

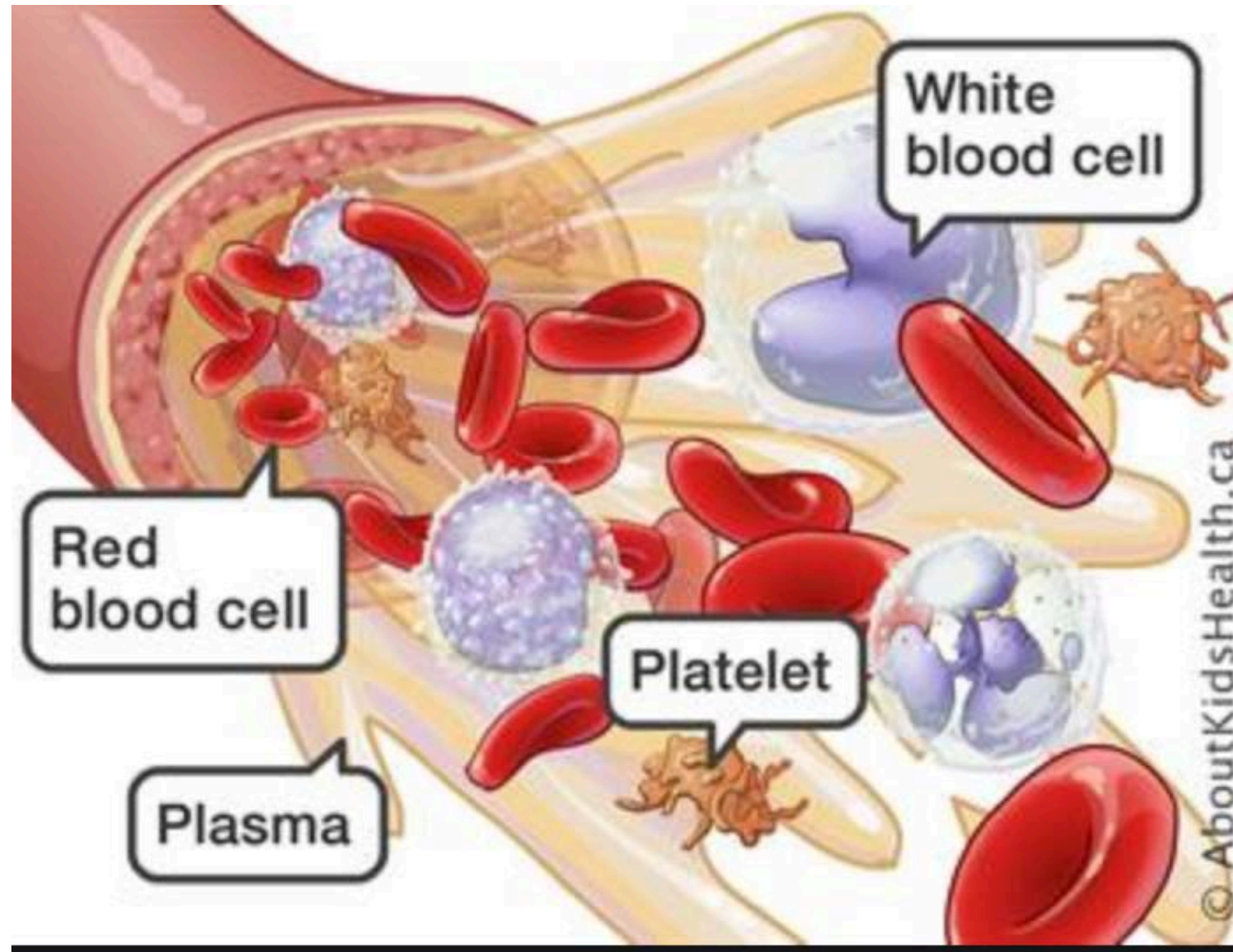
Myelodysplastic Syndrome

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Your bone marrow is the spongy tissue inside some of your bones, such as your hip and thigh bones. It contains immature cells, called stem cells. The stem cells can develop into the red blood cells that carry oxygen through your body, the white blood cells that fight infections, and the platelets that help with blood clotting. If you have a myelodysplastic syndrome, the stem cells do not mature into healthy blood cells. This leaves less room for healthy cells, which can lead to infection, anemia



Causes

Most of the time, we don't know the exact cause of MDS. We do know that certain lifestyle factors are linked to MDS. MDS cannot be passed down through the genes from parent to child. It cannot be passed through germs from person to person.

You may be more likely to develop MDS if you:

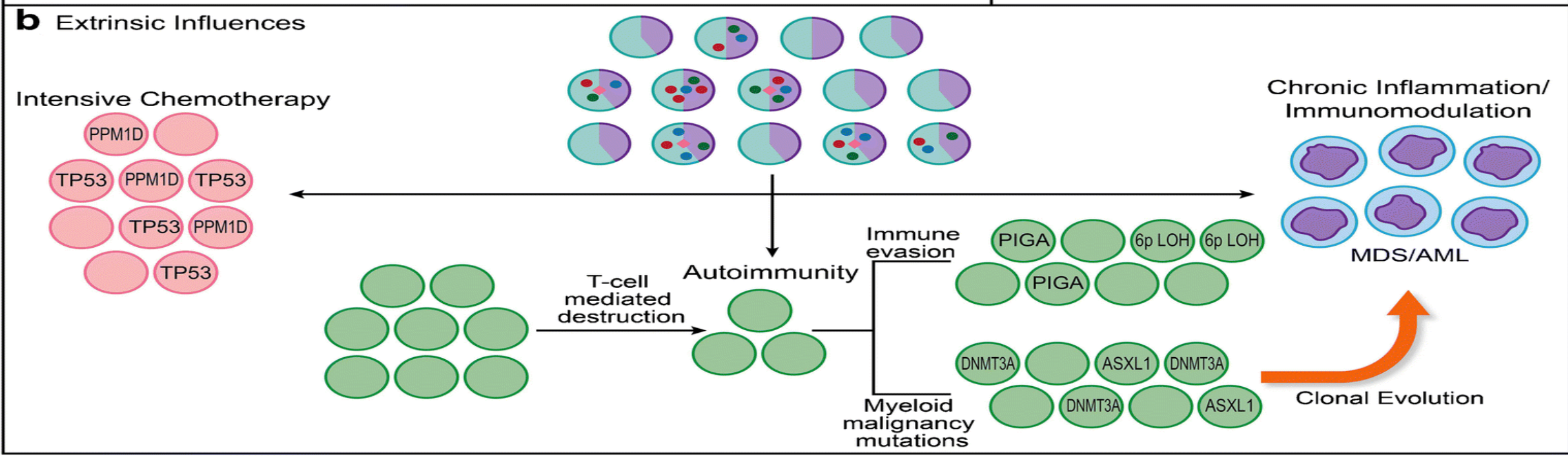
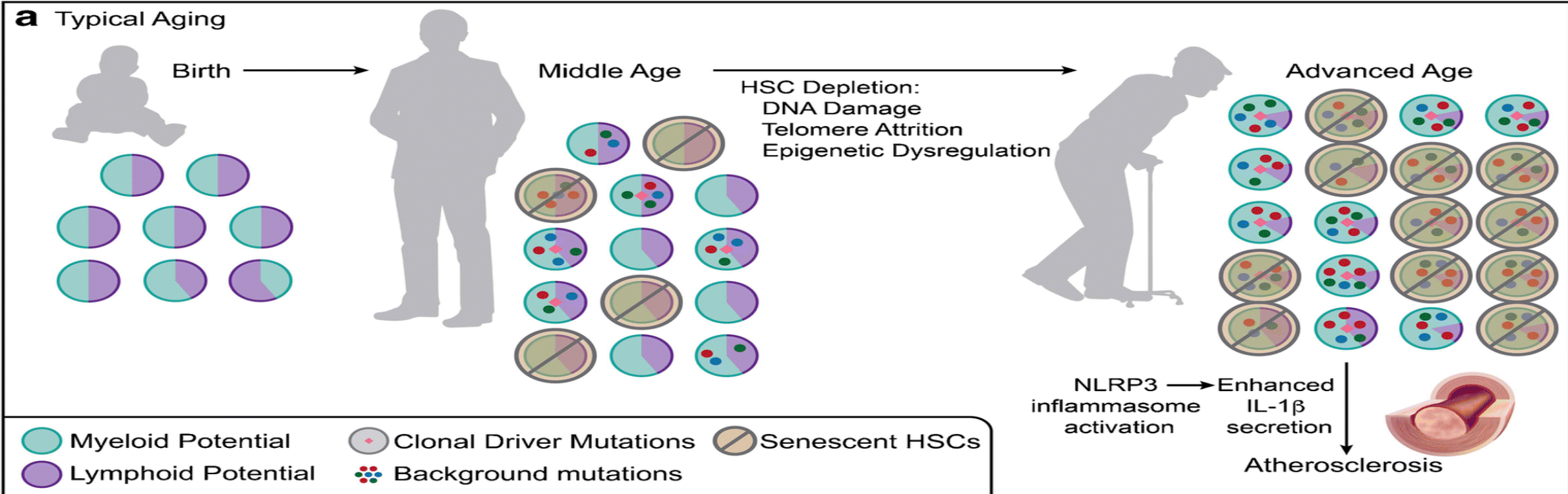
Causes

- Have been heavily exposed to certain chemicals, such as benzene.
- Have had chemotherapy or radiation treatments.
- Have been a smoker.

We know that people diagnosed with MDS are:

Causes

- More often men than women.
- Most often age 60 or older. The average age at diagnosis is 71.



Myelodysplastic syndromes are rare. People at higher risk are over 60, have had chemotherapy or radiation therapy, or have been exposed to certain chemicals. Treatment options include transfusions, drug therapy, chemotherapy, and blood or bone marrow stem cell transplants.

Myelodysplastic syndromes often do not cause early symptoms and are sometimes found during a routine blood test. If you have symptoms, they may include:

- Shortness of breath
- Weakness or feeling tired

- Skin that is paler than usual
- Easy bruising or bleeding
- Pinpoint spots under the skin caused by bleeding
- Fever or frequent infections

1588: QUEEN ELIZABETH I
RETURNS FROM HER HOLIDAYS

OOOH! HASN'T SHE
GOT A LOVELY PALLOR!

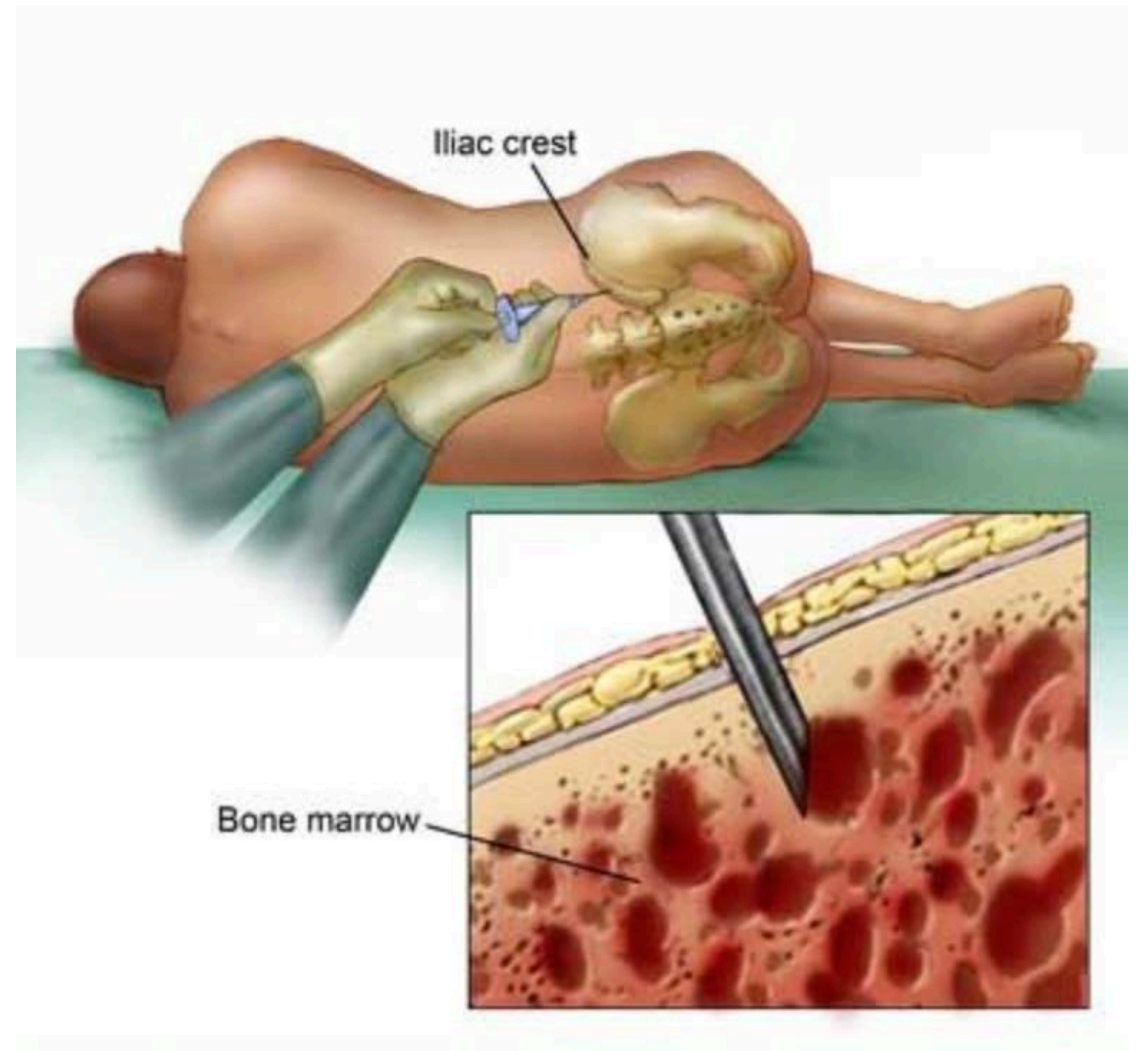


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Diagnosis

MDS is a complex disease. So diagnosing it is a complex process. Doctors use a number of tests to figure out exactly what type of MDS you have. To understand what is causing your symptoms and low blood counts, your doctor will take a detailed medical history. Your doctor may ask you questions about your symptoms, past medical treatments and exposure to harmful chemicals.



Bone Marrow Structure

○ Periosteum

Outer fibrous layer, inner osteogenic layer

○ Bone

Cortex - Lamellar bone

Trabeculae - Cancellous bone, define medullary region

Endosteal cells - Inner cortex and trabeculae, osteoblasts and osteoclasts

○ Connective tissue

Intertrabecular regions of medulla

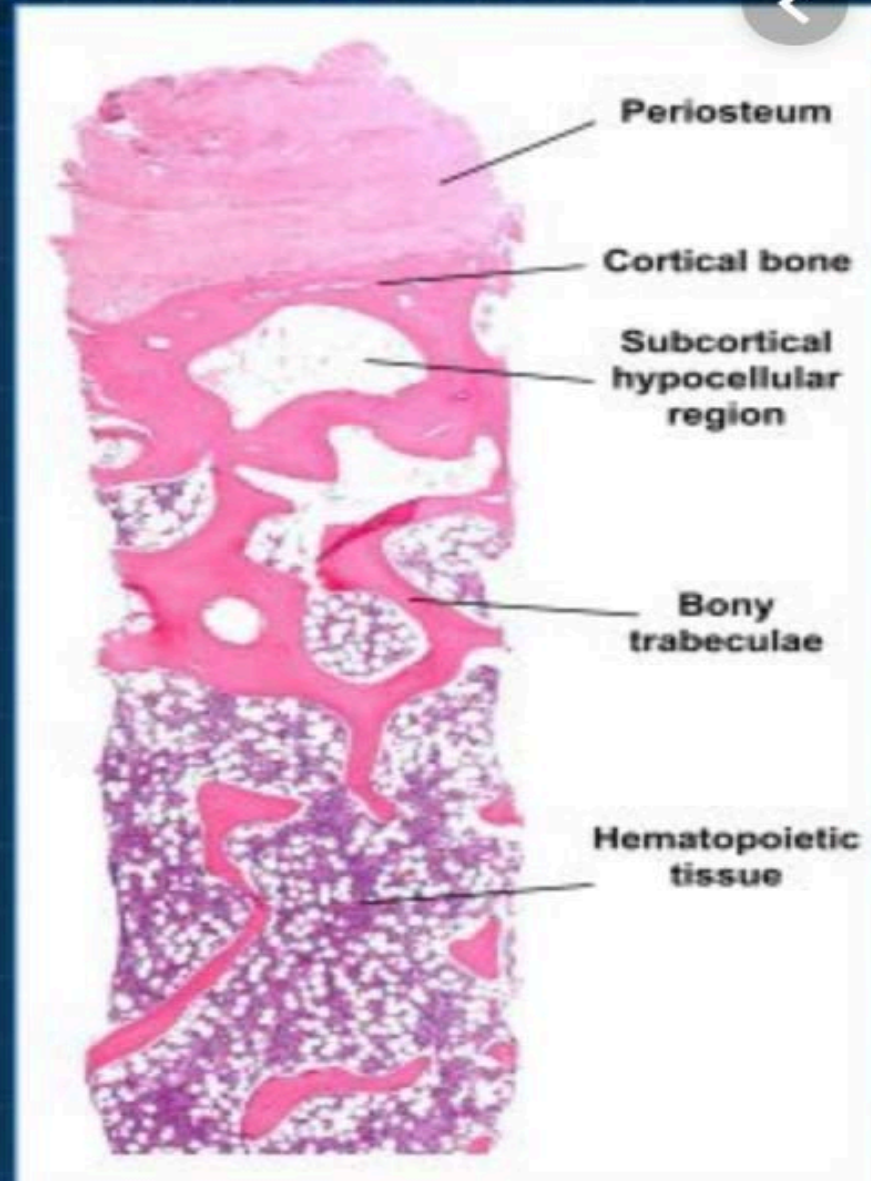
Reticular cells, fat cells, fibroblasts, macrophages, nerve fibers and meshwork of blood vessels

○ Hematopoietic tissue

Lie in cords or wedges between sinusoids

Normally confined to interstitium

Mature hematopoietic cells pass transcellularly through sinusoids



Diagnosis

When trying to figure out the cause of your symptoms, your doctor will ask you for blood samples and a sample of your bone marrow. These samples will be used in a number of tests.

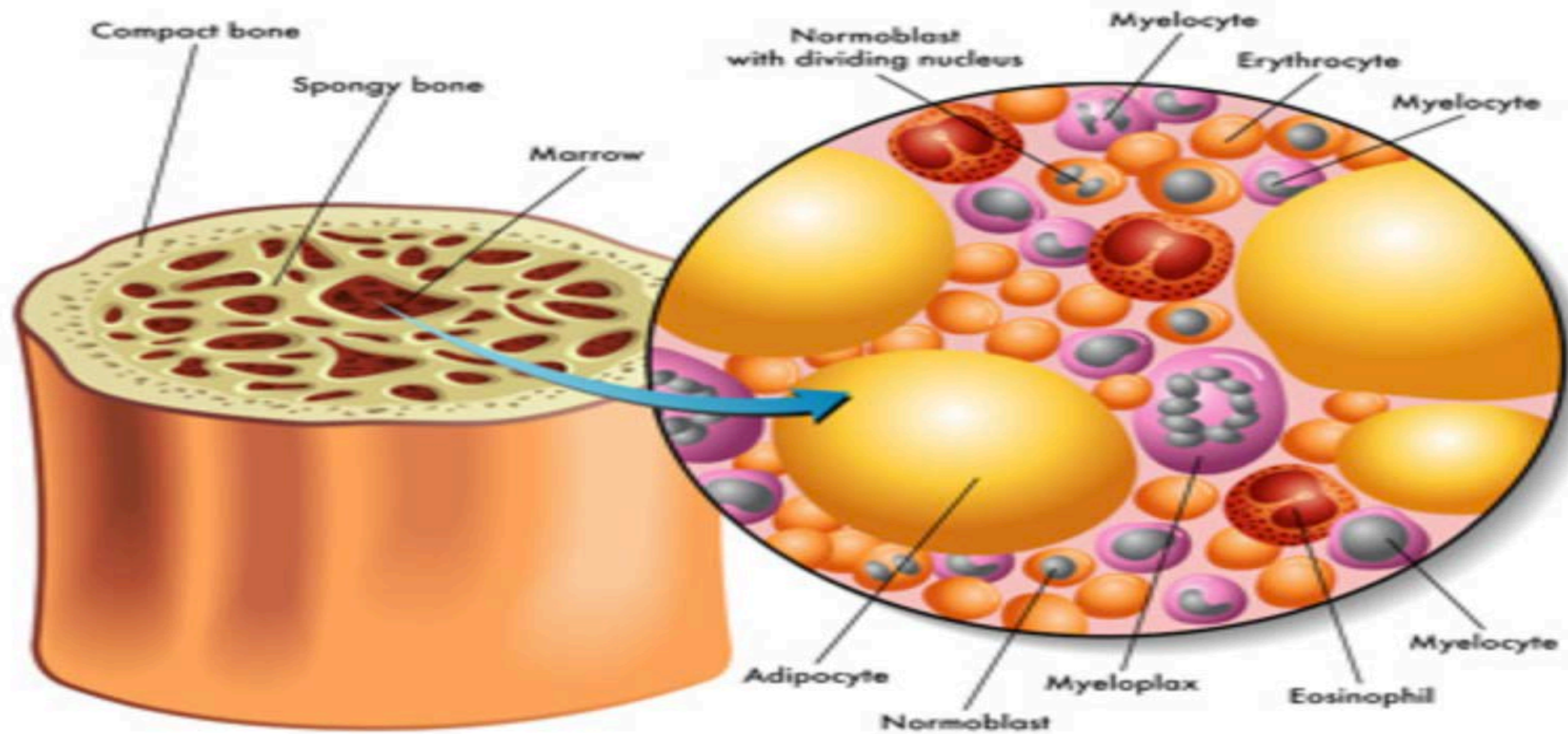
The bone marrow tests show:

1. Exactly what types and amounts of cells your marrow is making.

Diagnosis

2. Levels of bone marrow blasts, the immature white blood cells. If more than 5 out of every 100 white blood cells in your bone marrow are blast cells, this is not normal.
3. Damaged chromosomes in the cells of your bone marrow.

Bone Marrow Cells



System	Factors	Prognostic Factors Scored	Risk Groups Based on Total Risk Score
IPSS	Blast cells in bone marrow (percent)	<ul style="list-style-type: none"> • Less than 5 = 0 • 5 to 10 = 0.5 • 11 to 20 = 1.5 • 21 to 30 = 2.0 	<ul style="list-style-type: none"> • Low Total IPSS Risk score = 0 • Intermediate –1 Total IPSS Risk Score = 0.5 to 1.0 • Intermediate –2 Total IPSS Risk Score = 1.5 to 2.0 • High Total IPSS Risk Score = 2.5 or higher
	Cytogenetics (chromosome changes)	<ul style="list-style-type: none"> • None, del(5q), del(20q) = 0 • 3 or more abnormalities, abnormal chromosome 7 = 1.0 • Other abnormalities = 0.5 	
	Cytopenias	Number of cytopenias (anemia, neutropenia or thrombocytopenia) <ul style="list-style-type: none"> • None or 1 = 0 • 2 or 3 = 0.5 	

	Prognostic score value						
	0	0.5	1	1.5	2	3	4
Prognostic category							
Cytogenetics	Very good		Good		Intermediate	Poor	Very poor
BM blasts, %	≤ 2		> 2 to < 5		5-10	> 10	
Hgb, g/dL	≥ 10		8 to < 10		< 8		
Platelets, x 10 ⁹ /L	≥ 100	50 to < 100		< 50			
ANC, x 10 ⁹ /L	≥ 0.8	< 0.8					
Cytogenetic group		Characteristics					
Very good		-Y, del(11q)					
Good		Normal, del(5q), del(12p), del(20q), del(5q) + 1 additional abnormality					
Intermediate		del(7q), +8, +19, i(17q), other abnormalities not in other groups					
Poor		-7, inv(3)/t(3q), -7/del(7q) + 1 additional abnormality, complex (3 abnormalities)					
Very poor		Complex (> 3 abnormalities)					

Clinical assessment

History, exam, transfusional history, CBC, reticulocyte count, folic acid, B12, ferritin, epo level,
bone marrow aspiration, and biopsy

Molecular studies: JAK2 and Flt-3 mutation studies

Consider echocardiogram

Confirmation of diagnosis

Lower-risk disease

IPSS: Low/Int-1
Bone marrow blasts <10%

Observation (very low risk, transfusion independent)
Growth factor support
Iron chelation
Lenalidomide (anaemia in del5q MDS)
Hypomethylating agents
Immune modulation (hypoplastic MDS)

Higher-risk disease

IPSS: Int-2 or High
Bone marrow blasts \geq 10%

Age \leq 60 Years

AML-like therapy
Hypomethylating agents

Age >60 Years

Hypomethylating agents

Allogeneic stem cell transplantation

Treatment

The main goal of MDS treatment is to help patients live longer. One key to achieving this goal is increasing the number of healthy blood cells in your blood. This is known as your blood count.

When your blood counts go up:

Treatment

- You are less likely to need a blood transfusion.
- Your quality of life gets better.
- Your symptoms are not as bad.

Your doctor will look at several issues in finding the best treatment plan for you. These include:

Treatment

- Your symptoms
- Your age
- Which type of MDS you have
- Your disease risk score using the International Prognostic Scoring System
- Other serious conditions or diseases you have

Treatment

- Whether someone - preferably a family member - is willing and able to donate matching bone marrow to you

Treatments for MDS have a variety of goals. They may:

- Help healthy cells mature
- Increase the number of healthy cells in your blood

Treatment

- Kill abnormal bone marrow cells
- Reduce the number of abnormal blasts in your bone marrow

The treatment options used for MDS include the following:

1. Wait and watch is an approach your doctor might



Treatment

suggest if your blood counts aren't too low and your

symptoms aren't too bad.

Treatment

2. Supportive care helps you manage the symptoms of your MDS. Its goals are to increase blood counts, treat infections, and treat iron overload. Getting many red blood cell transfusions can cause you to have too much iron in your body. This can lead to a condition called iron overload. Iron overload can hurt your heart and other organs.

Treatment

Supportive care includes red cell and platelet transfusions, growth factors that can increase the number of red cells, white cells and platelets your body produces, antibiotics to help prevent or treat infection and iron chelation therapy to treat iron overload.

3. Drugs which lower the body's immune response (Immunosuppressive therapy) can improve blood counts in some patients.

Blood Transfusion

Red blood cells



Treatment

4. Medicines recently approved to treat MDS can be used to stop abnormal cells from growing and stimulate the growth of healthy bone marrow cells. Medicines currently approved by the FDA to treat MDS include azacitidine (Vidaza[®]), decitibine (Dacogen[®]) and lenalidomide (Revlimid[®]).
5. Intensive Chemotherapy treats MDS by using drugs that kill abnormal cells.

★ Important Note ★

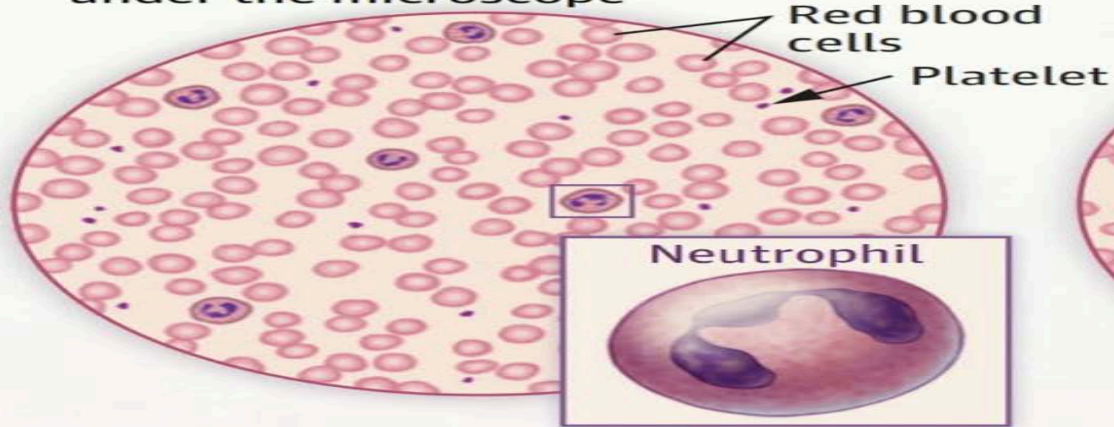
**Febrile neutropenia is a
MEDICAL EMERGENCY,
just like a heart attack or stroke.**



What is neutropenia?

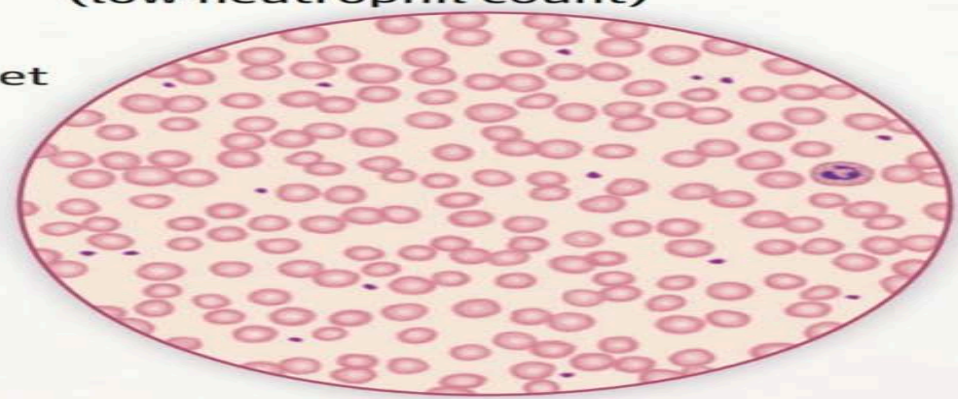
Neutropenia is when there is a low number of neutrophils in the blood.

Normal blood cells
under the microscope



Absolute neutrophil count (ANC)
greater than 1500 per microliter
of blood

Neutropenia
(low neutrophil count)



ANC less than 1500 per microliter
of blood

What is febrile neutropenia?

Fever (temperature greater
than 100.3°F)

plus

ANC less than 500 per microliter
of blood



Treatment

6. Stem cell transplantation which replaces damaged stem cells in your bone marrow with healthy stem cells provided by a donor. Stem cell transplantation is currently the only cure for MDS.

Stem cells removed from donor

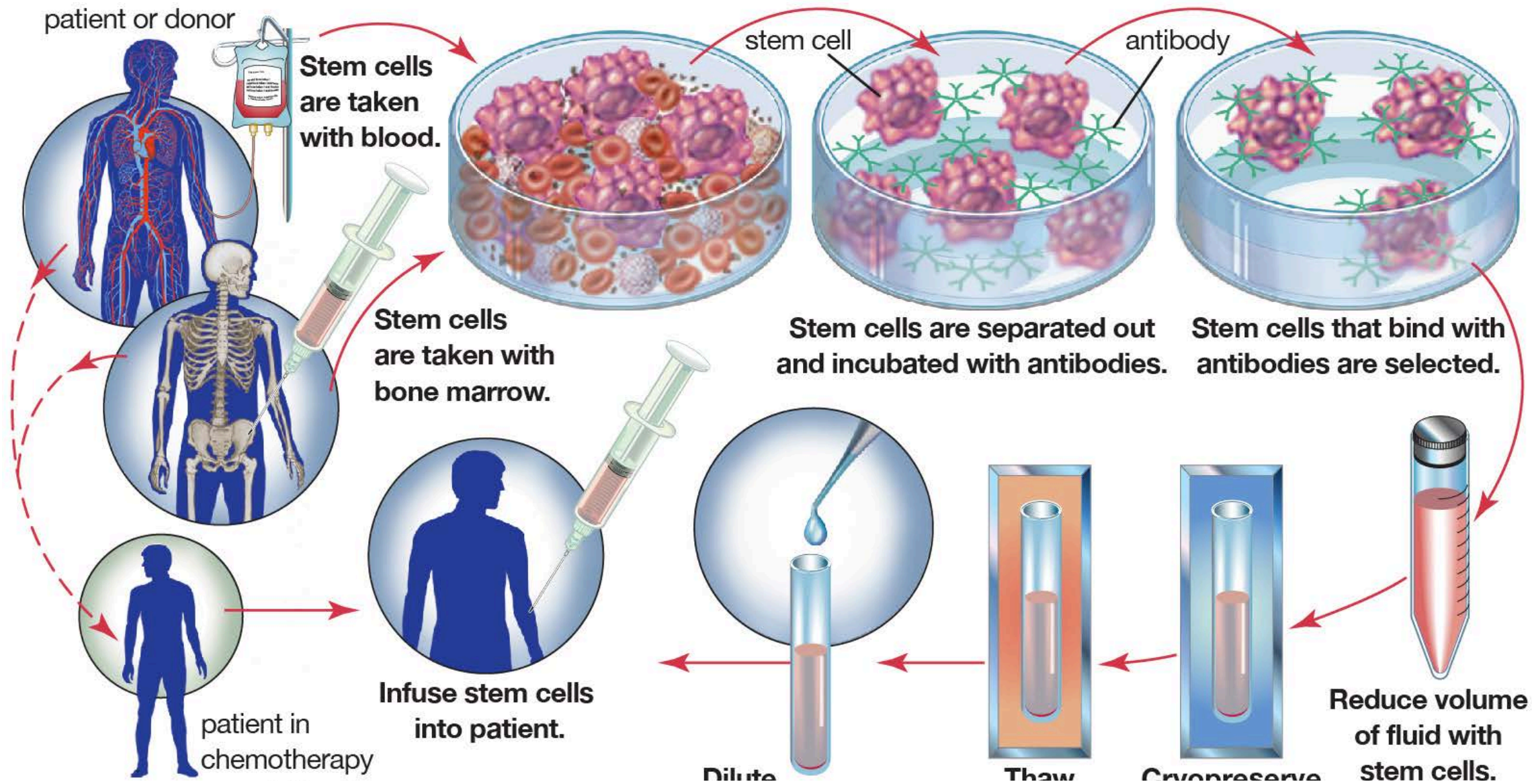


**Patient receives treatment to
destroy blood-forming cells**



Patient receives stem cells

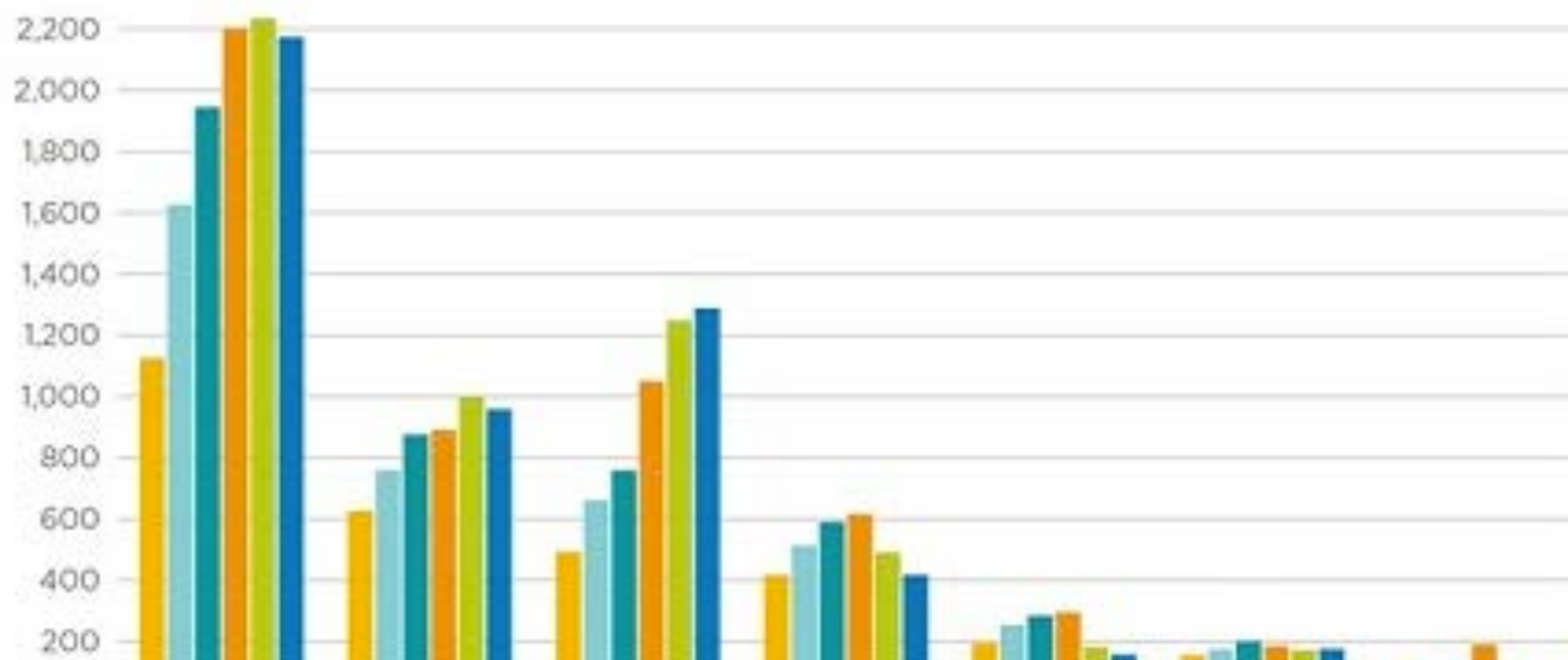




Transplants by Patient Diagnosis

Hematologic Malignancies

Unrelated Donor Transplants Facilitated by NMDP/Be The Match



Thank you!