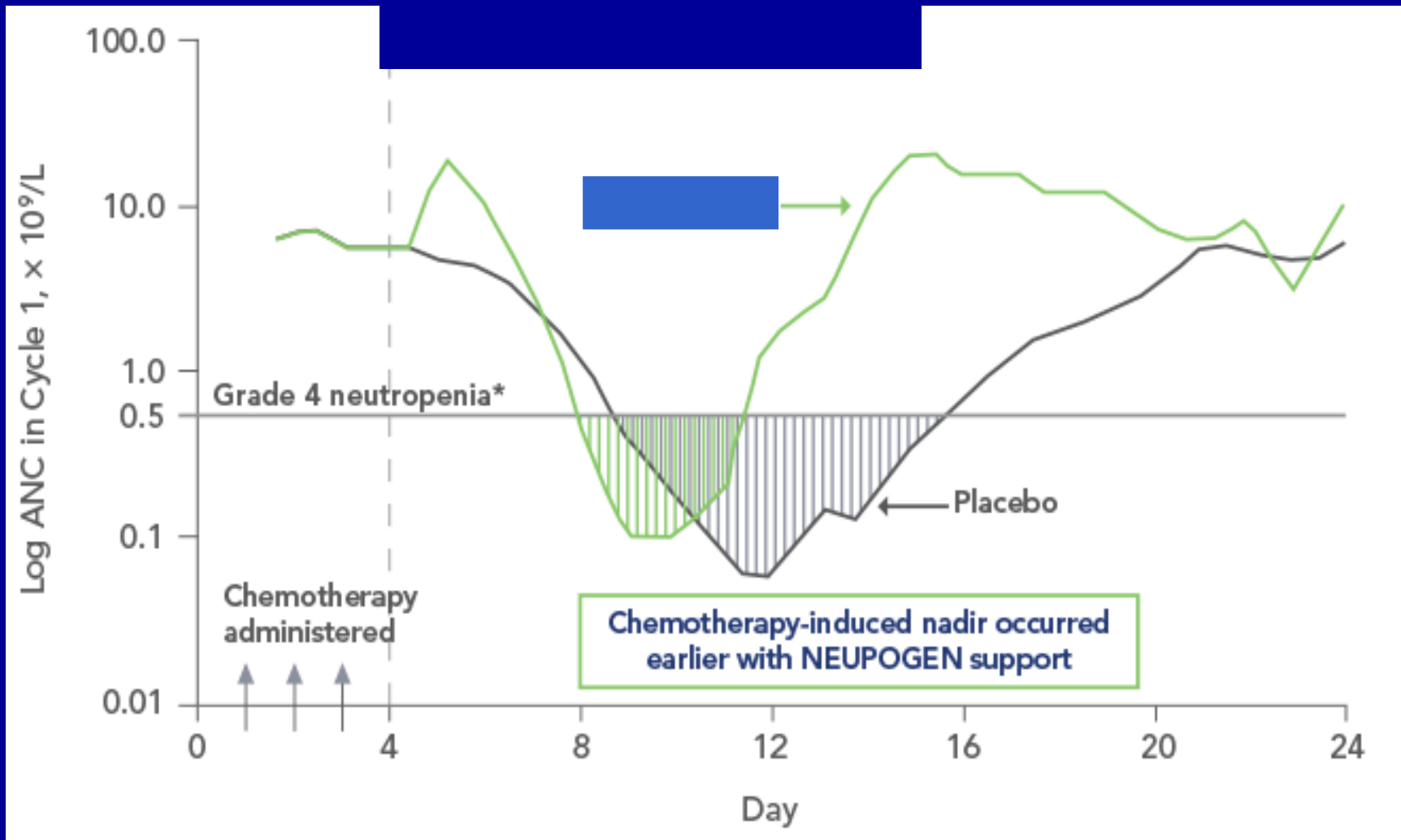
# Chemotherapy Nadir



# Colony Stimulating Factors

Drug	Dose	Timing	Adverse Events
Filgrastim - Neupogen - Zarxio - Granix	5 mcg/kg/day	Post Chemo: >24 Hour Prior to Chemo: Not <24 Hour	Bone Pain Respiratory Distress Hypersensitivity ↑ Bleomycin Lung Toxicity
Pegfilgrastim - Neulasta	Single Dose 6 mcg/kg	Post Chemo: >24 Hour Prior to Chemo: Not <14 Days	

# Filgrastim for Neutropenia



# Risk Factors for Neutropenic Fever

- **Patient**

Age  $\geq 65$  years

Poor PS  $\geq 2$

Albumin  $< 35$ g/L

Comorbidities

- Single 27%
- Two 67%
- Three (+) 125%

FN History

- **Cancer**

Diagnosis

- AML
- MDS
- NHL
- MM
- Germ Cell
- Soft Tissue

Incomplete Response

- Persistent/Refractory
- Progressive
- Remission Unattained

Stage  $\geq 2$

- **Treatment**

Medication

- $> 85\%$  Dose Admin
- Purine Analogs
- Alemtuzumab
- Steroids
- High Dose Chemo

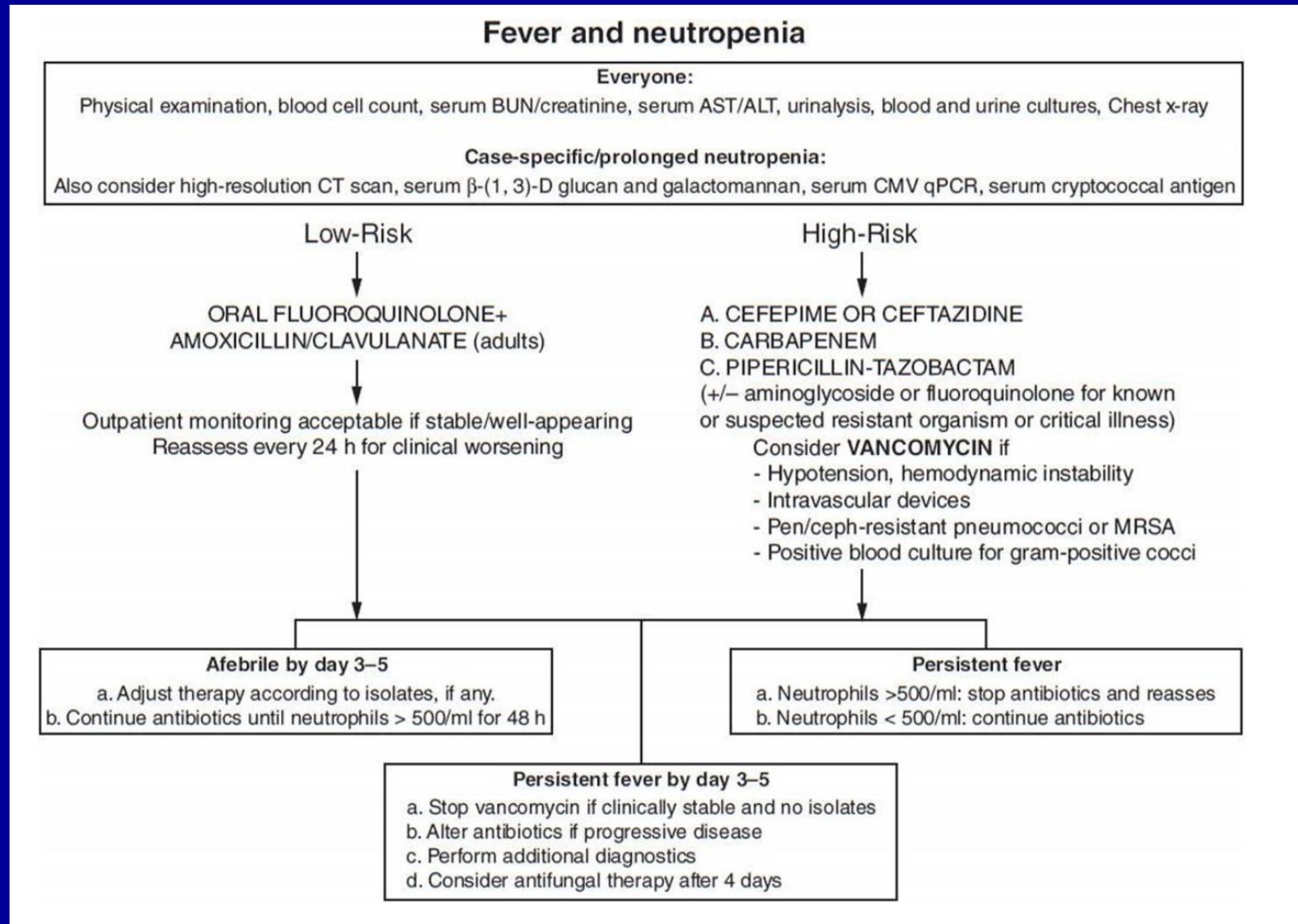
Mucositis grade  $\geq 3$

Neutropenia  $\geq 7$  days

Procedures

- HSCT
- Splenectomy
- Radiation

# Antibiotics for neutropenic fever



# Objectives

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  - other pancytopenia



# Case 7: Pancytopenia

- 38yo man with hematemesis
- alcohol dependence, recent vegetarian diet
- exam shows spleen tip palpable
- Hgb 8.0; plt 75,000 WBC 3
- PT 28 secs; APTT 50 secs
- D-dimer neg; fibrinogen 165mg/fL

# Case 7: Pancytopenia

- 38yo man with hematemesis
- alcohol dependence, recent vegetarian diet
- exam shows spleen tip palpable
- Hgb 8.0; plt 75,000 WBC 3
- PT 28 secs; APTT 50 secs
- D-dimer neg; fibrinogen 165mg/fL
- **PLAN: cryo and FFP are more important than plts**
- **"whenever plt<50 transfuse one dose plt"**
- **Attempt to address local cause of bleeding**

# How to evaluate & manage inpatients who have “other pancytopenia”

- Differential diagnosis
  - Liver dysfunction/hypersplenism
  - Autoimmune “lupus”
  - Infection: bacteremia, Covid, EBV, HIV, “other”
  - Heme quasi-malignancy (MDS)
  - Heme malignancy

# Case 8: Pancytopenia

- 26yo young man with no chronic medical problems
- Evaluated for weakness, possible fever, weight loss

	5/12/23 06:49	5/11/23 21:20	5/11/23 19:39
CBC			
WBC	3.5 ▼		3.6 ▼
RBC	3.94 ▼		3.90 ▼
HGB	10.6 ▼		10.6 ▼
HCT	31.2 ▼		31.1 ▼
MCV	79.2 ▼		79.7 ▼
MCH	26.9		27.2
MCHC	34.0		34.1
RDW	13.1		13.0
Platelet Count	39 ▼		24 ▼
Platelet Estimate	Decreased		Decreased

COAG OTHER	
Fibrinogen	266
PROTIME W/ INR	
Protime	15.6 ▲
INR	1.3
PTT	
APTT	48 ▲

# Case 8: Pancytopenia

- 26yo young man with no chronic medical problems
- Evaluated for weakness, possible fever, weight loss

	5/12/23 06:49	5/11/23 21:20	5/11/23 19:39
CBC			
WBC	3.5 ▼		3.6 ▼
RBC	3.94 ▼		3.90 ▼
HGB	10.6 ▼		10.6 ▼
HCT	31.2 ▼		31.1 ▼
MCV	79.2 ▼		79.7 ▼
MCH	26.9		27.2
MCHC	34.0		34.1
RDW	13.1		13.0
Platelet Count	39 ▼		24 ▼
Platelet Estimate	Decreased		Decreased

COAG OTHER	
Fibrinogen	266
PROTIME W/ INR	
Protime	15.6 ▲
INR	1.3
PTT	
APTT	48 ▲

HIV TESTS	
HIV-1/HIV-2 Ab	Prelim... !
HIV 1/2 Ab Differentiation	HIV-1 ... !

# How to evaluate & manage inpatients who have “other pancytopenia”

- Consider abdomen ultrasound
- Decide about testing HIV Ab, ANA, Covid testing
- Decide whether to do BM biopsy
- Transfusion parameters (e.g., Hgb < 7, plt < 20)
- Assess bleeding tendency
- Decide about low dose anticoagulant for DVT/PE prev

# Take-home points

- Presumed ITP is a “diagnosis of exclusion” that means “doubt heme malignancy, doubt liver dz”
- Leukopenia (neutropenia) may be drug-induced
- Pancytopenia is usually liver dysfunction, but need to r/o heme malignancy or aplastic anemia
- Use transfusion parameters when possible
- Consider inpatient filgrastim or romiplostim