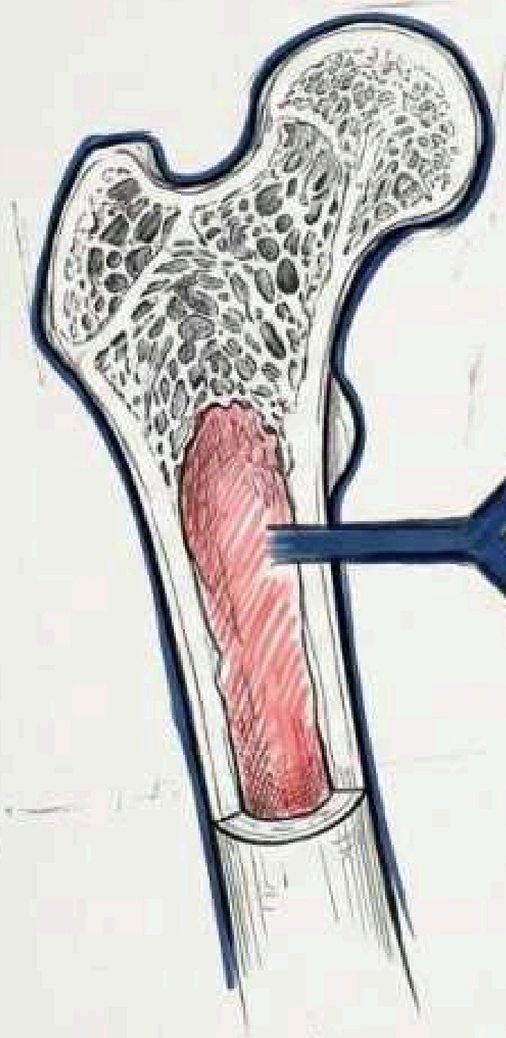


HSC → CMP

HSC → CLP

Myeloid Lineage

HSC → CLP

Lymphoid Lineage

HSC → CLP

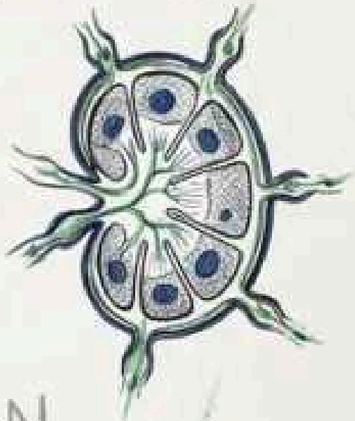
$$P(\text{pathology}) = \frac{dN}{dt} = \frac{dN}{r}$$

P(pathology)

Leukaemias
Cancers of blood-forming cells that fill the marrow and blood.

P(2–, pathology)

Lymphomas
Cancers of lymphocytes forming masses in lymph nodes.

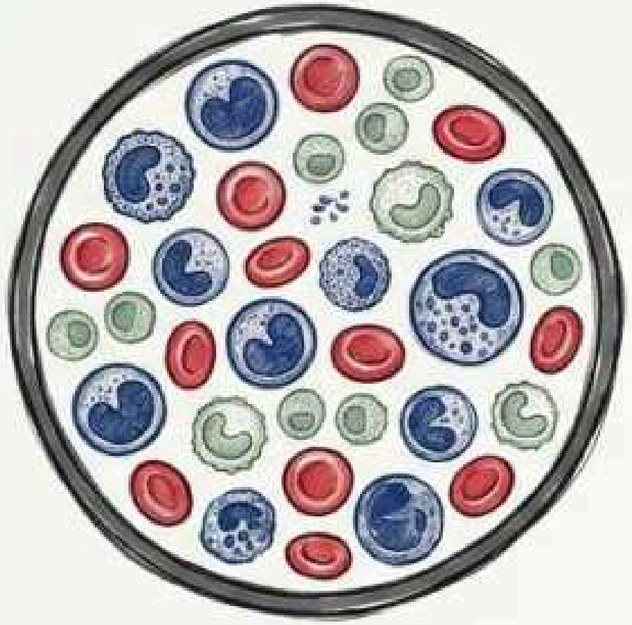


$$\frac{dN}{dt} = \frac{rN}{n}$$

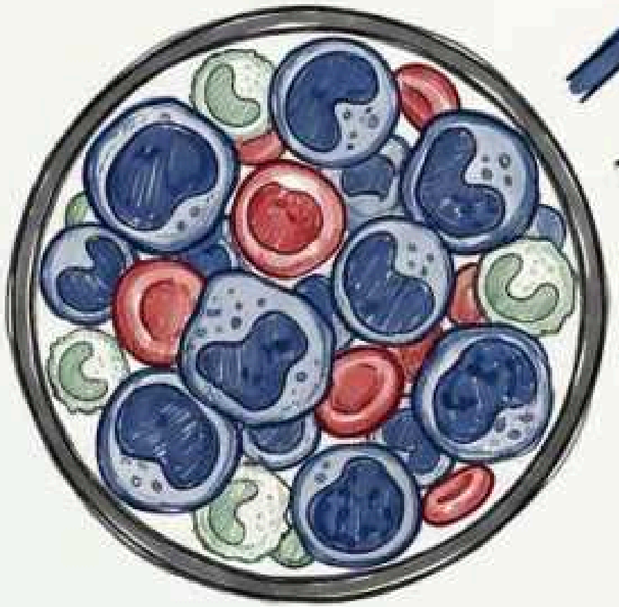
Myeloma
Cancer of the plasma cells that make antibodies.

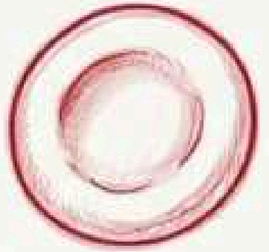
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Normal

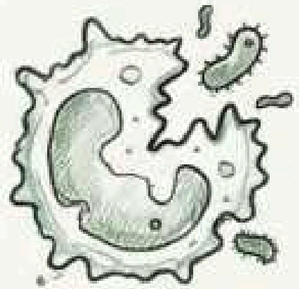


Acute Crisis

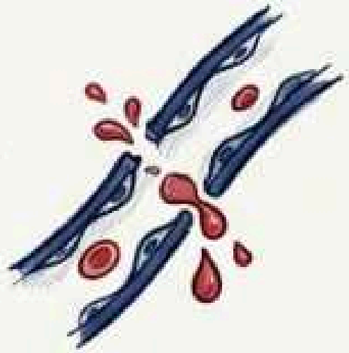




Anaemia
Depleted red blood cells



Infections
Lack of mature white cells



Bleeding
Lack of platelets

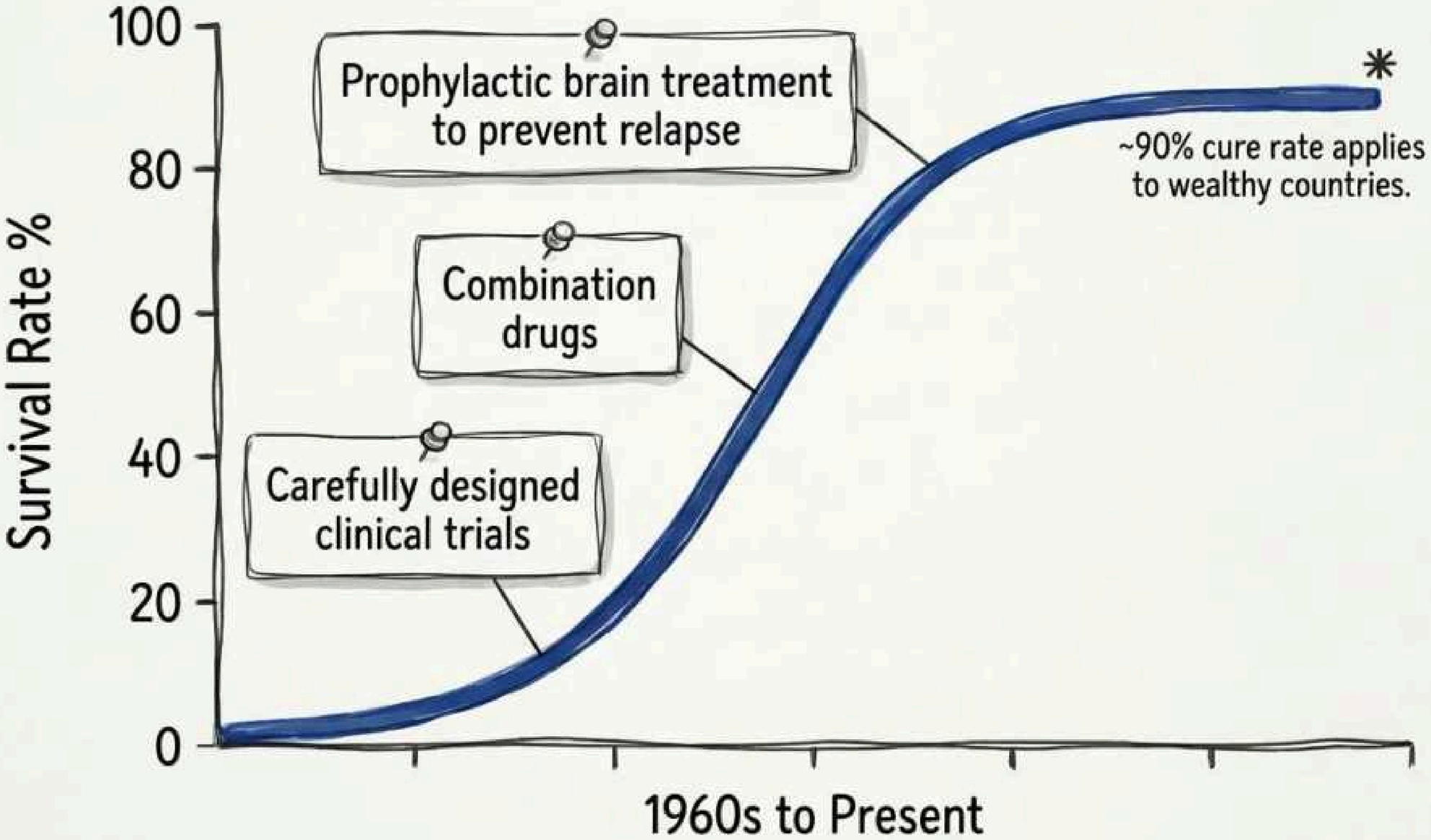
Pace: Weeks

Requires urgent, intensive chemotherapy.

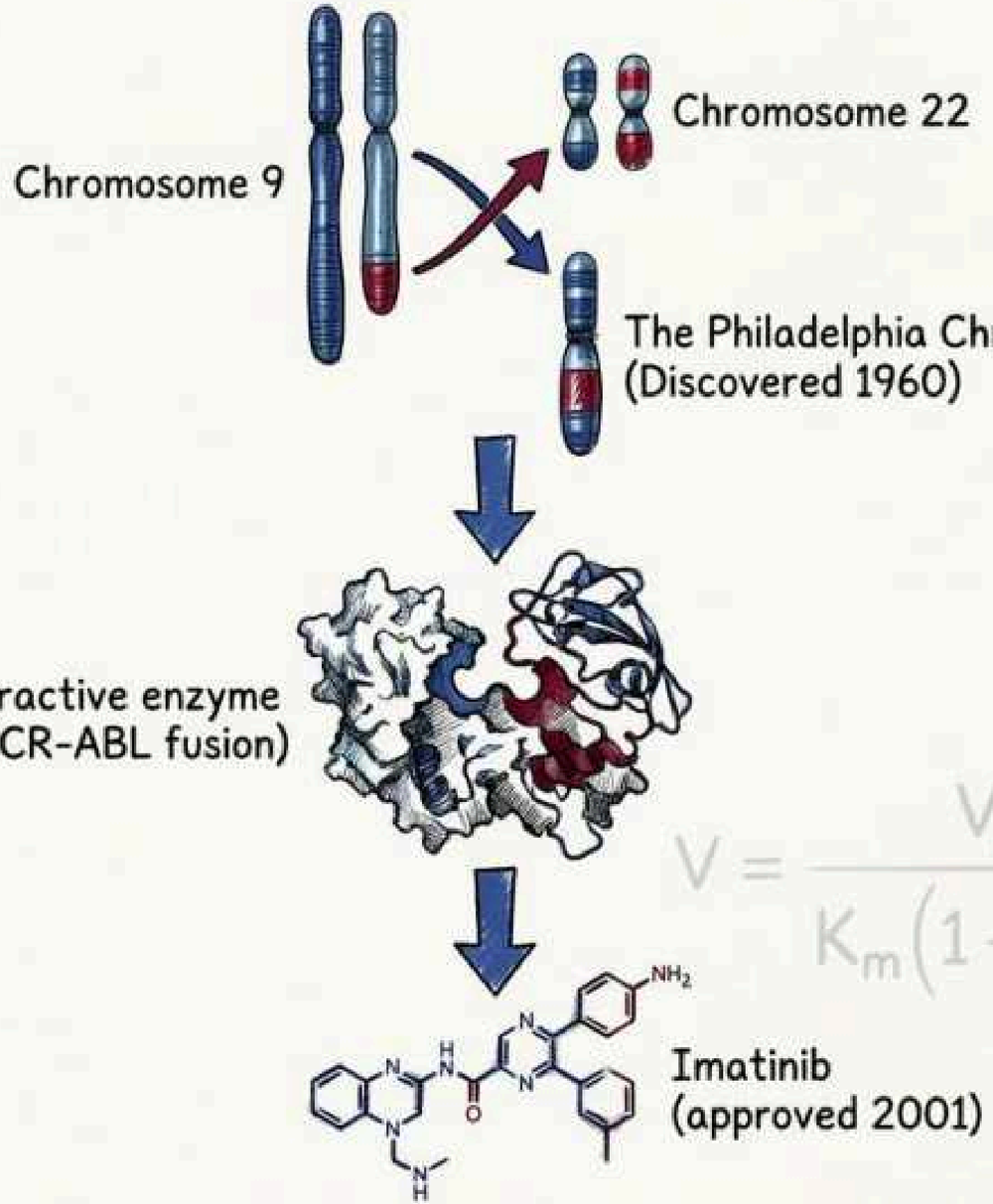
ALL (Acute Lymphoblastic Leukaemia) = Commonest in childhood
AML (Acute Myeloid Leukaemia) = Commoner in older adults

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The Triumph Over Childhood ALL



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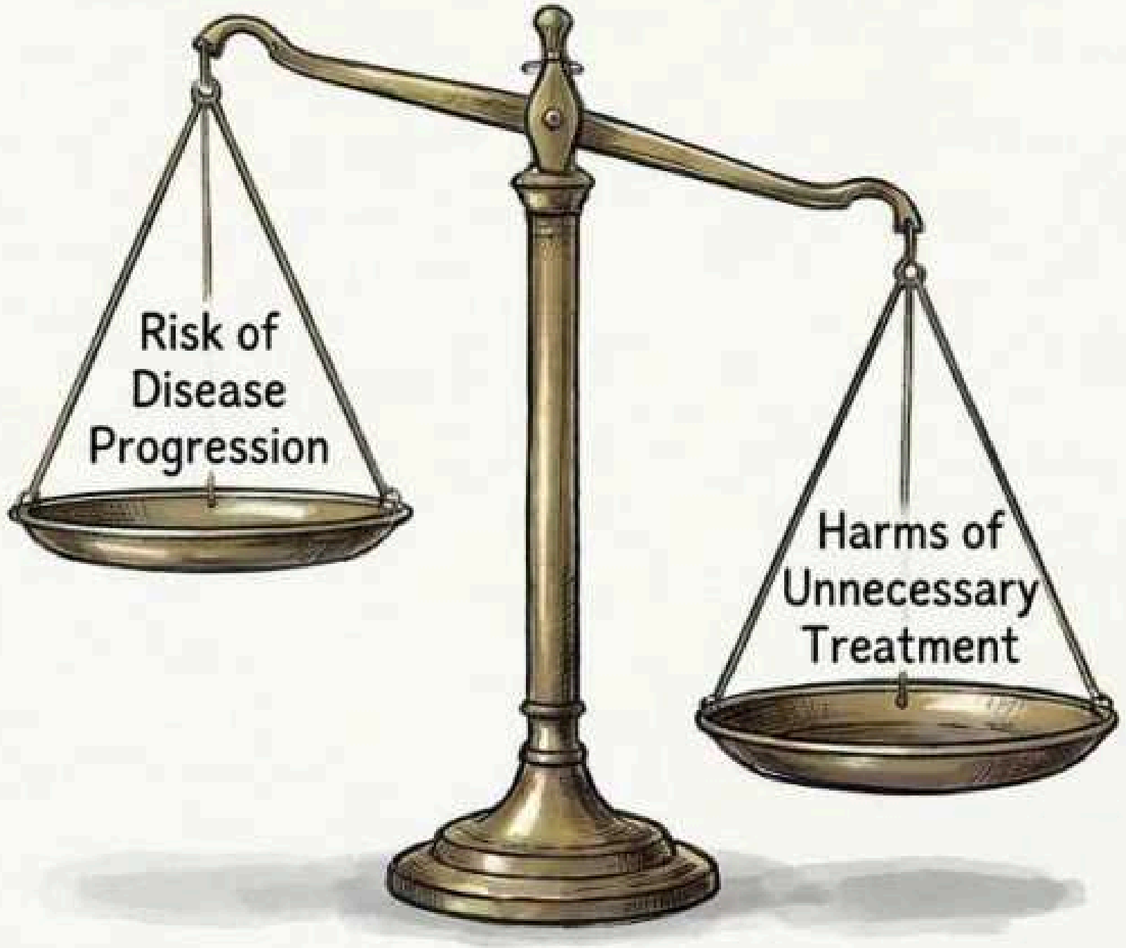
$$V = \frac{V_{max}[S]}{K_m\left(1 + \frac{[I]}{K_i}\right) + [S]}$$

Transformed a fatal disease into a manageable one,
serving as the model for targeted cancer drugs.

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Watch and Wait

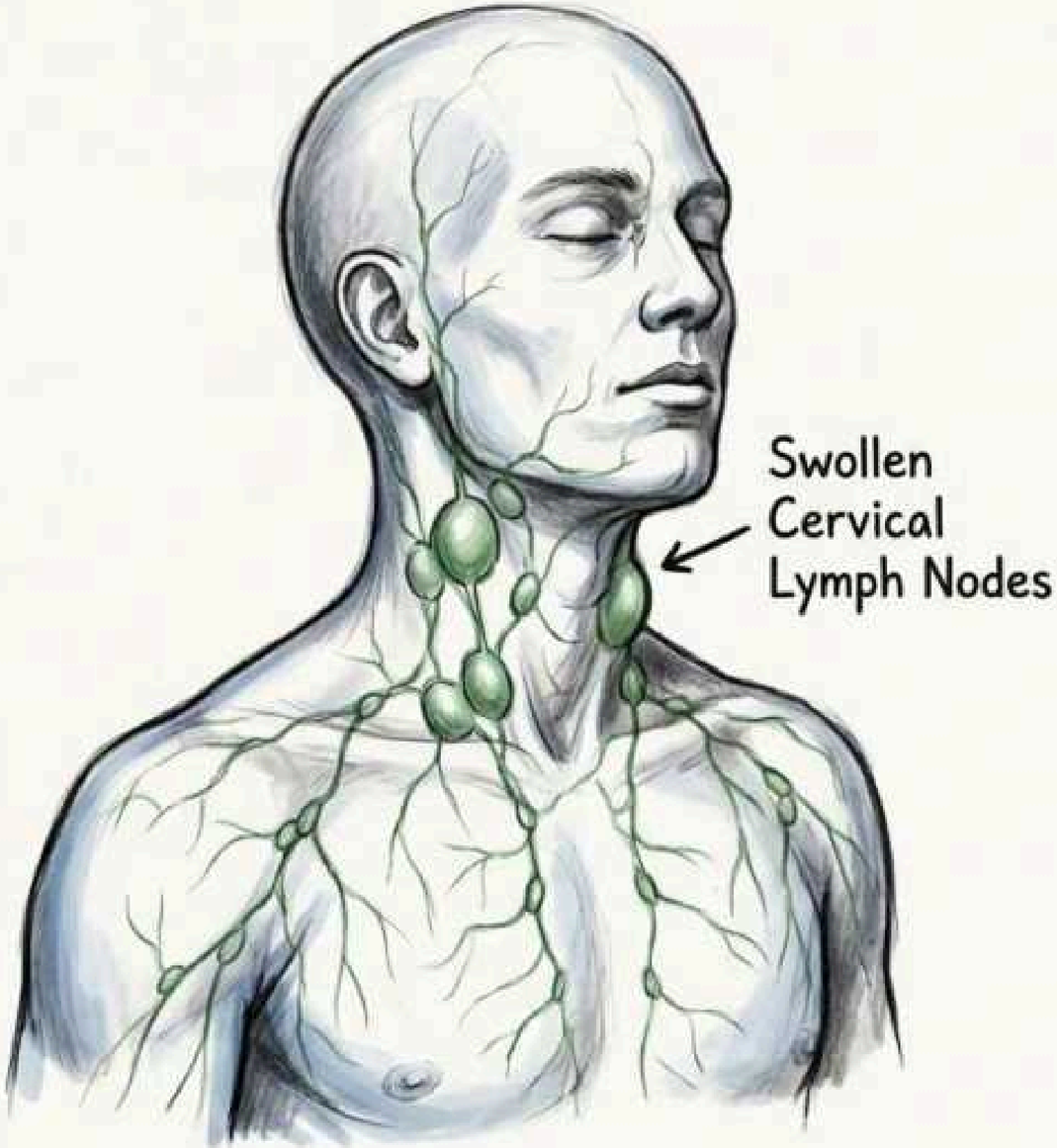
¶ 6.5



- The commonest leukaemia in adults in Western countries.
- Often progresses very slowly; many patients need no treatment for years.

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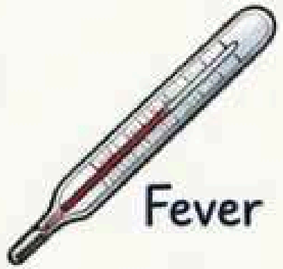
Lymphomas (Cancers of the Lymphocytes)



Hodgkin	Non-Hodgkin
• Named after Thomas Hodgkin (1832) • Cured in most patients with chemotherapy ± radiotherapy	• Encompasses many different types

Shared Symptoms

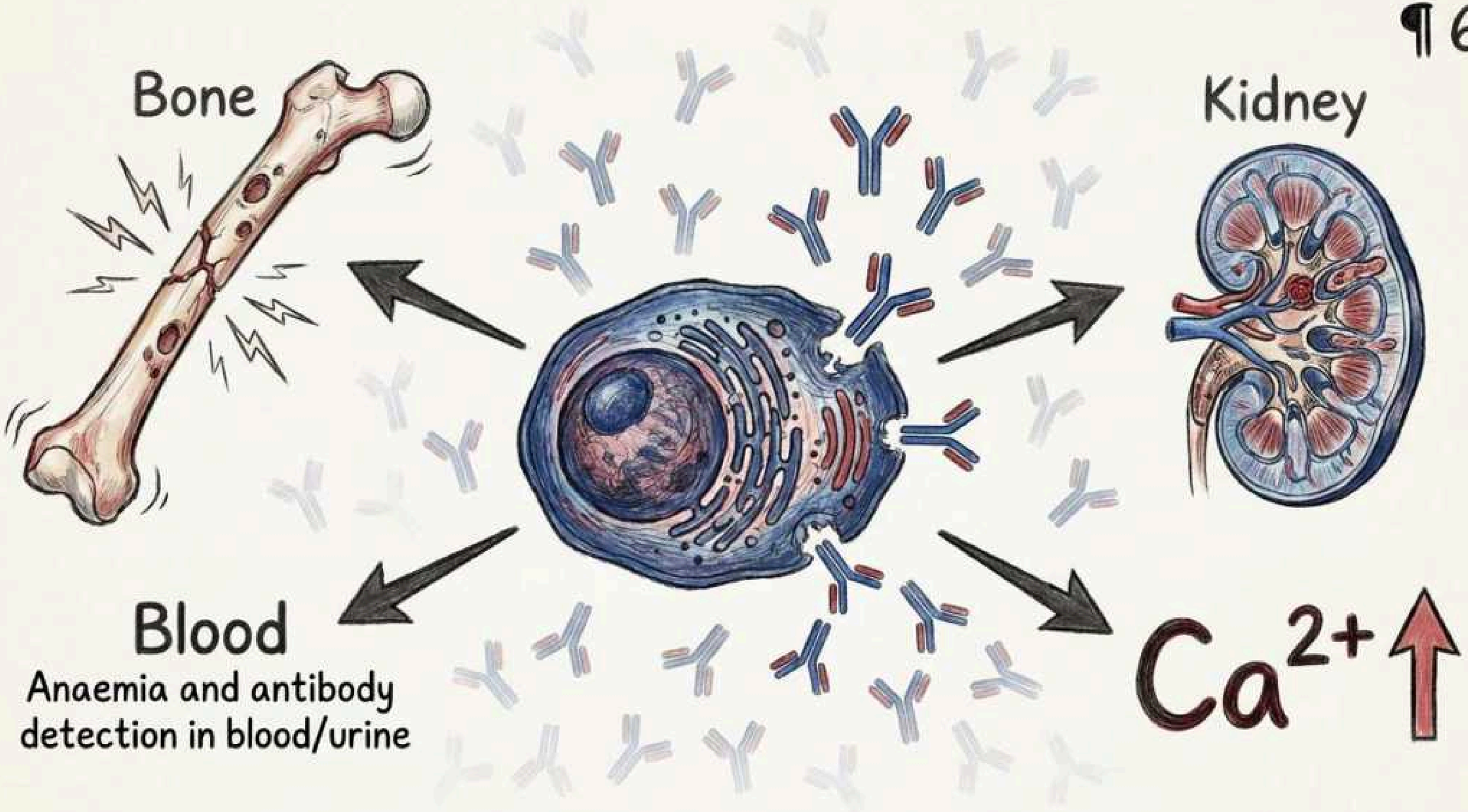
Painless swollen nodes, fevers, night sweats, weight loss.





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¶ 6.7



New drugs have greatly extended survival, though myeloma is usually not cured.

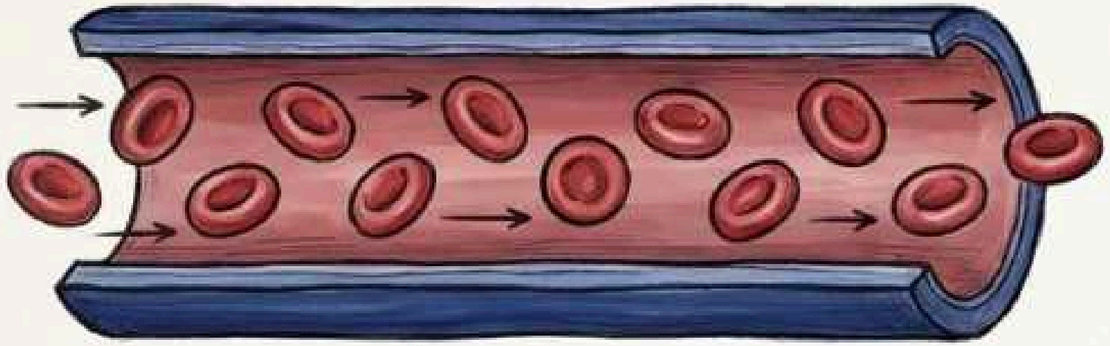
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Hemodynamic Comparison

¶ 6.8

$$\Delta P = \frac{8\mu L Q}{\pi r^4}$$

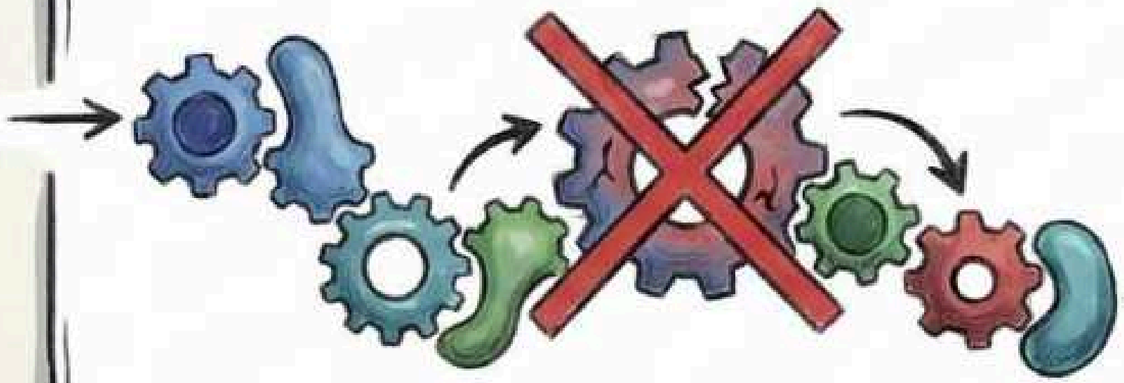
Normal



Polycythaemia vera



Marrow makes too many of one or more cell types. Thick bl raises the risk of clots.



2005 Discovery: Shared genetic change in a signalling enzyme led to highly targeted treatments.

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Immunotherapy: Transforming Blood Cancer Treatment

¶ 6.9

Monoclonal antibodies target markers on cancer cells.

Collection

Apheresis:
- Platelets, and
- T cells

Patient's Own T Cells

Engineering

CAR gene

DNA

Viral vector

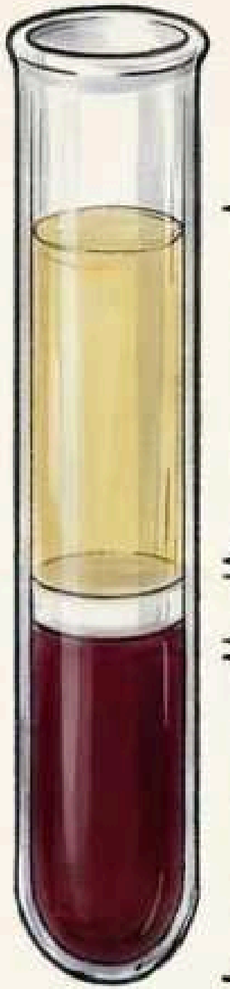
Infusion

Modified CAR T Cells Ready for Patient

Targeting

Produces lasting remissions in patients whose cancers had resisted all other treatments.

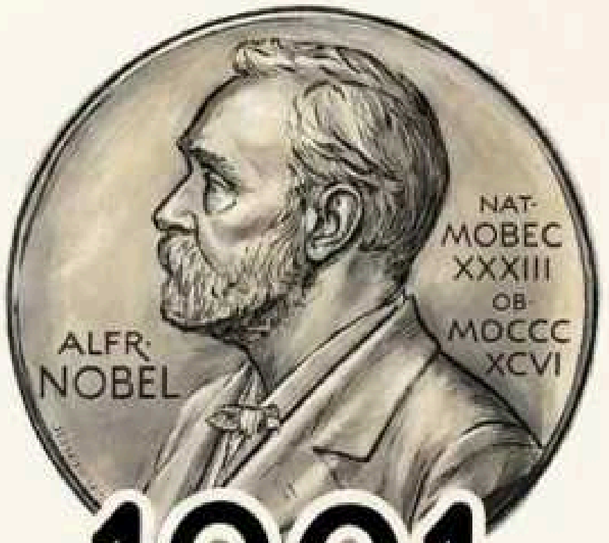
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Separate donated blood so each patient receives only what they need.

ABO & Rhesus D Compatibility

Donor \ Recipient	A	B	AB	O	Rh^+
A	✓	✓	✓	✗	✗
B	✓	✓	✓	✗	✗
AB	✓	✓	✓	✗	✗
O	✗	✓	✓	✓	✗
Rh^+	✗	✗	✗	Rh^+	✓
Rh^-	✗	✗	✗	Rh^-	✓

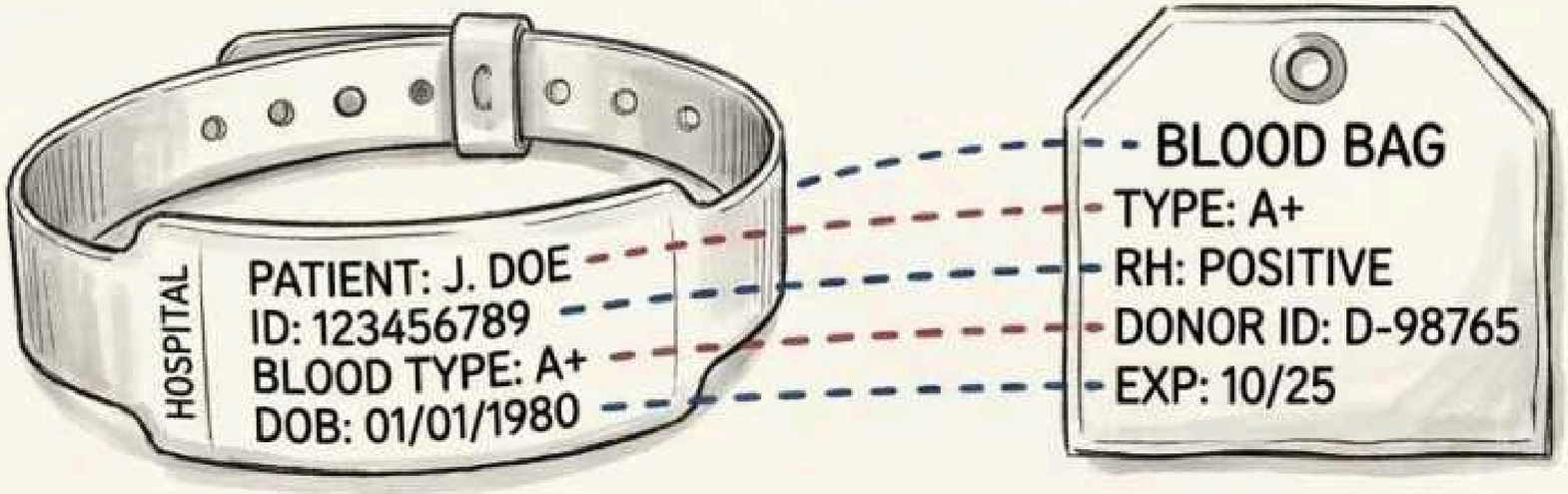


1901

Karl Landsteiner discovered ABO blood groups, avoiding dangerous reactions.

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Right Blood, Right Patient





Rigorous screening of donated blood

Transfusion is safe but not risk-free

[High Transfusion Threshold] = [Low Transfusion Threshold]

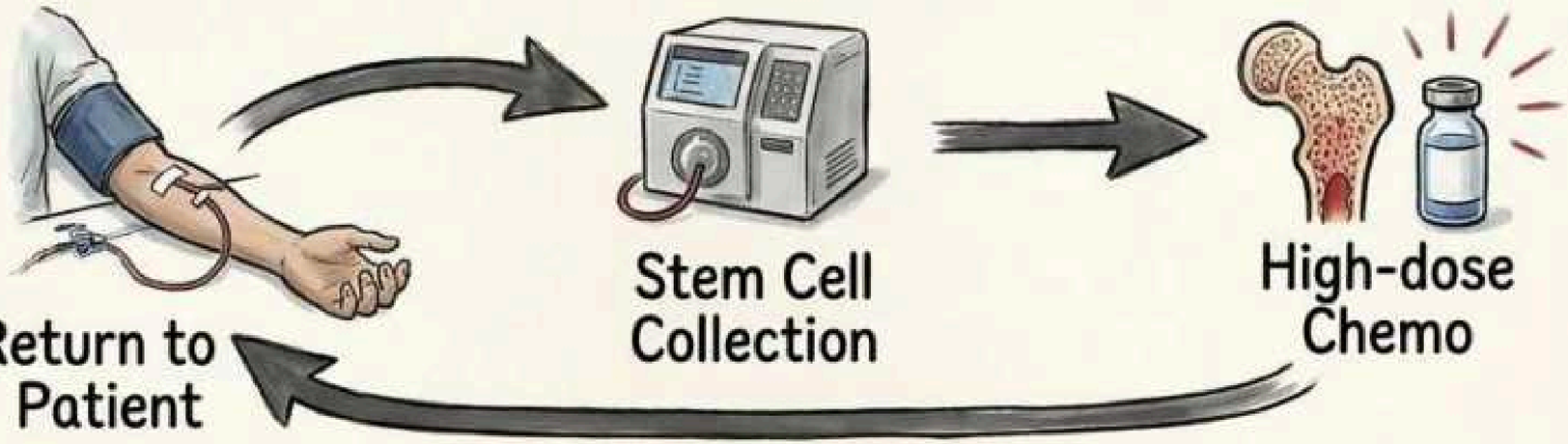
Lower thresholds for transfusing red cells are as safe as higher ones for many patients, ensuring modern practice uses transfusion only when strictly needed.

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Haematopoietic stem cell transplantation replaces a patient's marrow with healthy stem cells.

¶ 6.12

Autologous



tension



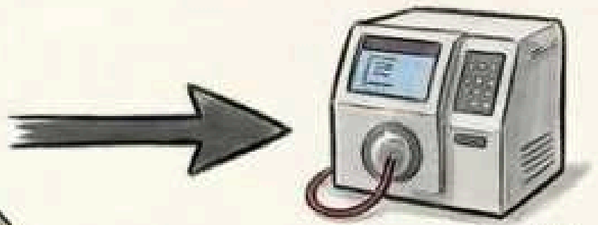
- Benefit: Donor immune cells attack remaining cancer



Allogeneic

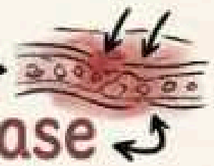


Matched Donor



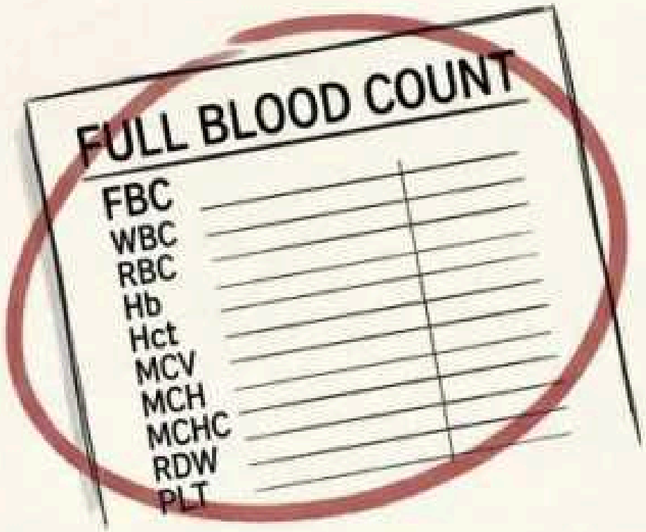
Stem Cell Collection

- Complication: Graft-versus-Host Disease (attacking patient tissues)
  ↳ Patient

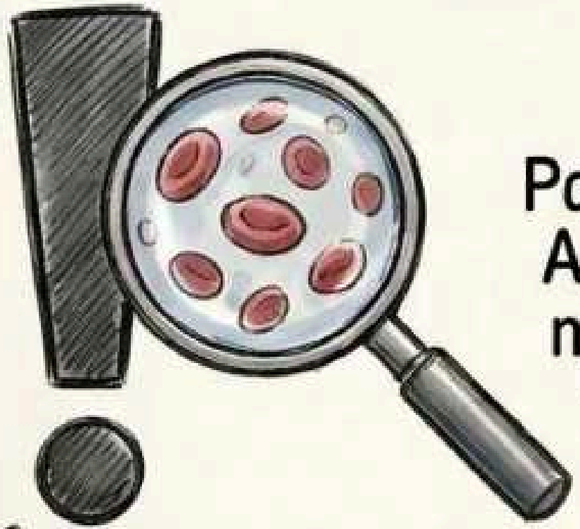


E. Donnall Thomas pioneered the technique and won the Nobel Prize in 1990.

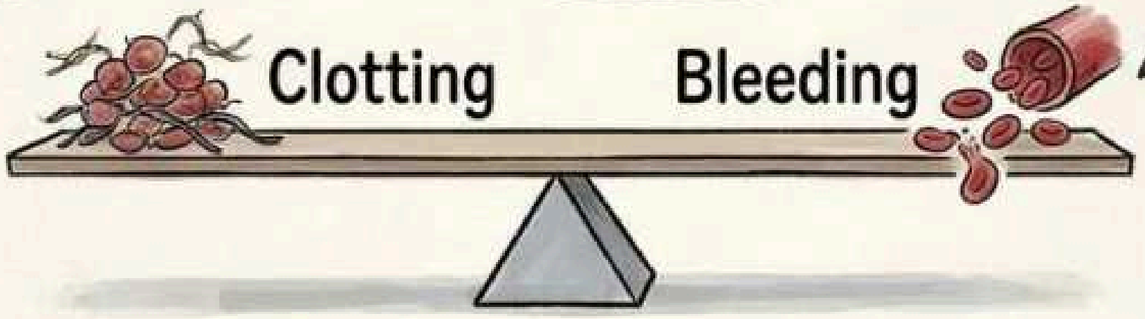
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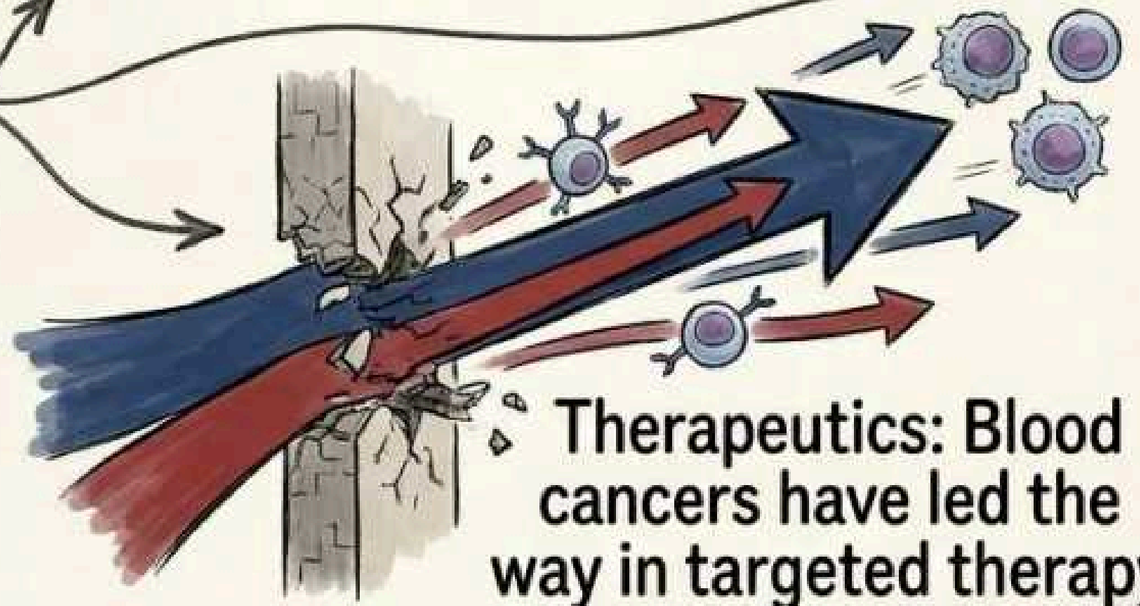
Diagnostics: Read the FBC line by line.



Pathology Principle: Anaemia is a sign, not a diagnosis—find the cause.



System Mechanics: Haemostasis is a balance.



Therapeutics: Blood cancers have led the way in targeted therapy and immunotherapy.

Questions/Feedback?
Email: garyanderson@mail.grokbot.com | X: @garyanderson

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