



FOR  
Health Professionals

# Blood disorders in immigrants

Arjuna Ponnampalam MD, FRCPC

# Disclosures

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## **FINANCIAL DISCLOSURE**

None

# Objectives

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1. Recognize laboratory indices of red cell turnover
2. Develop an approach to identifying inherited anemias
3. Distinguish between trait and disease

# Referral to Hematology

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	<b>Flags</b>	<b>Results</b>	<b>Reference Range</b>
Hemoglobin	A	122	140 - 180
WBC Count	N	7.7	4.5 - 11
RBC Count	N	4.99	4.4 - 5.9
Hematocrit	A	0.358	0.4 - 0.52
MCV	A	71.6	80 - 98
MCH	A	24.5	25 - 35
MCHC	N	342	320 - 365
Platelet Count	A	89	140 - 440
Ferritin		308	

# Referral to Hematology

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Qualitative disorder  
Hemoglobin SC disease

# Referral to Hematology

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## HAEMATOLOGY

	Flags	Results	Reference Range	Units
Hemoglobin	A	85	140 - 180	g/L
WBC Count	A	3.2	4.5 - 11	x 10 <sup>9</sup> /L
RBC Count	N	5.07	4.4 - 5.9	x 10 <sup>12</sup> /L
Hematocrit	A	0.295	0.4 - 0.52	L/L
MCV	A	58.1	80 - 98	fl.
MCH	A	16.9	25 - 35	pg
MCHC	A	290	320 - 365	g/L
Platelet Count	A	128	140 - 440	x10 <sup>9</sup> /L
Ferritin	A	695		

# Referral to Hematology

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Quantitative disorder  
Hemoglobin H (alpha thal) disease

# Referral to Hematology

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WBC	11.0
RBC	2.35*
HGB	68*
HCT	0.184*
MCV	78.3*
MCH	28.9
MCHC	370*
RDW	24.0*
PLT	295
MPV	10.0

Sodium	142
Potassium	4.2
Chloride	109*
Glucose	4.8
Urea	2.3*
Creatinine	48
eGFR	>=60
Protein Total	78
Albumin	40
Bilirubin Total	56*
Bilirubin Direct	11*
AST	84*
ALT	33
LD	1869*
GGT	58*
Alk Phos	95



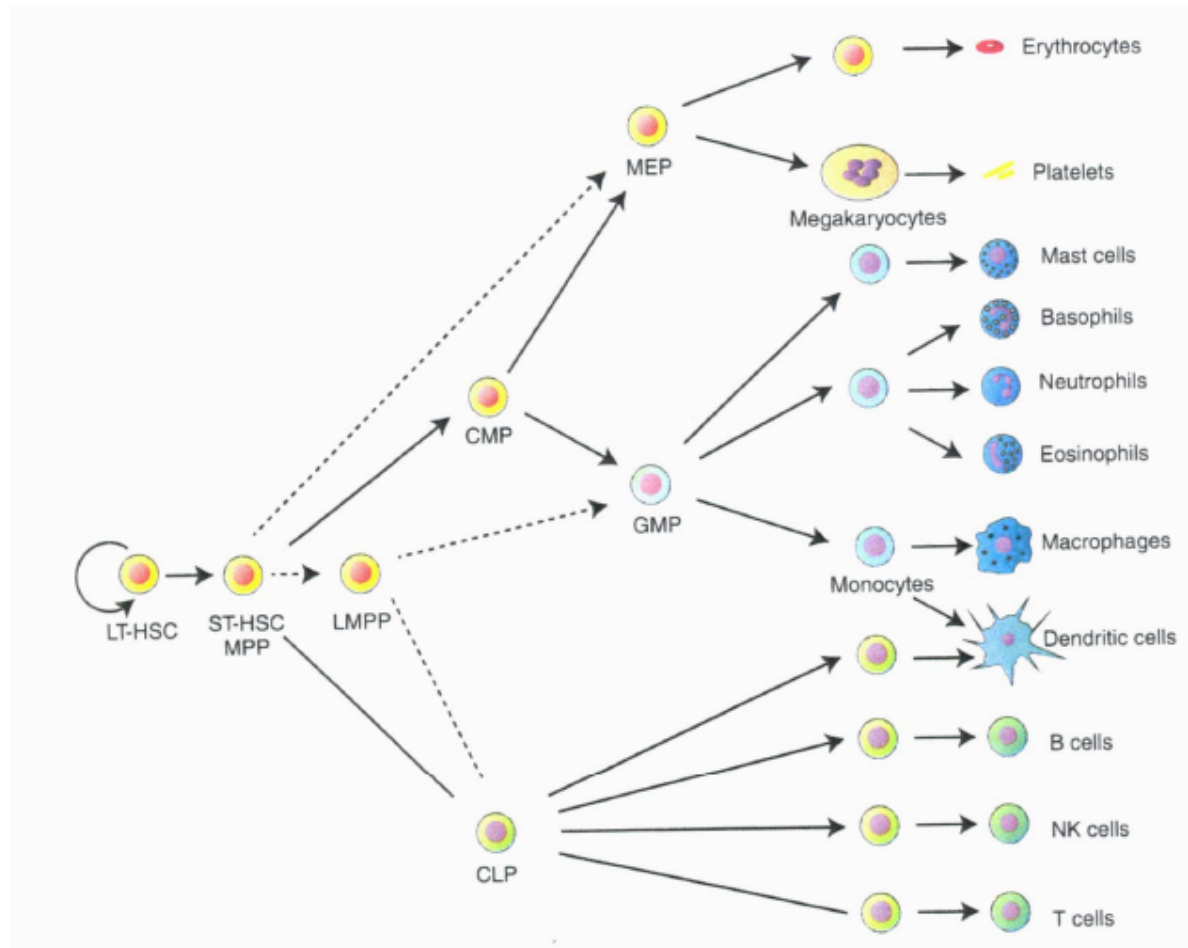
# Referral to Hematology

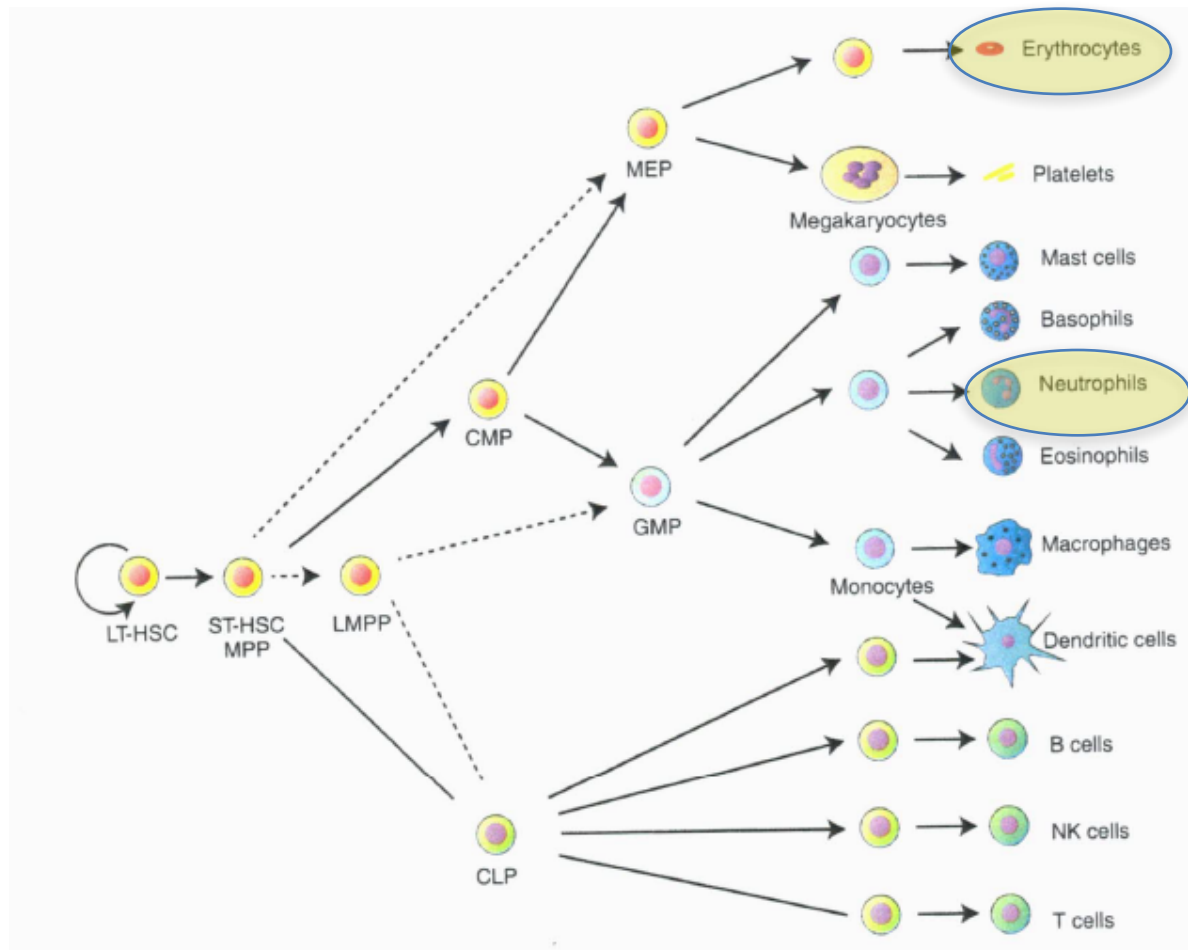
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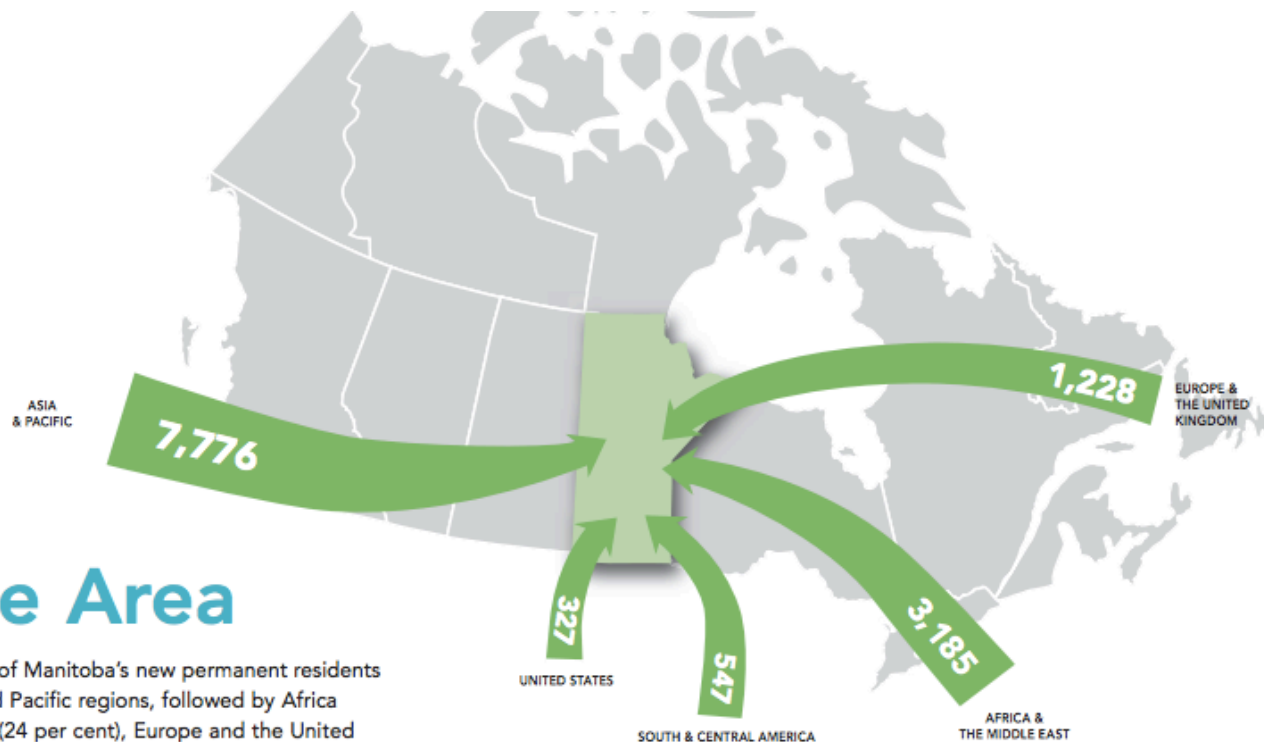
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Qualitative disorder  
Homozygous SS – Sickle cell disease

World Sickle Cell Day – June 19, 2016



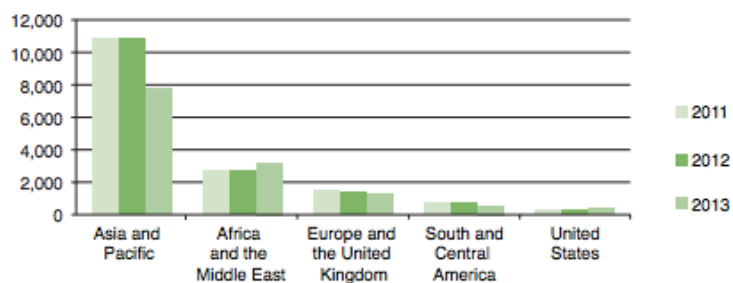




## Source Area

In 2013, 59 per cent of Manitoba's new permanent residents arrived from Asia and Pacific regions, followed by Africa and the Middle East (24 per cent), Europe and the United Kingdom (nine per cent), South and Central America (four per cent) and the United States (three per cent).

**MANITOBA PERMANENT RESIDENTS BY SOURCE AREA 2011 – 2013**

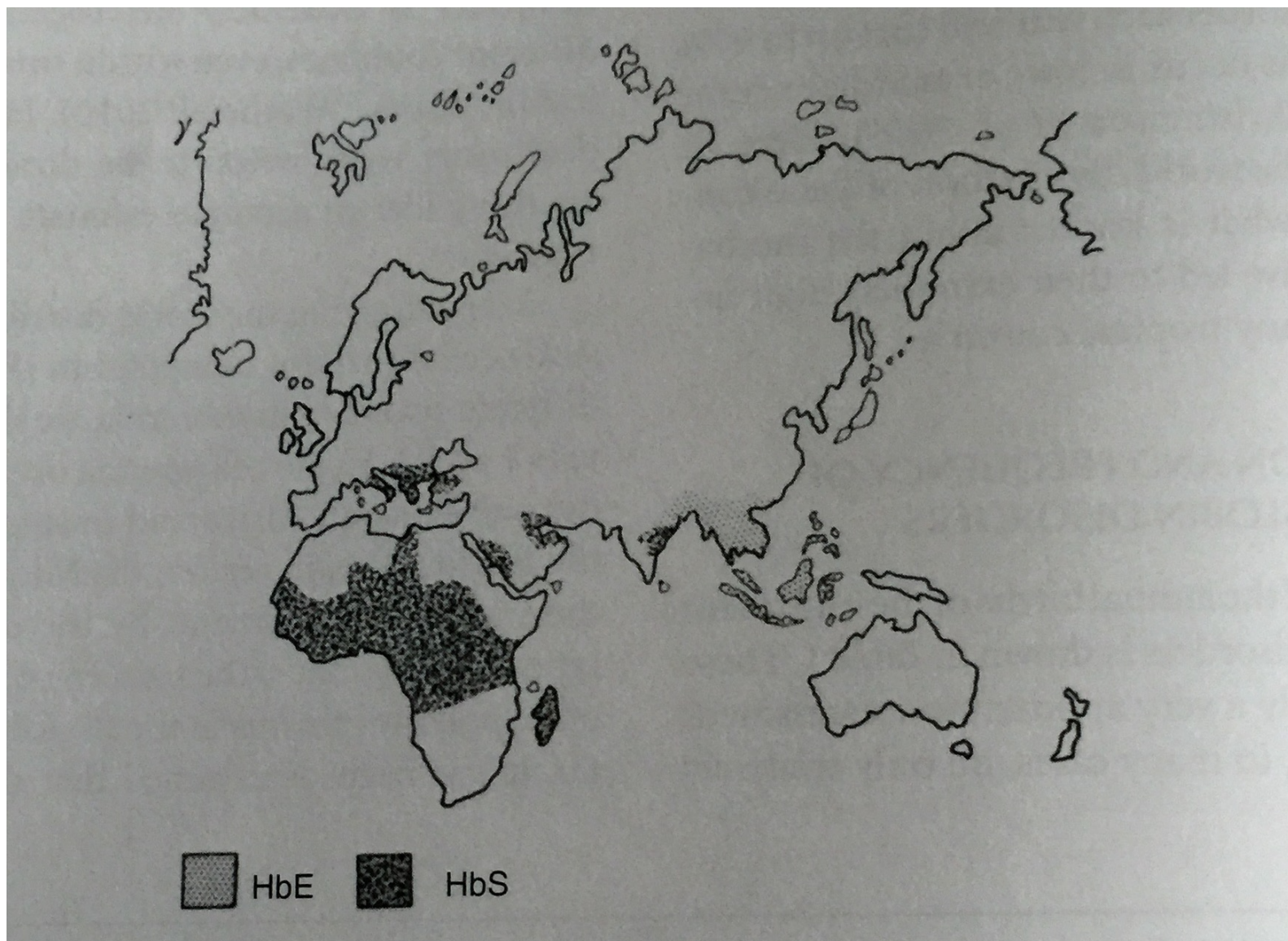


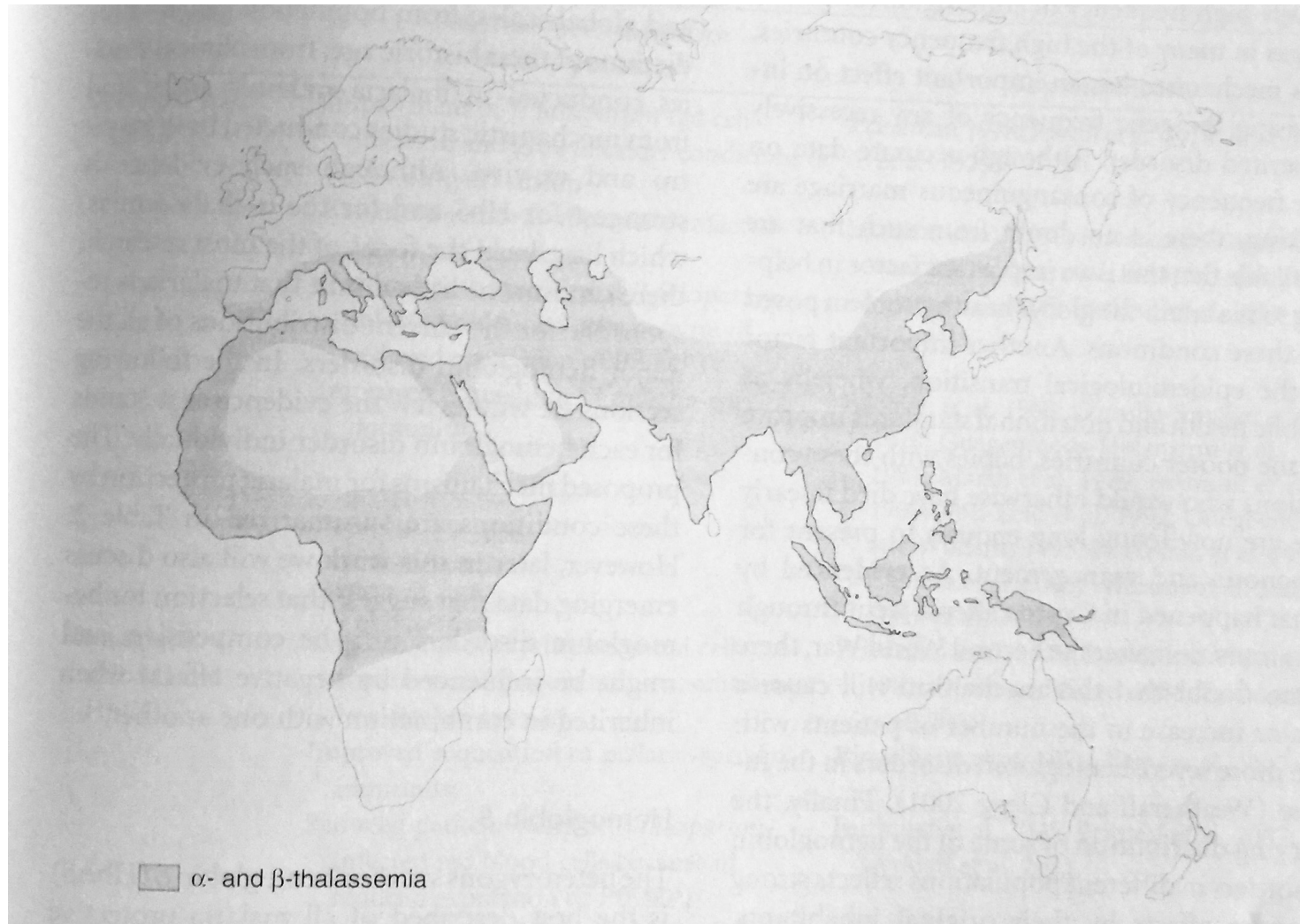
# Source Country

The Philippines, India and China have consistently ranked as the top three source countries for immigrants to Manitoba.

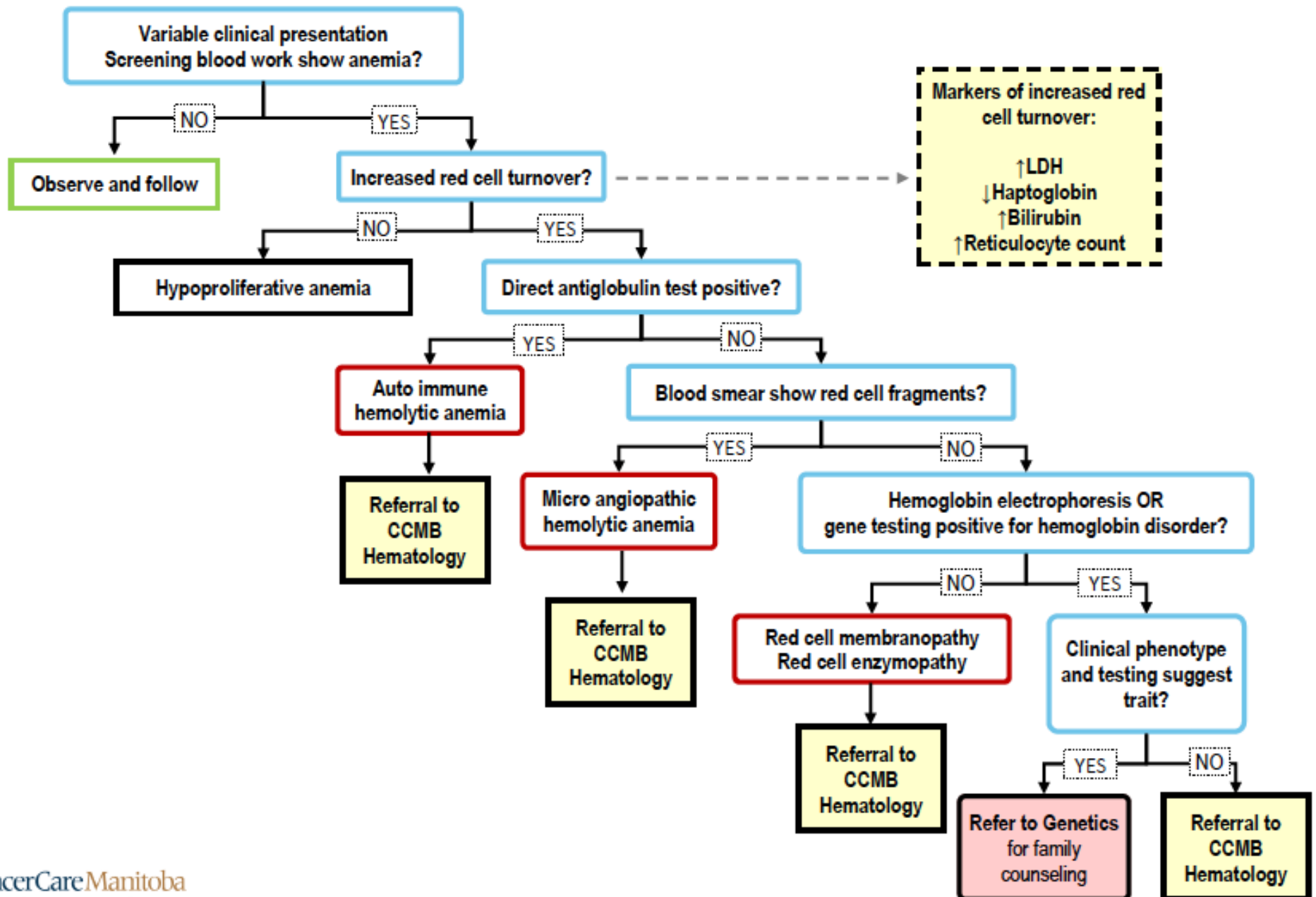
## MANITOBA PERMANENT RESIDENTS BY SOURCE COUNTRY (TOP TEN)

SOURCE COUNTRY	2011			2012			2013		
	Number	Percentage	Rank	Number	Percentage	Rank	Number	Percentage	Rank
Philippines	6,293	39.4	1	3,764	28.3	1	3,818	29.1	1
India	1,826	11.4	2	2,095	15.7	2	1,891	14.4	2
China	1,308	8.2	3	1,200	9.0	3	890	6.8	3
Nigeria	397	2.5	6	419	3.1	4	681	5.2	4
Eritrea	246	1.5	10				408	3.1	5
Republic of Korea	428	2.7	5	324	2.4	6	363	2.8	6
United States				300	2.3	8	327	2.5	7
Pakistan	272	1.7	9	337	2.5	5	305	2.3	8
Israel	302	1.9	8	271	2.0	10	287	2.2	9
United Kingdom							245	1.9	10
Ethiopia	369	2.3	7	301	2.3	7			
Germany	537	3.4	4	296	2.2	9			
<b>TOTAL TOP TEN</b>	<b>11,978</b>	<b>75.0</b>		<b>9,307</b>	<b>69.9</b>		<b>9,215</b>	<b>70.3</b>	
<b>OTHER COUNTRIES</b>	<b>3,985</b>	<b>25.0</b>		<b>4,005</b>	<b>30.1</b>		<b>3,885</b>	<b>29.7</b>	
<b>TOTAL</b>	<b>15,963</b>	<b>100%</b>		<b>13,312</b>	<b>100%</b>		<b>13,100</b>	<b>100%</b>	



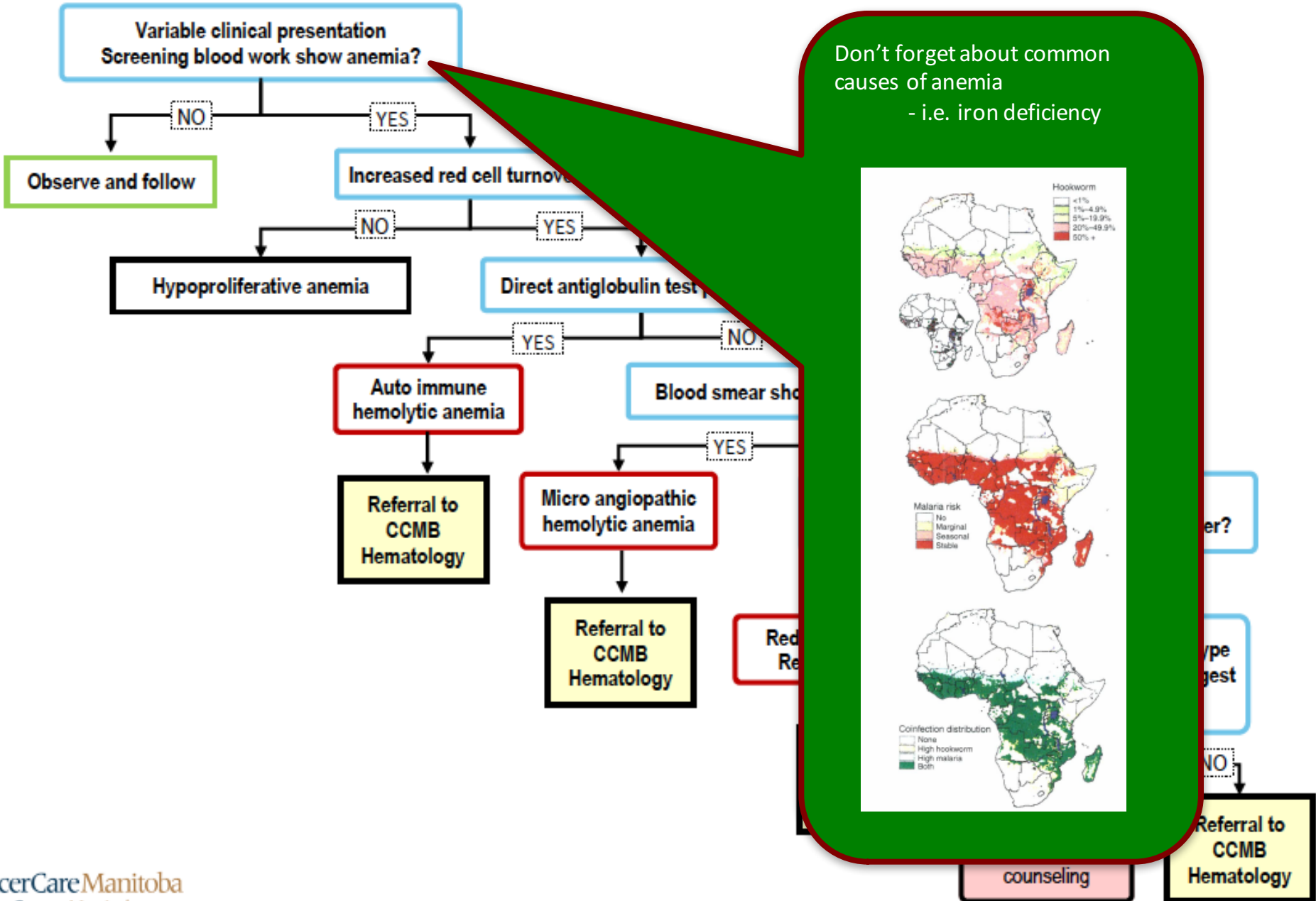


## Work-Up of SUSPECTED INHERITED ANEMIA in NEW IMMIGRANTS

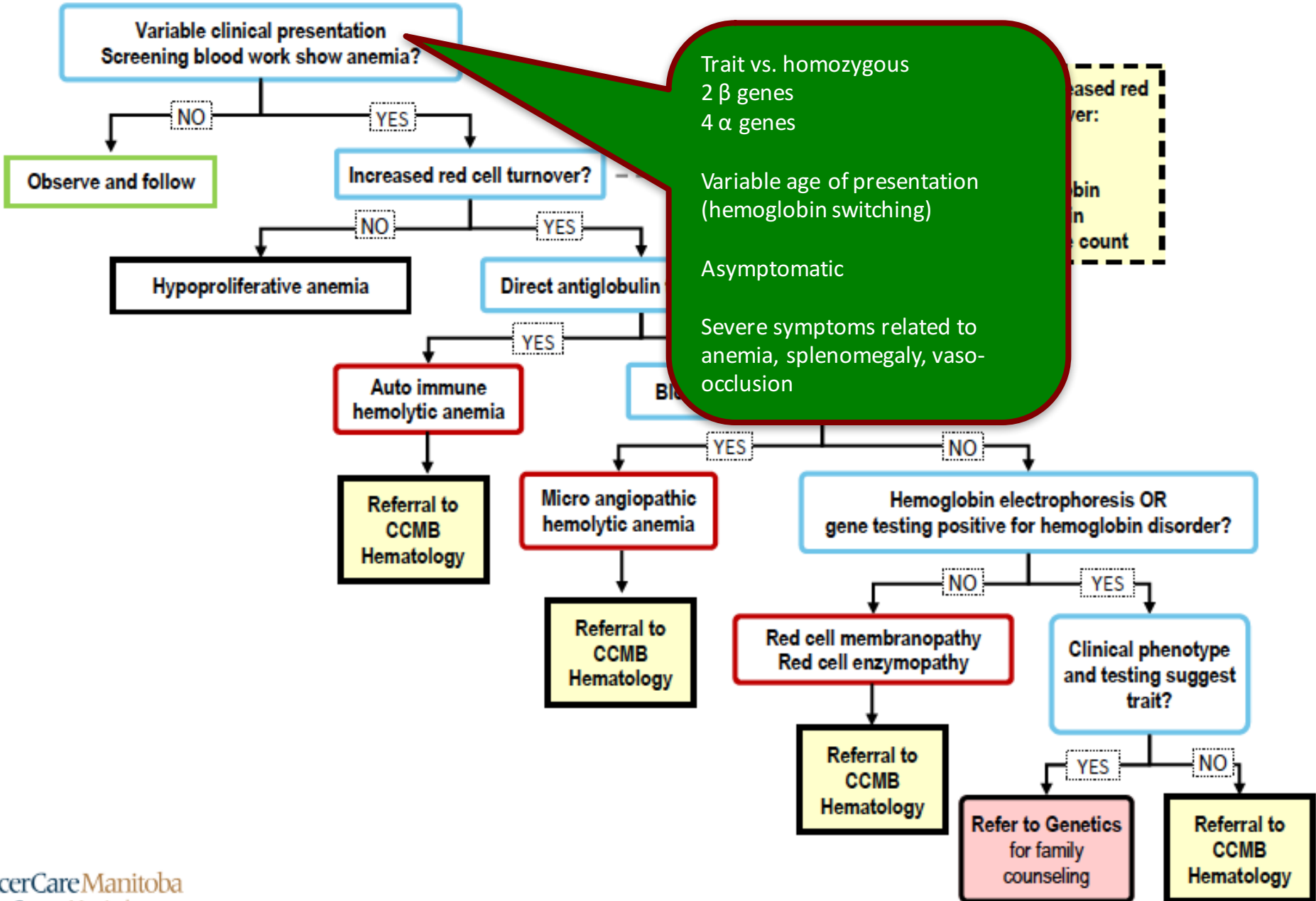




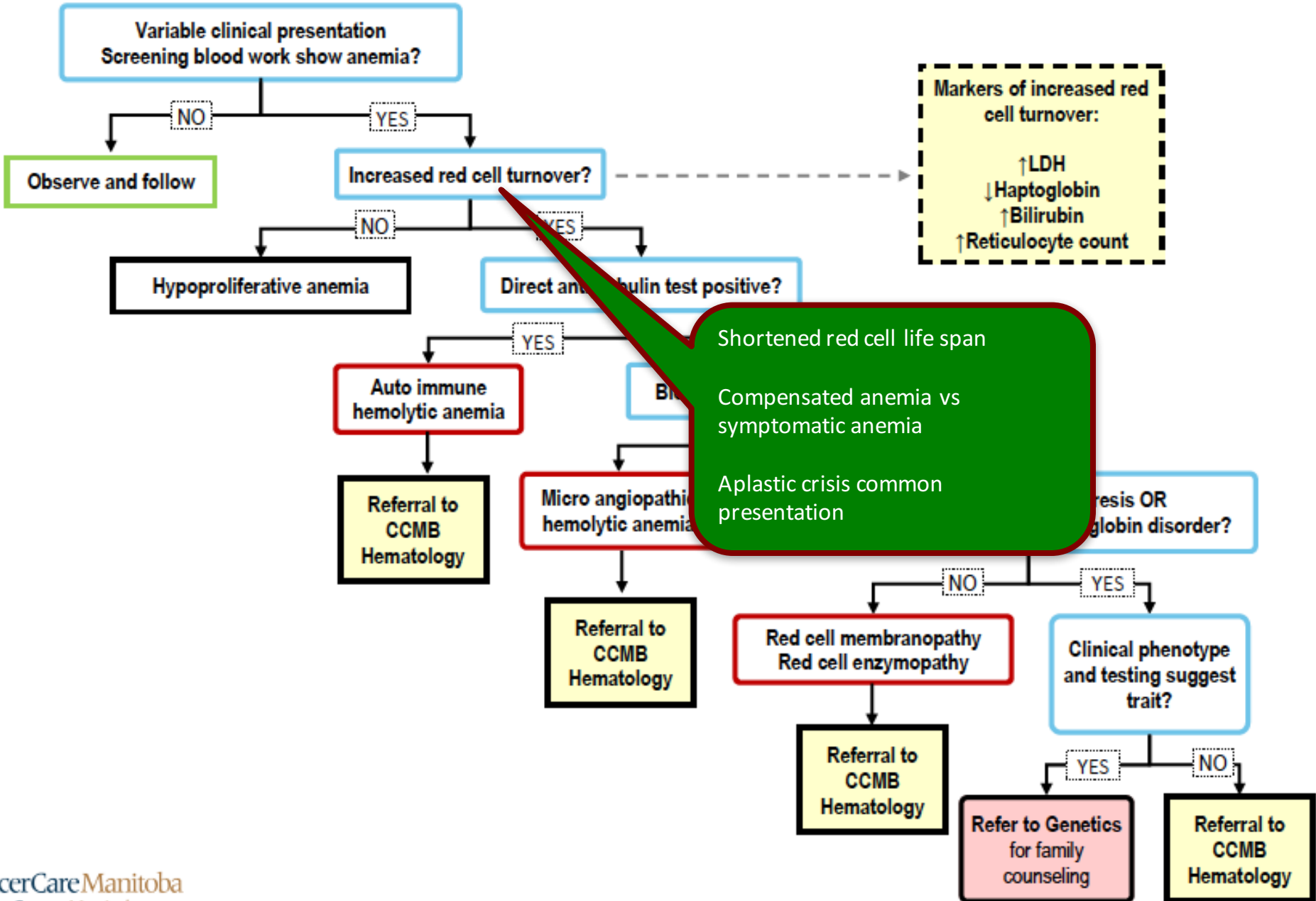
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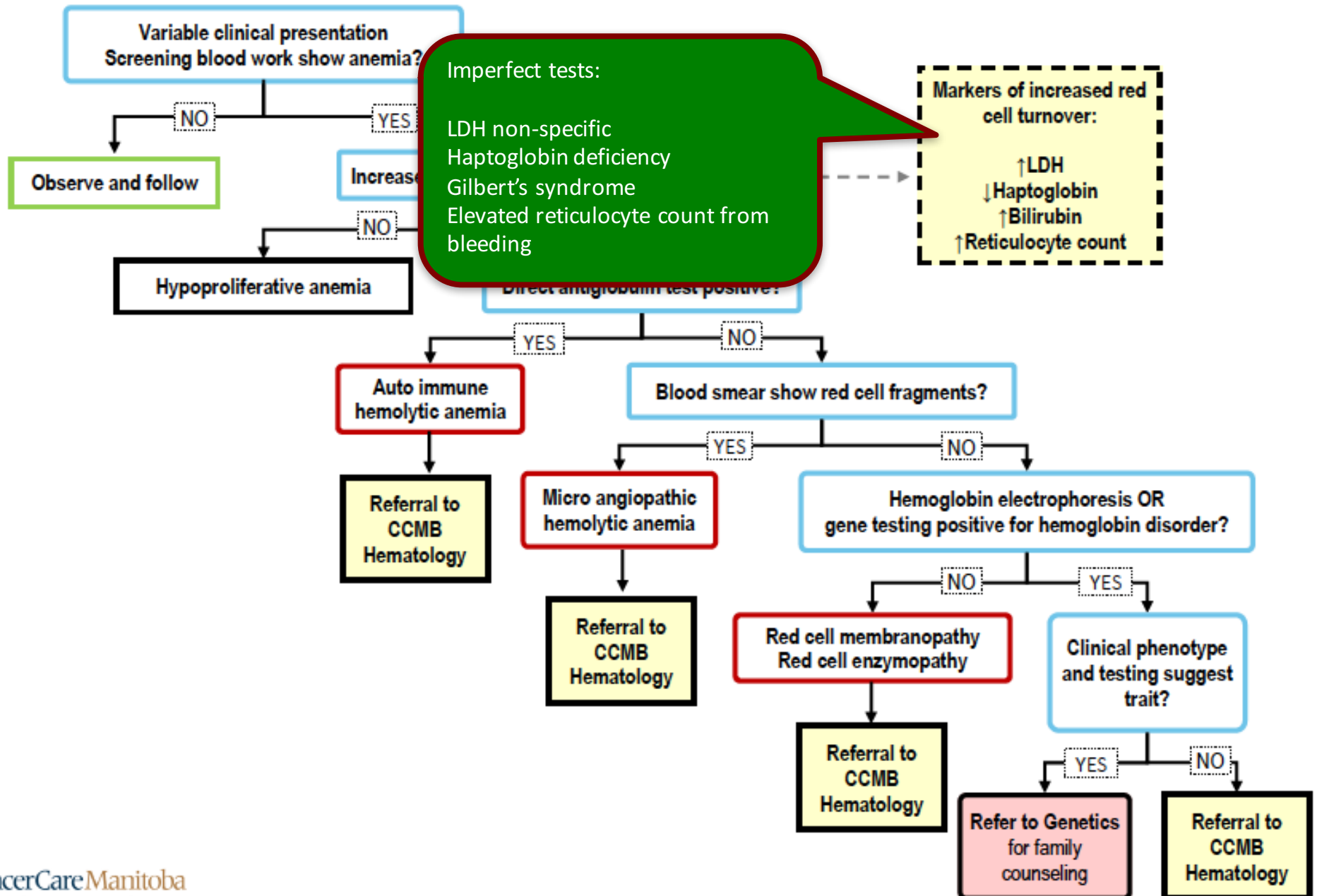
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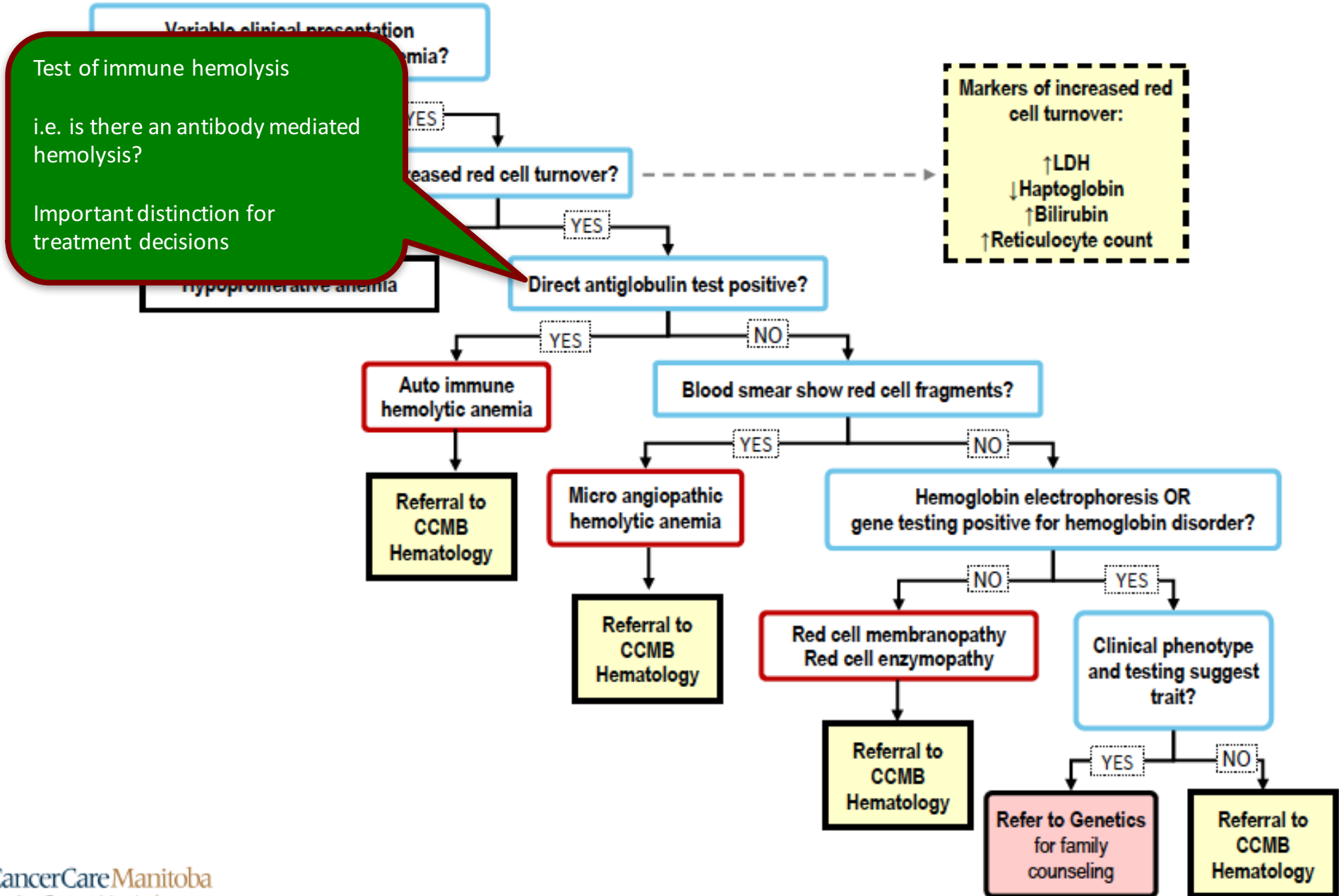
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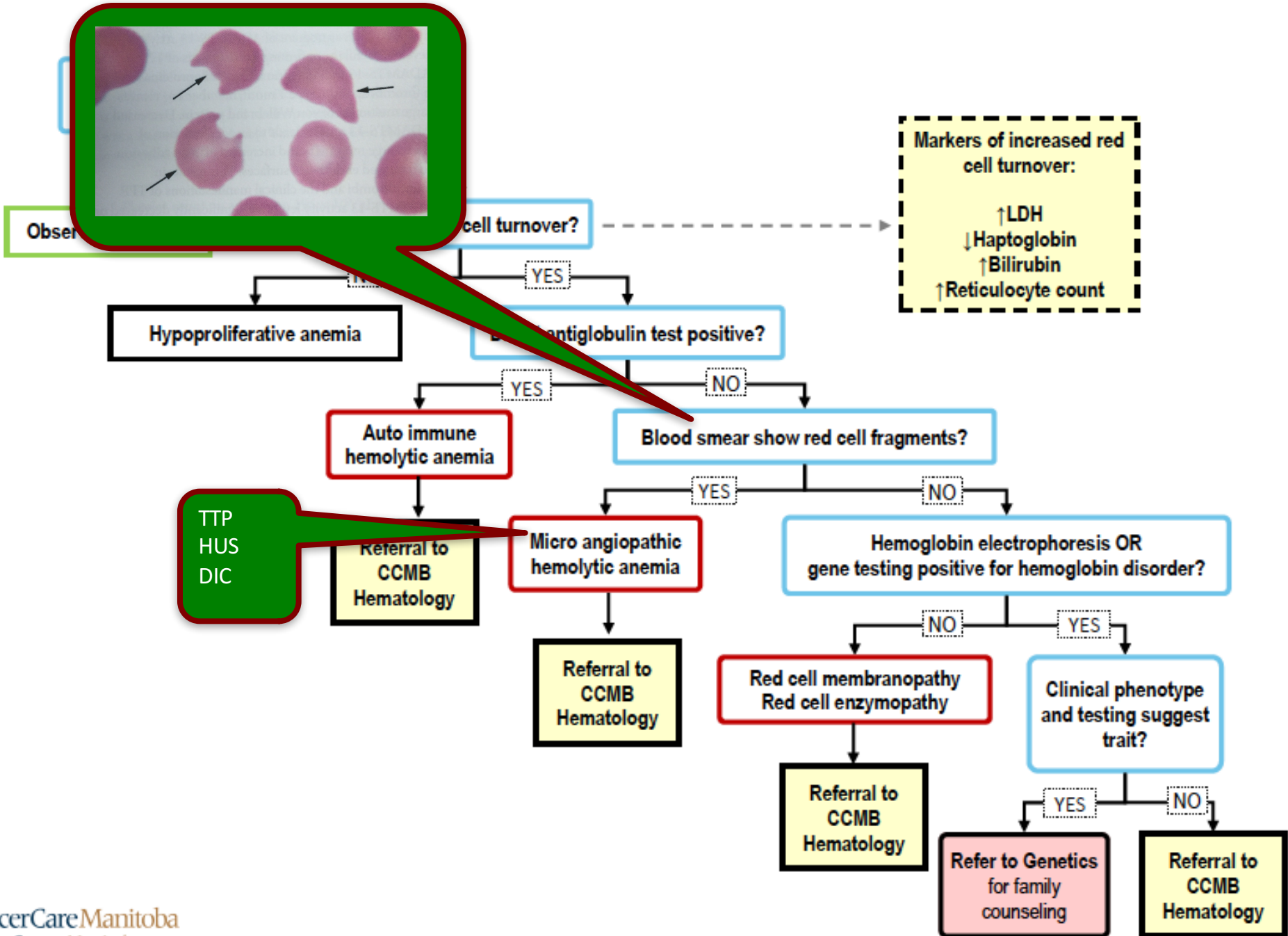
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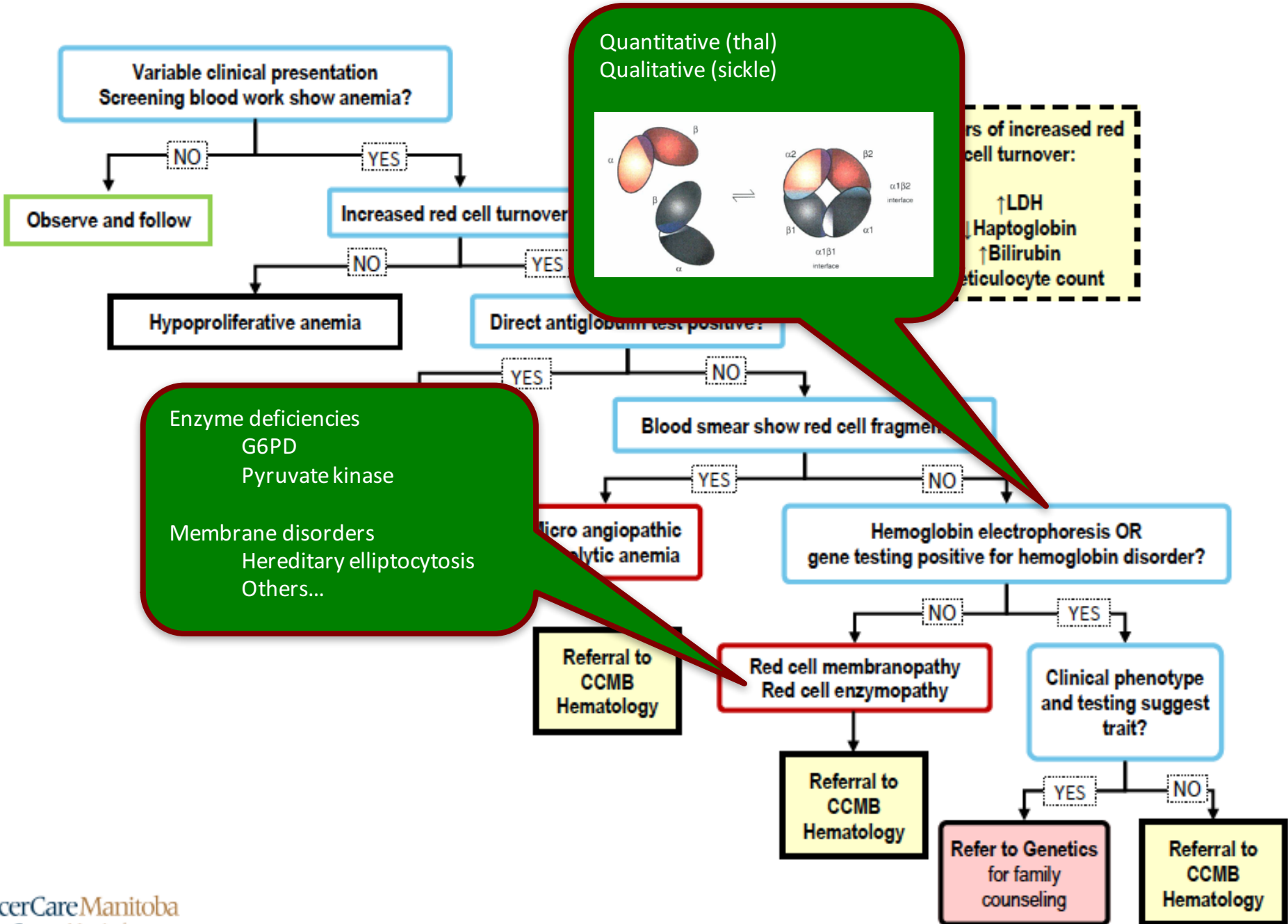
# Work-Up of SUSPECTED INHERITED ANEMIA in NEW IMMIGRANTS



# Work-Up of SUSPECTED INHERITED ANEMIA in NEW IMMIGRANTS



# Work-Up of SUSPECTED INHERITED ANEMIA in NEW IMMIGRANTS



Quantitative (thal)  
Qualitative (sickle)

Diagram illustrating hemoglobin structure with alpha (α) and beta (β) chains, and interfaces (α1β1, α1β2, α2β2).

Signs of increased red cell turnover:

- ↑LDH
- ↓Haptoglobin
- ↑Bilirubin
- ↑reticulocyte count

Enzyme deficiencies  
G6PD  
Pyruvate kinase

Membrane disorders  
Hereditary elliptocytosis  
Others...

# Work-Up of SUSPECTED INHERITED ANEMIA in NEW IMMIGRANTS

Variable clinical presentation  
Screening blood work show anemia?

NO

YES

Observe and follow

Increased red cell turnover?

NO

YES

Markers of increased red cell turnover:  
↑LDH  
↓Haptoglobin  
↑Bilirubin  
↑Reticulocyte count

Antiglobulin test positive?

NO

Blood smear show red cell fragments?

YES

NO

Microangiopathic hemolytic anemia

Referral to CCMB Hematology

Hemoglobin electrophoresis OR gene testing positive for hemoglobin disorder?

NO

YES

Red cell membranopathy  
Red cell enzymopathy

Referral to CCMB Hematology

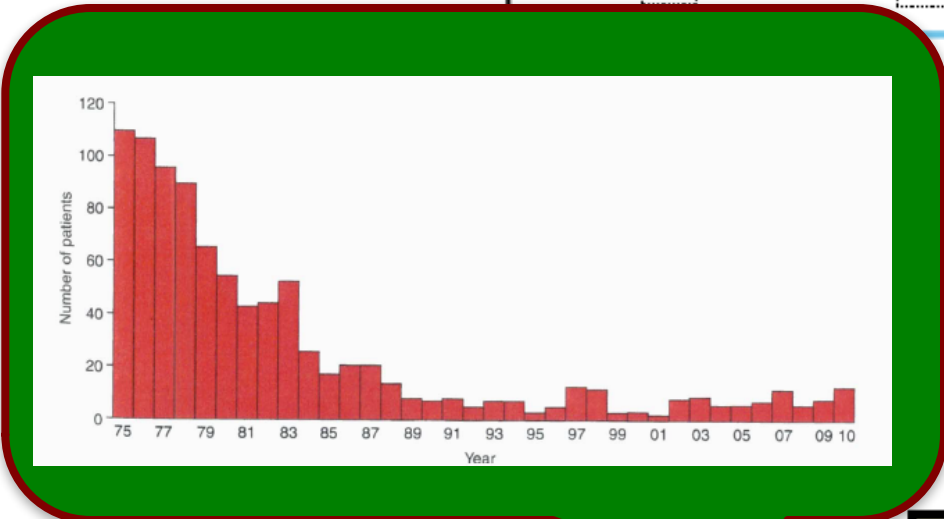
Clinical phenotype and testing suggest trait?

YES

NO

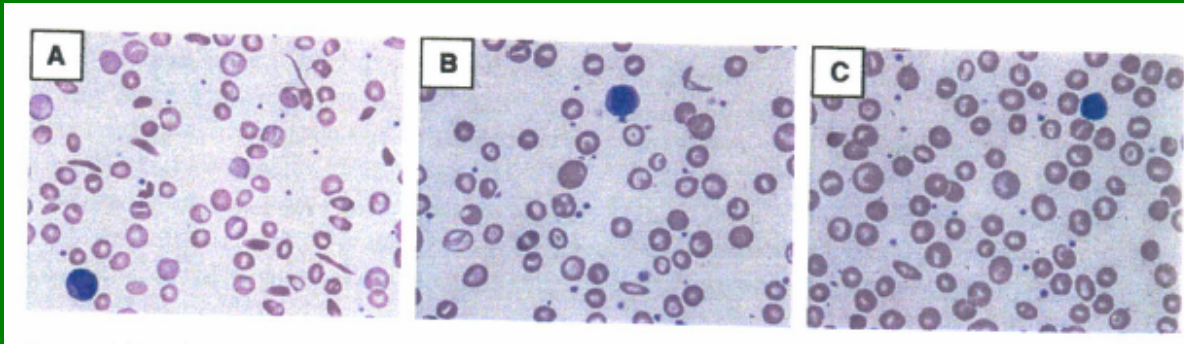
Refer to Genetics for family counseling

Referral to CCMB Hematology



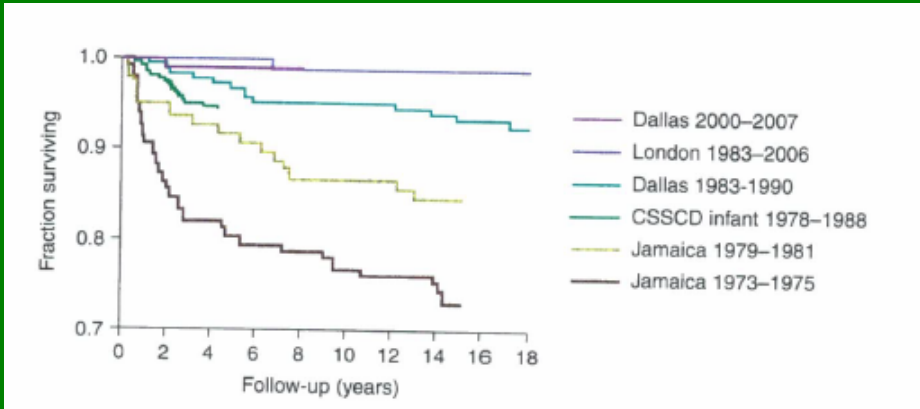


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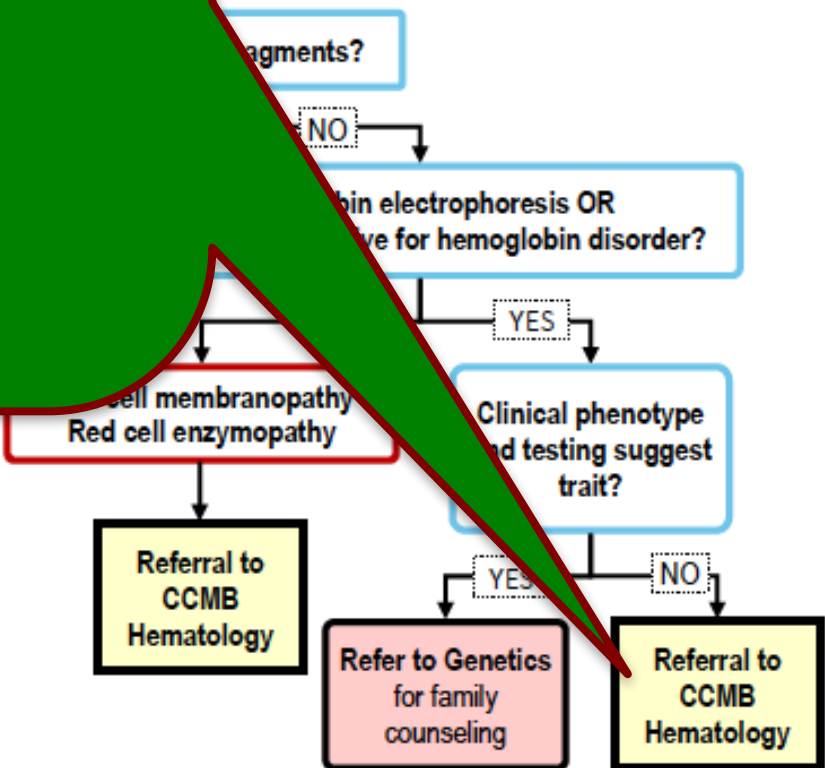


**Markers of increased red cell turnover:**

- ↑LDH
- ↓Haptoglobin
- ↑Bilirubin
- ↑Reticulocyte count



**CCMB Hematology**



## Take Home Messages

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- Inherited causes of anemia are common based on immigration patterns to Manitoba
- Variable presentation – severe cases picked up in childhood
- Asymptomatic carriers need family counseling
- Haptoglobin is a useful marker of hemolysis
- Don't forget about common causes of anemia - Fe deficiency

# Questions?

[aponnampalam@cancercare.mb.ca](mailto:aponnampalam@cancercare.mb.ca)

**9. Which of the following laboratory parameters is NOT consistent with increased red cell turnover related to hemolysis?**

- A. Increased LDH above normal range
- B. Increased indirect bilirubin above normal range
- C. Increased haptoglobin above normal range
- D. Increased reticulocyte count above normal range

**9. Which of the following laboratory parameters is NOT consistent with increased red cell turnover related to hemolysis?**

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- C. Increased haptoglobin above normal range**
- D. Increased reticulocyte count above normal range