

# Overview Of Blood and Marrow Transplantation

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# Disclosures: Stephen Couban

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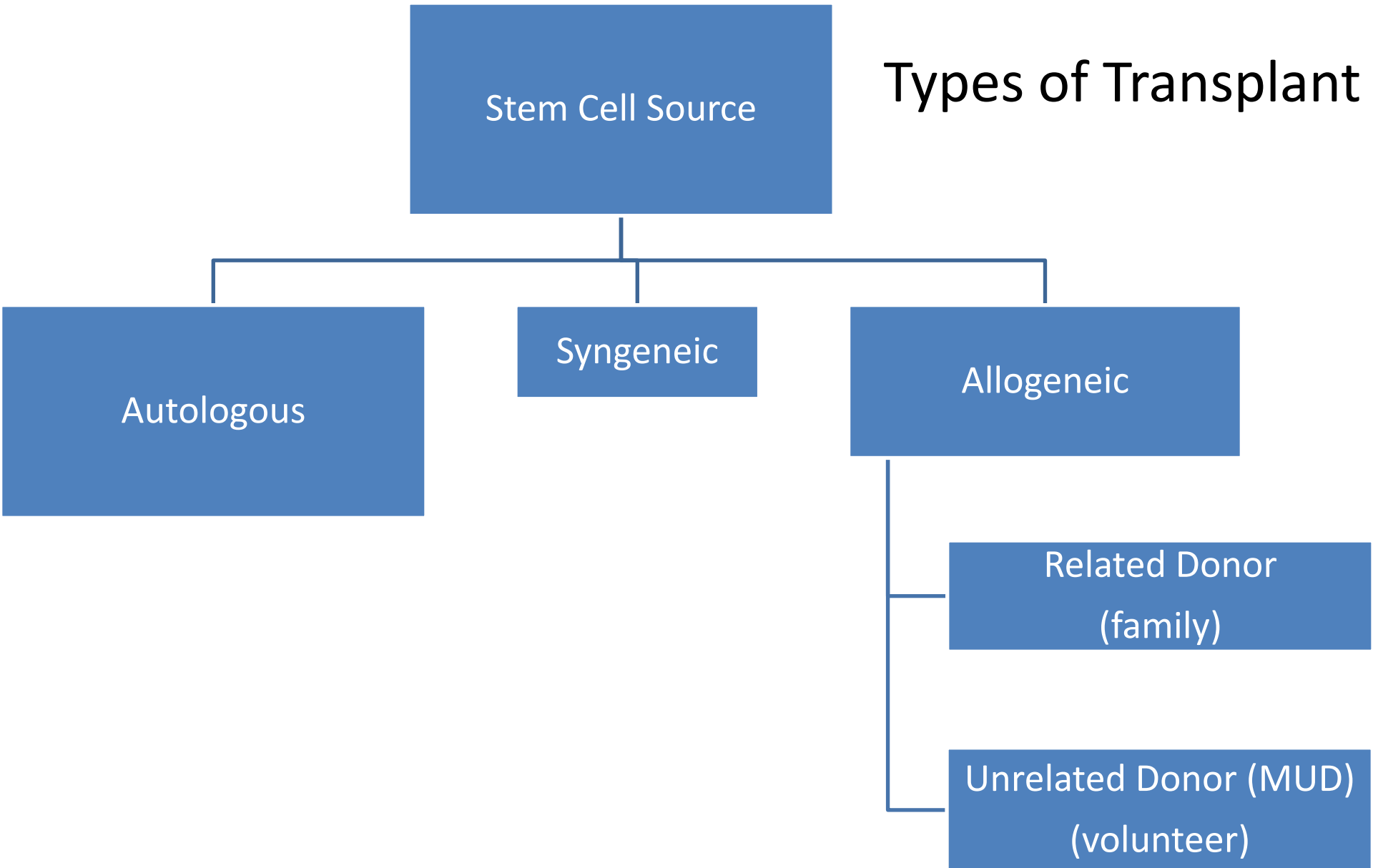
# Objectives:

- Describe the different types of bone marrow and peripheral blood transplant
- Review transplant eligibility criteria
  - Which patients benefit from a transplant?
- Describe major diseases for which transplant is undertaken
- Explain graft vs host disease and the graft versus tumour effect

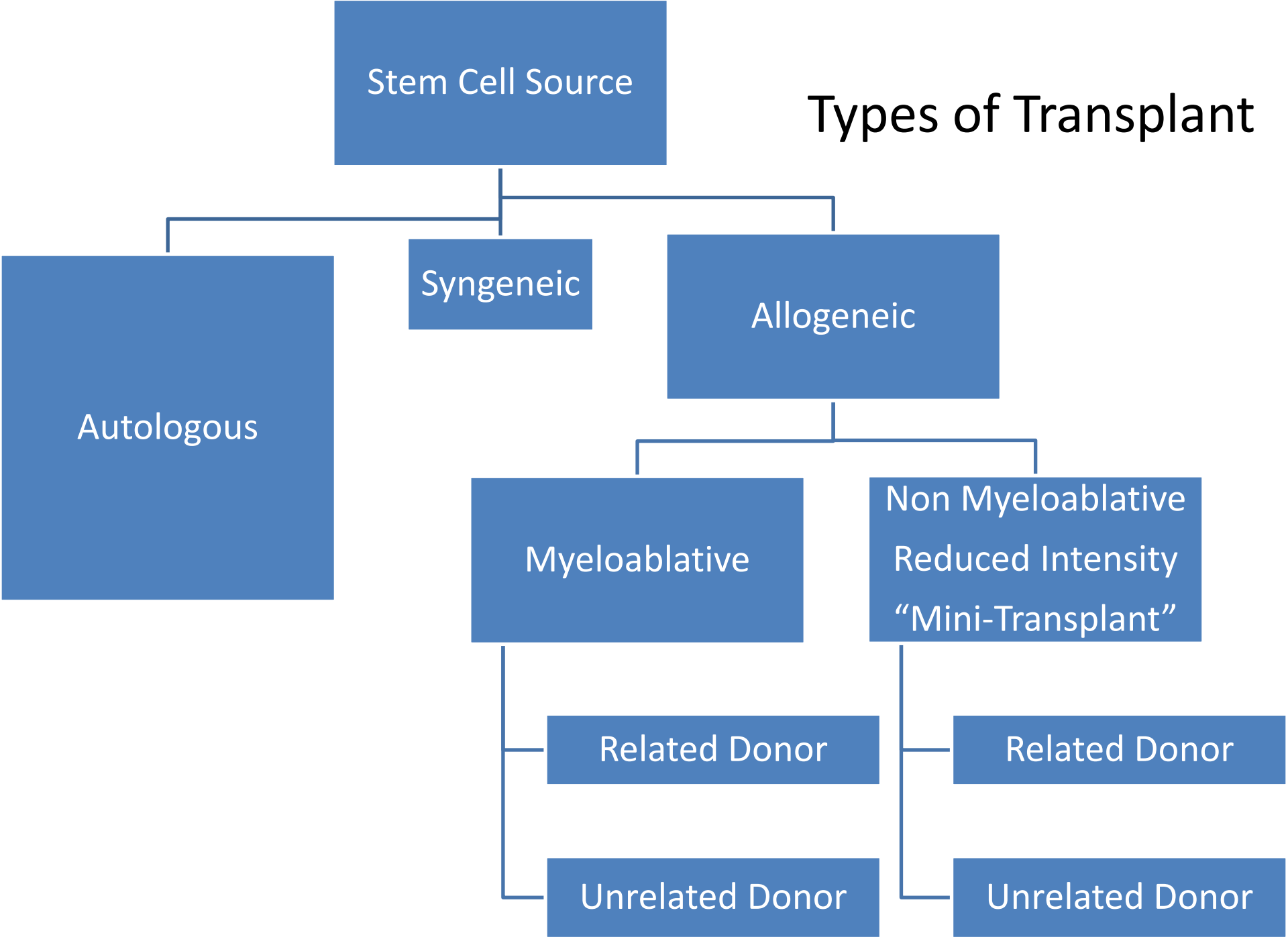
# Goals of BMT

- Cancer therapy
  - Often with the intent to cure the disease
- Marrow replacement
  - Aplastic anemia, thalassemia, sickle cell disease
- Developmental
  - Connective tissue diseases: scleroderma
  - Multiple sclerosis
  - Brain tumours
  - (Breast Cancer)

# Types of Transplant



# Types of Transplant



# Other Types of Transplant

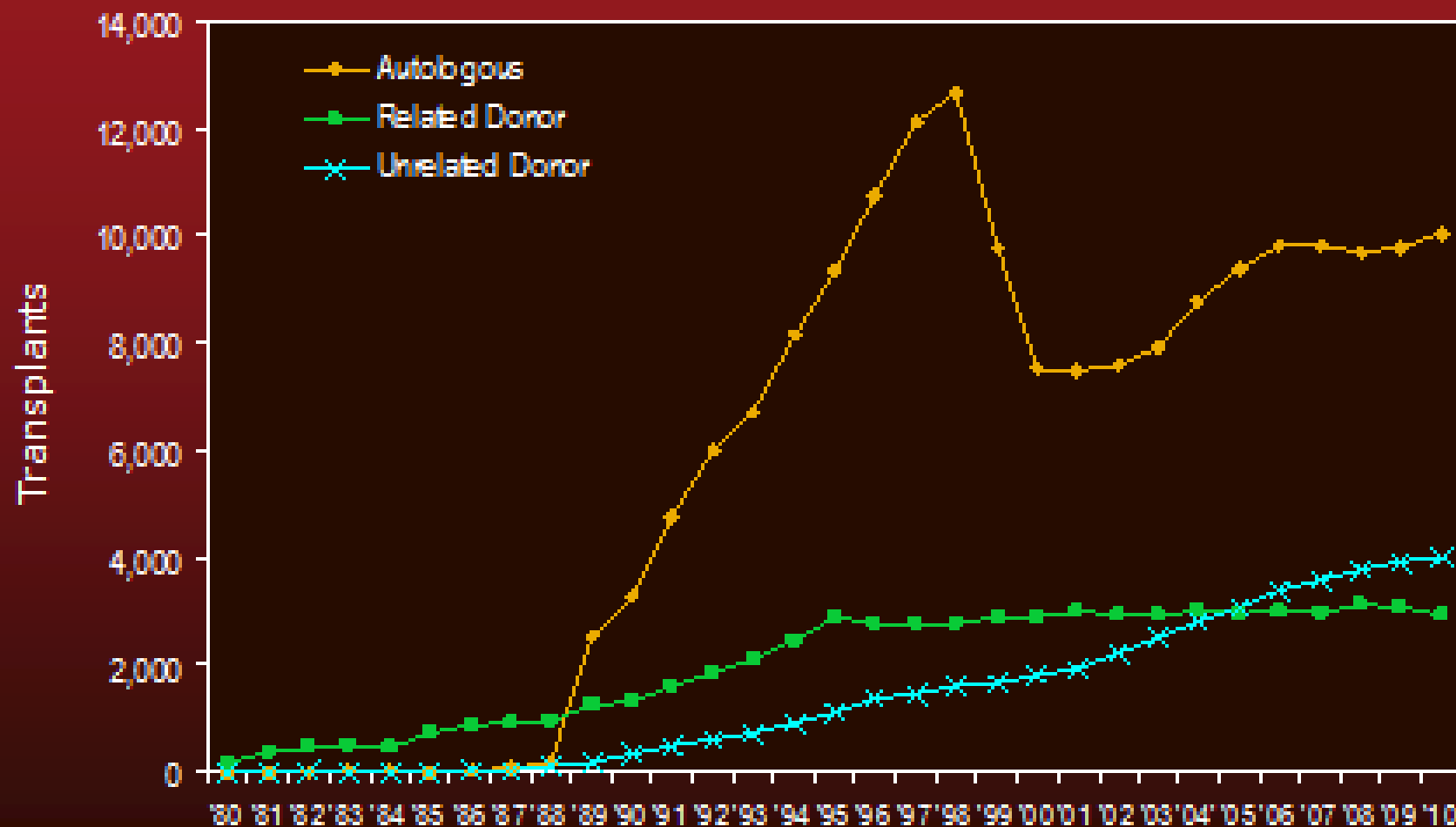
- Cord blood transplants
- Haplo-identical transplants

## Key Points

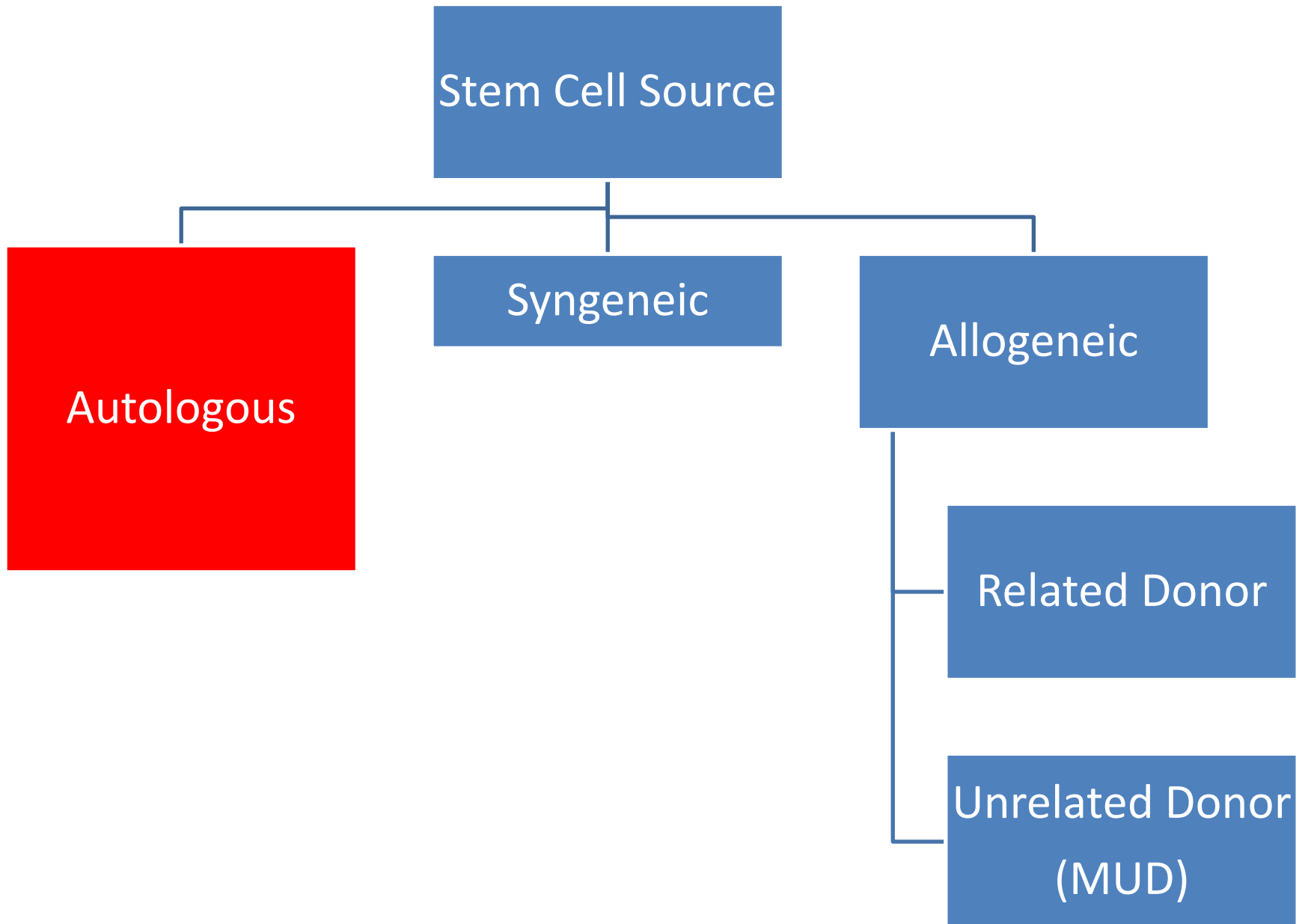
1. Many types of blood and marrow transplant
  - Different risks and benefits
2. Different terms to describe similar types of transplant
  - Non-myeloablative transplant or reduced intensity transplant or “mini transplant”
  - Stem cell transplant or autologous transplant or peripheral blood transplant.
3. Key distinction: autologous vs allogeneic



# Transplant Activity in the U.S. 1980-2010



# Autologous Transplant



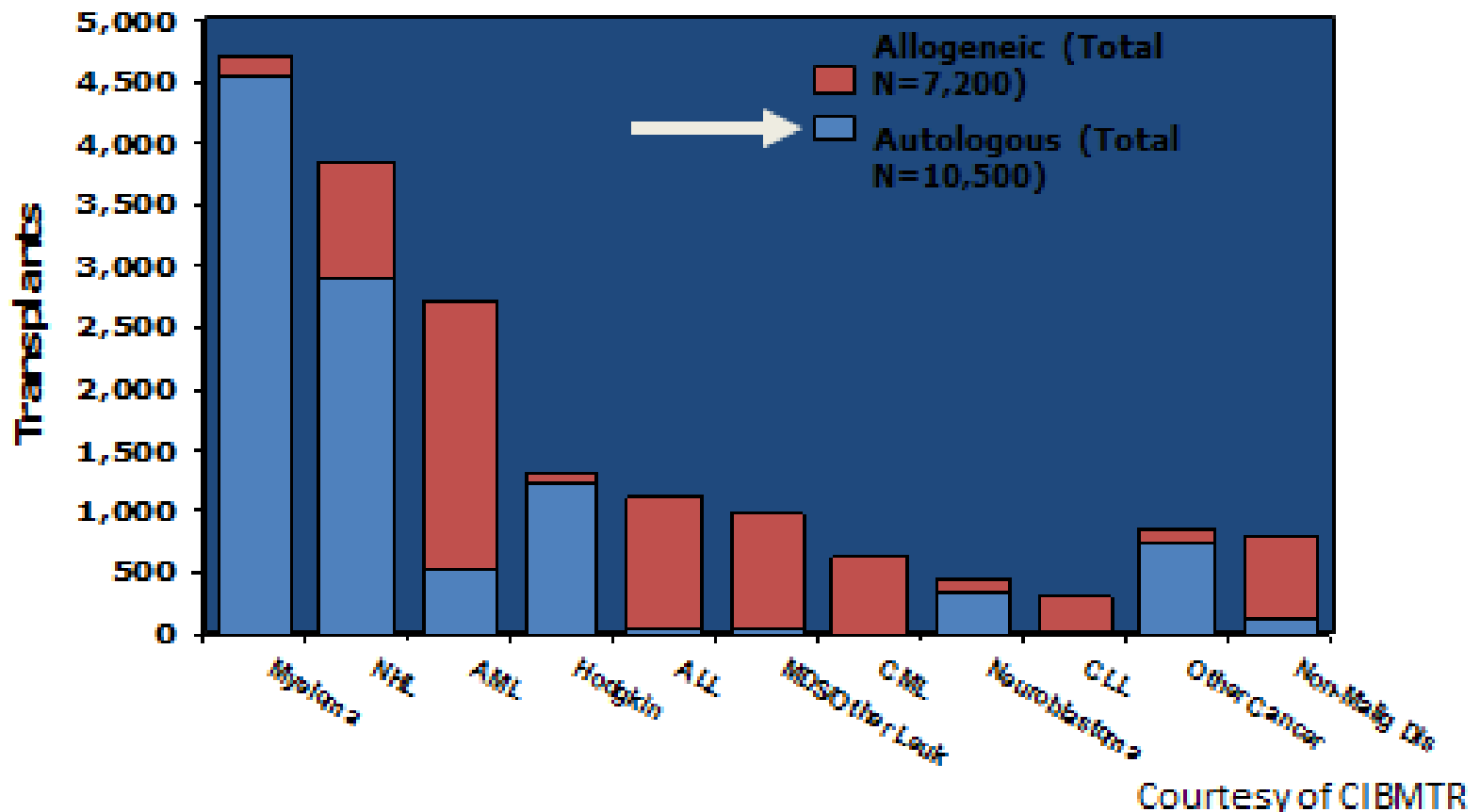
# Autologous Transplant

- Age
  - 70 years old or younger
    - Evidence of benefit
- Performance State
  - vital organ function (heart, lungs, liver, kidneys)
- Chemosensitivity

# Autologous Indications: 2016

- Myeloma
  - Novel therapies
- Relapsed Lymphoma
  - Hodgkin, Non-hodgkin's lymphoma
- Acute leukemia
- Solid tumours
  - Germ cell tumour
  - (breast cancer)

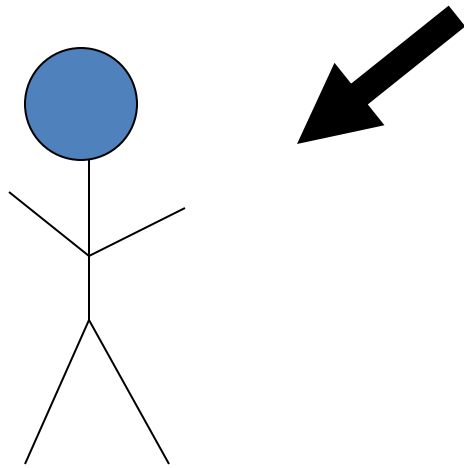
# Indications for Hematopoietic Stem Cell Transplantation in North America



# Autologous Transplant: Stages

1. Pre-transplant chemotherapy
2. Harvest
3. Conditioning
4. Infusion
5. Recovery

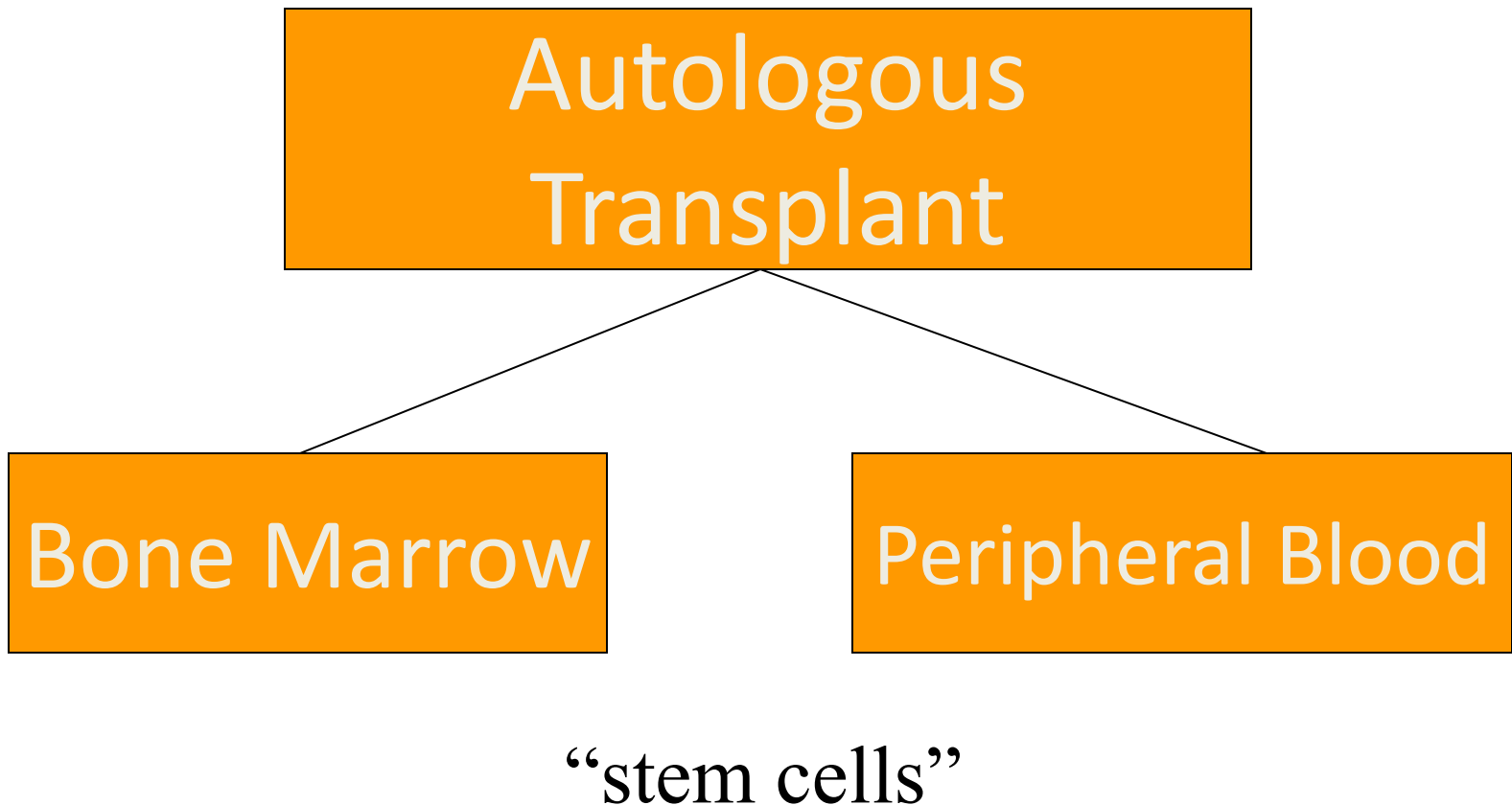
# 1. Pre-Transplant Chemotherapy



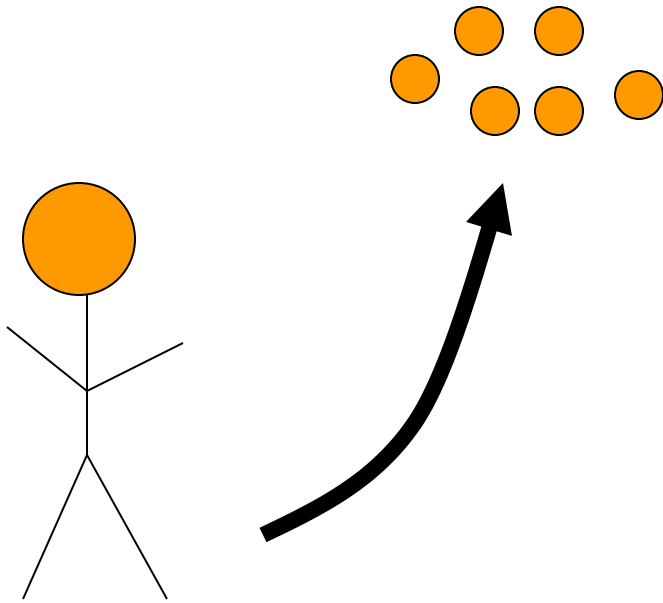
- Demonstrate chemosensitivity
- Reduce the amount of cancer cells in the patient



## 2. Harvest: Source of Cells

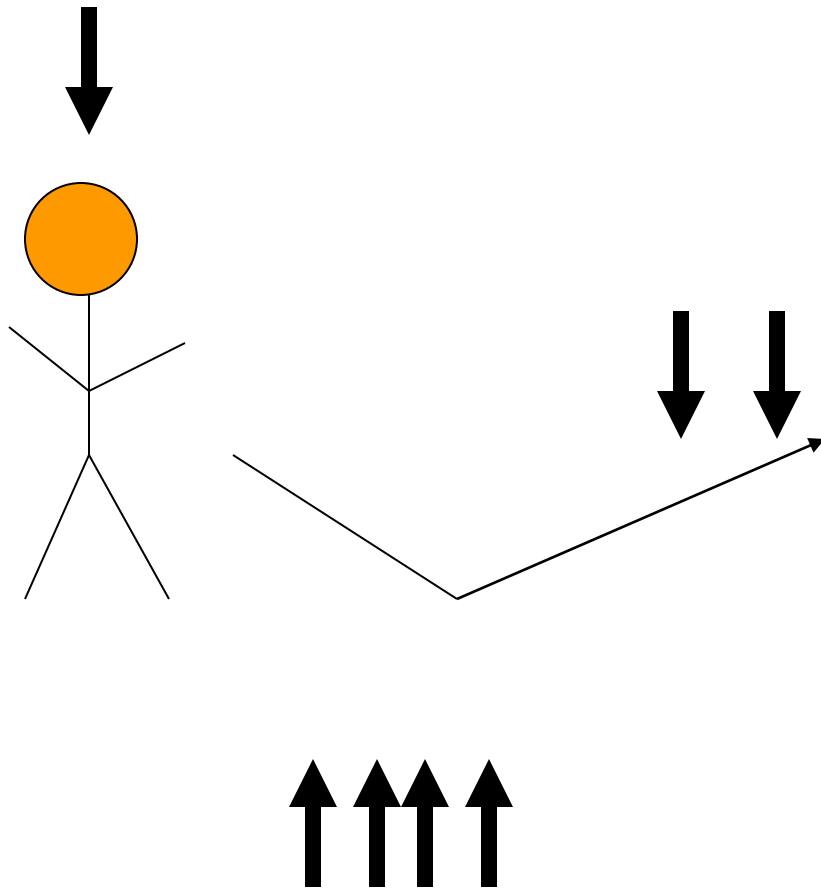


# Bone Marrow Harvest



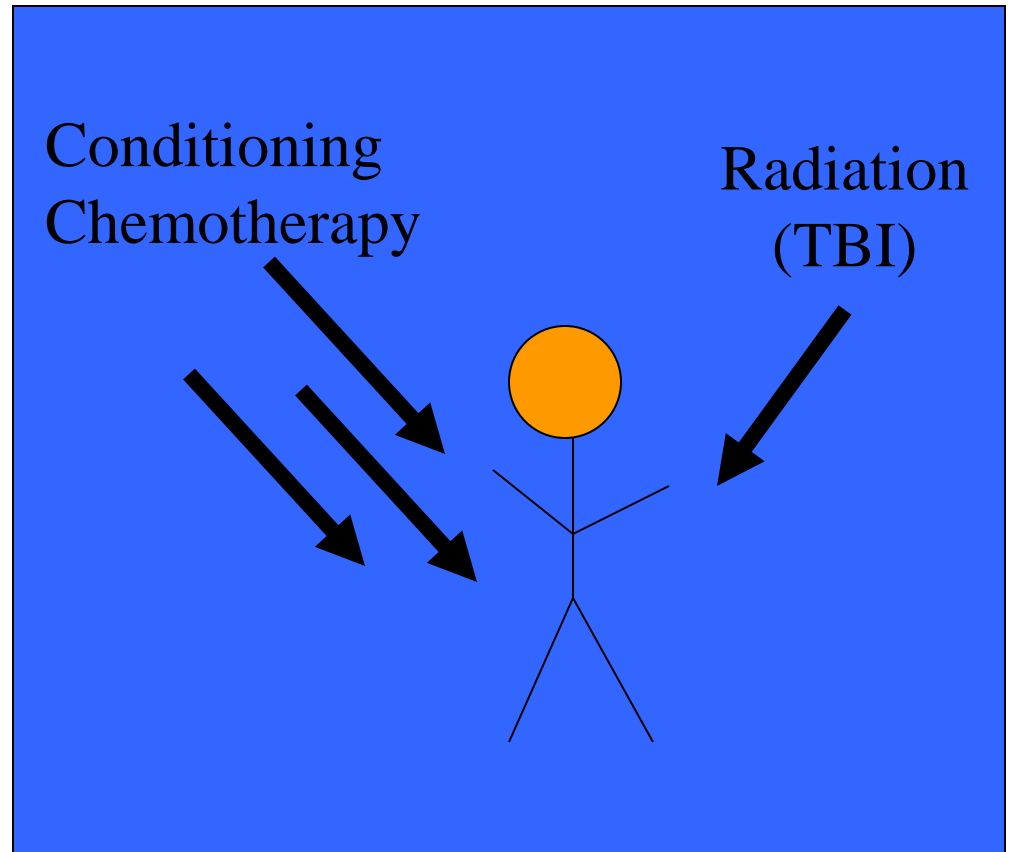
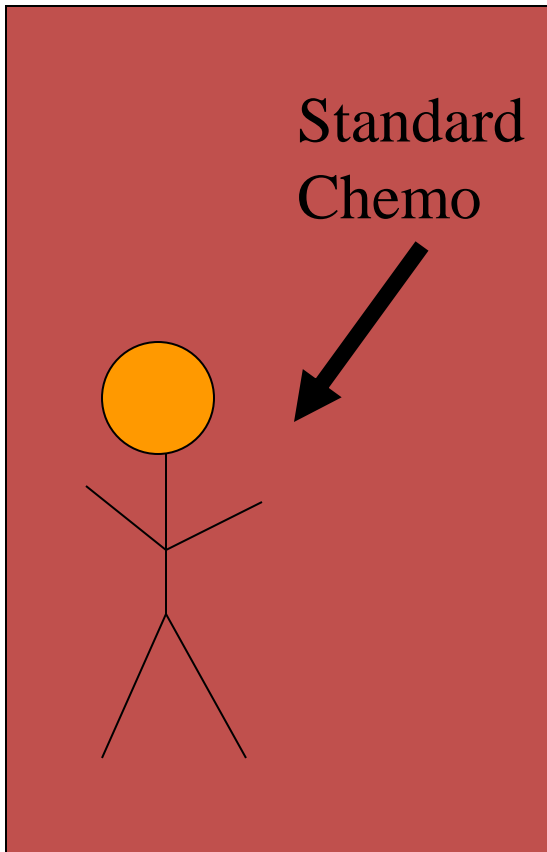
- Advantages
  - No further chemotherapy
  - No growth factors
  - One day
- Disadvantages
  - General anesthetic
  - Large volume

# Peripheral Blood Harvest



- Advantages
  - No general anesthetic
  - Small volume
  - **Recovery of counts**
- Disadvantages
  - Chemotherapy
  - Growth factors
  - Apheresis

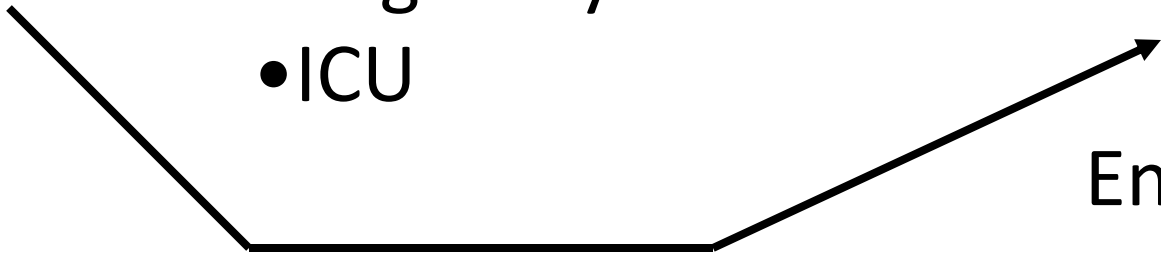
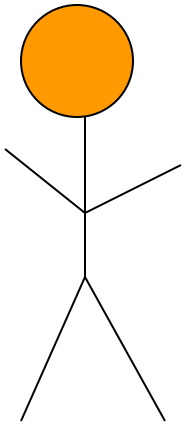
# 3. Conditioning





# 4+5. Infusion to Count Recovery

- Infection
- Bleeding
- Organ Dysfunction
- ICU



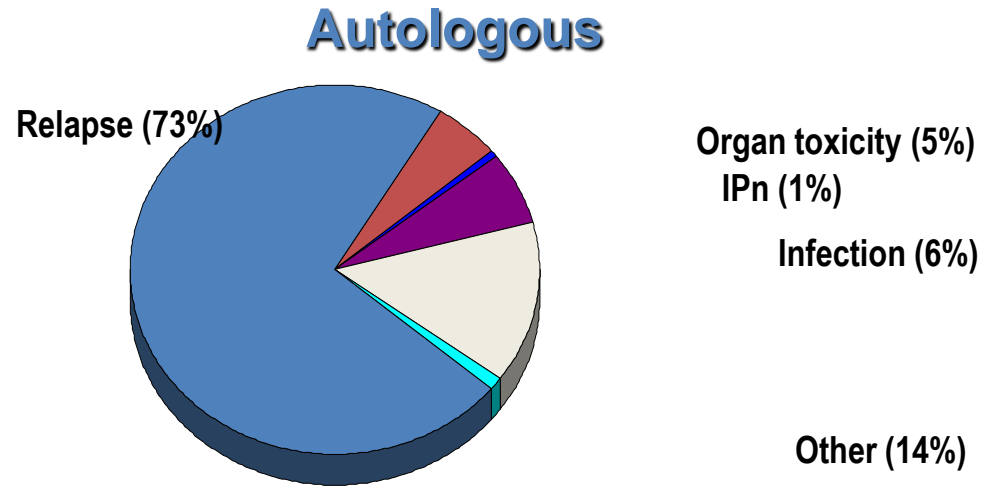
Engraftment

# Late Effects

- Organ Damage: pulmonary, cardiac, renal
- Second Cancers
- Hormonal issues
  - Underactive thyroid, osteoporosis
- Infertility
- Cataracts
- Relapse

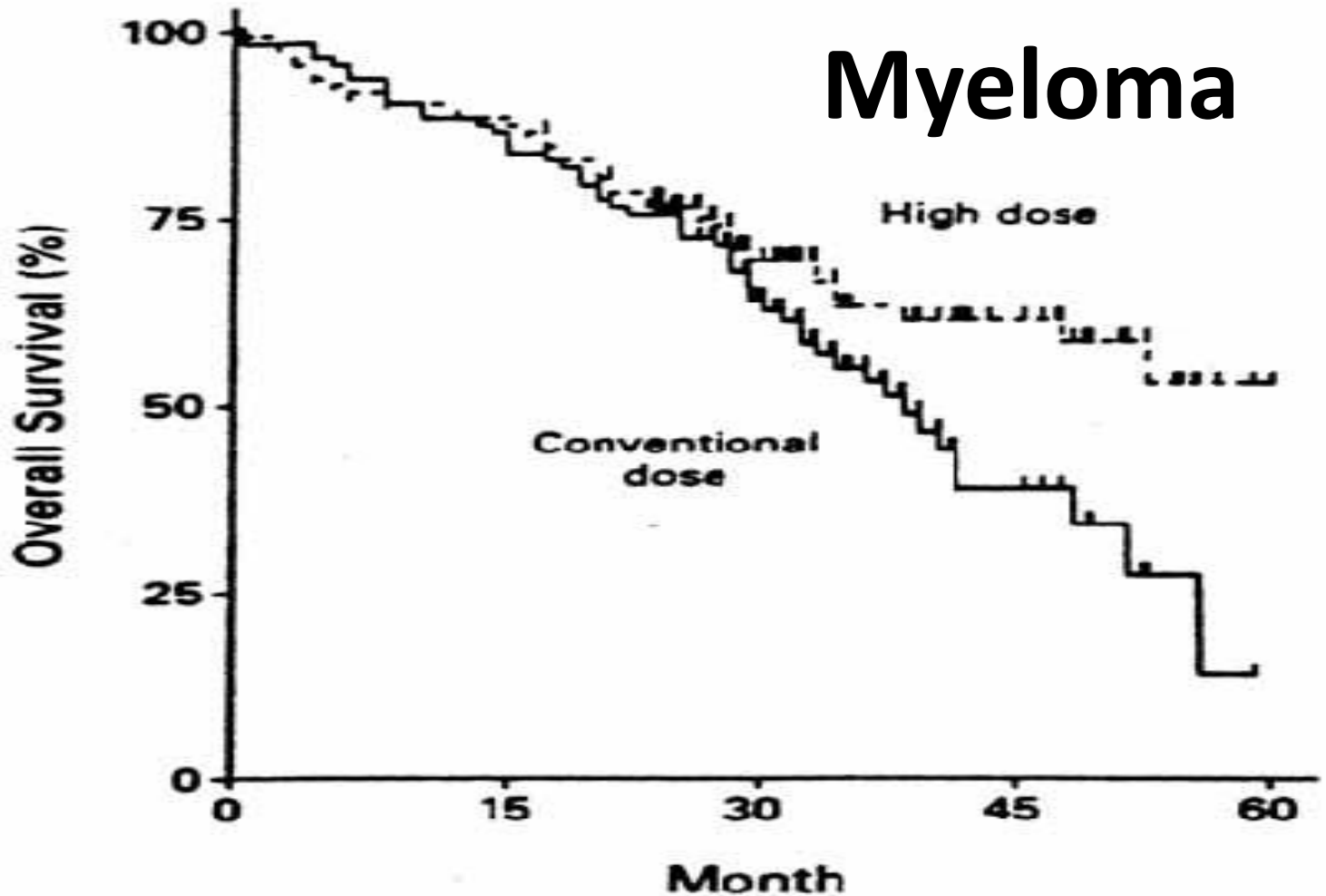
# Causes of Death after Autologous Transplantation

Relapse is the single most common cause of death after autologous transplant



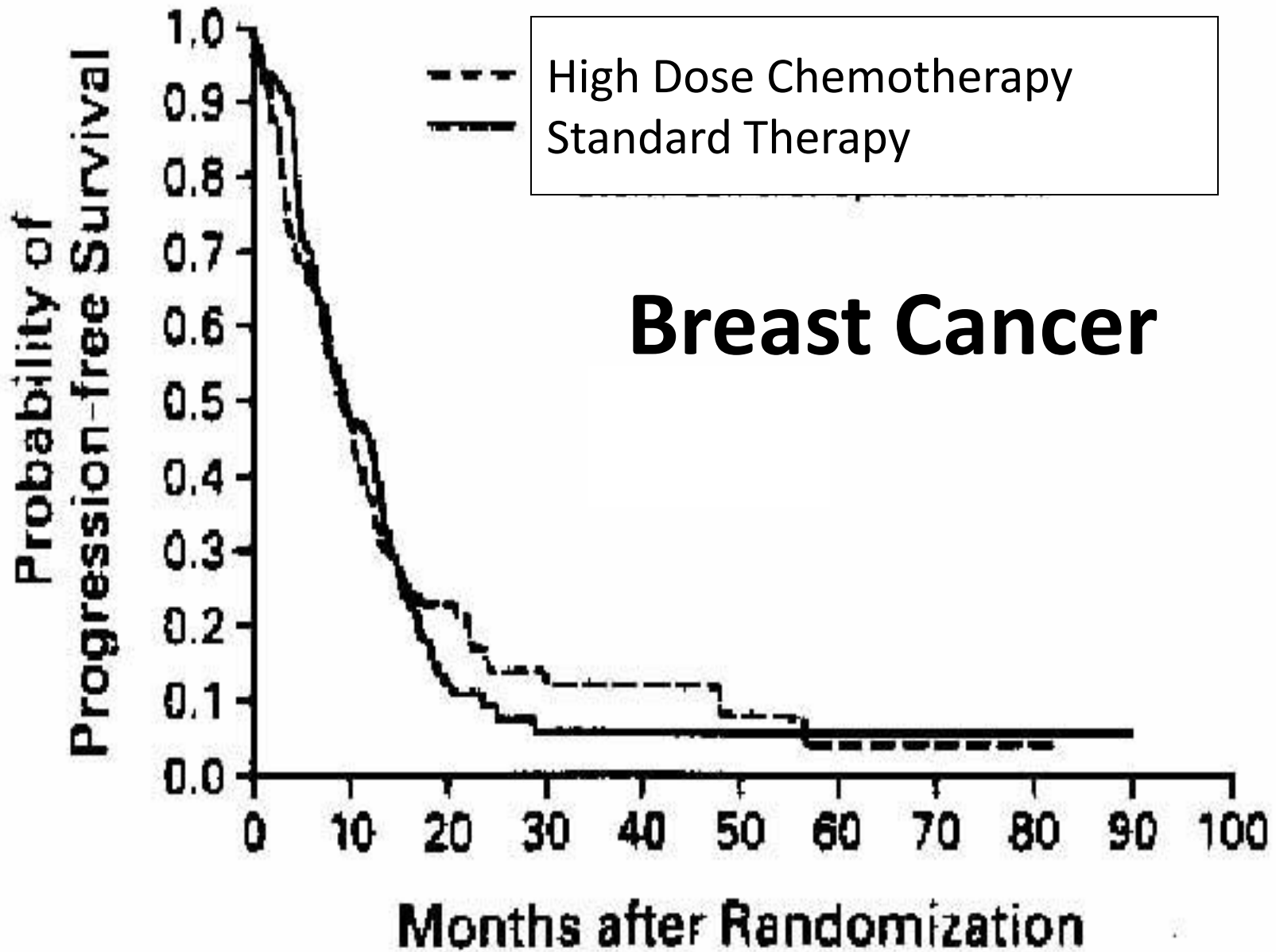


# Myeloma



Conventional dose	63 (53-73)	35 (22-50)	12 (1-40)
High dose	69 (58-78)	61 (50-71)	52 (36-67)

**Figure 2. Overall Survival According to Treatment Group.**  
 The numbers shown below the time points are probabilities of overall survival (the percentages of patients surviving) and 95 percent confidence intervals.



# Allogeneic Transplant

# Types of Transplant

Autologous

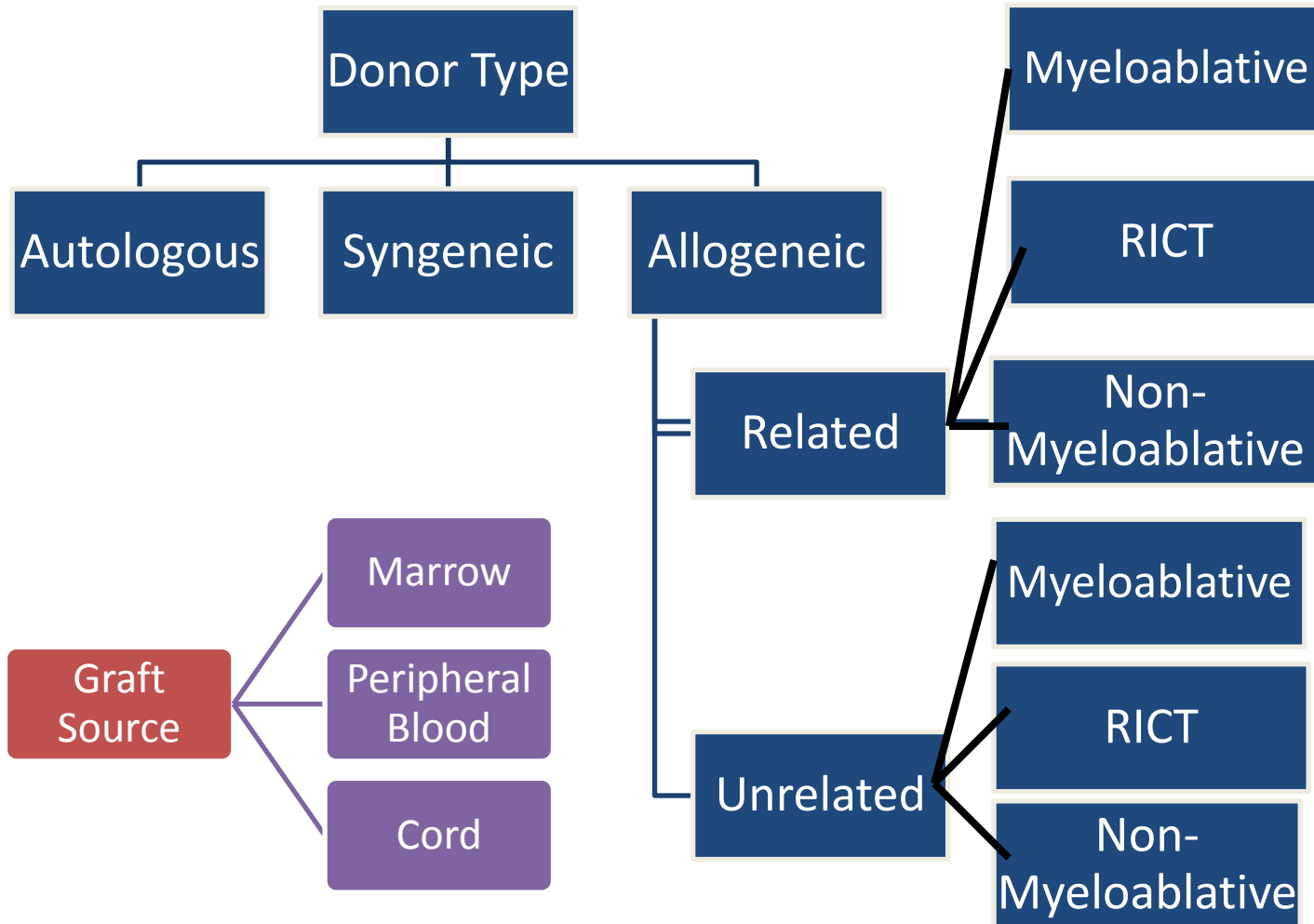
Syngeneic

Allogeneic

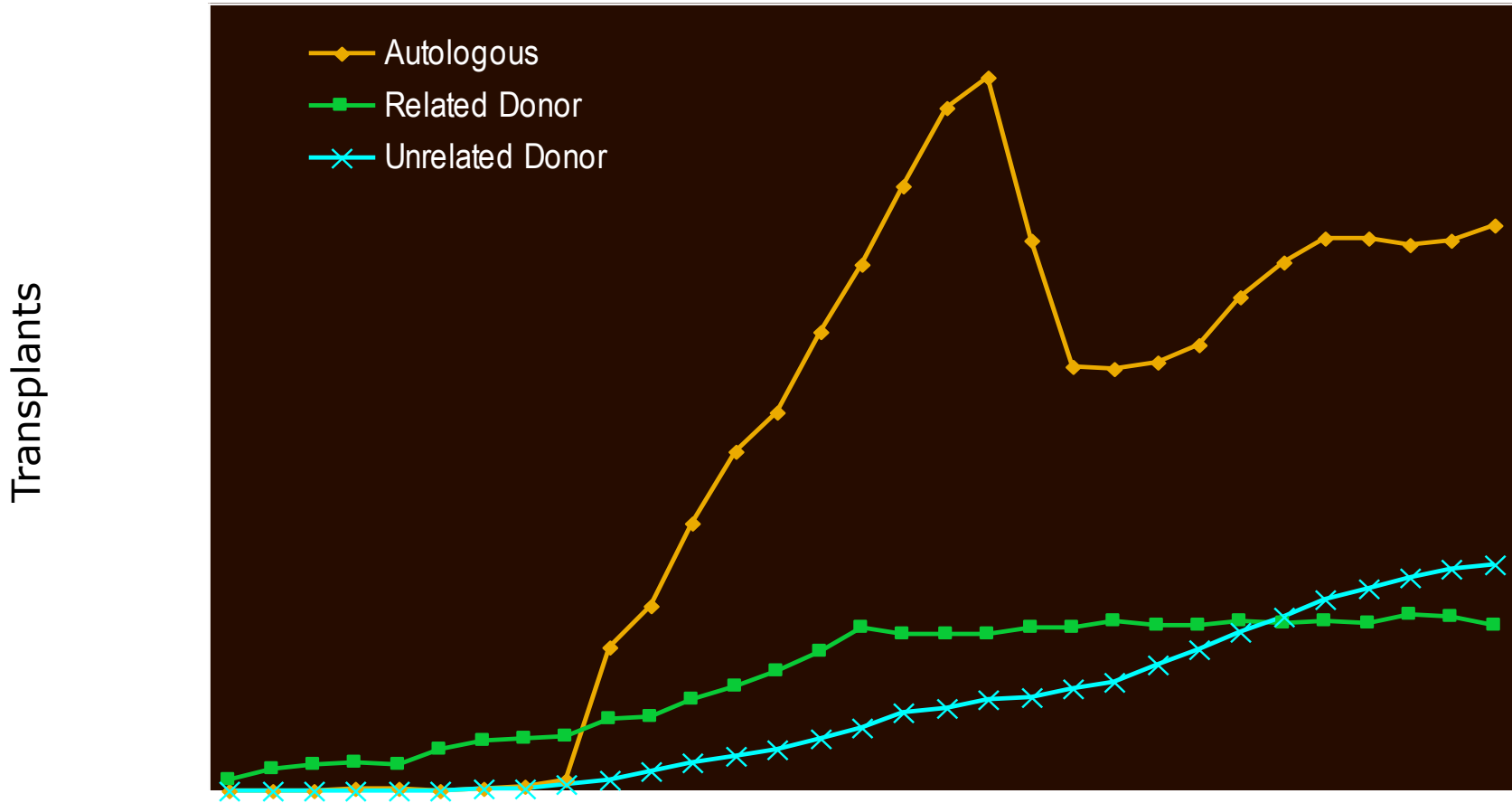
Related Donor  
(Sibling)

Unrelated Donor  
(MUD)  
(Volunteer)

# Types of Transplant



# Transplant Activity in the U.S. 1980-2010



# Allogeneic Transplant

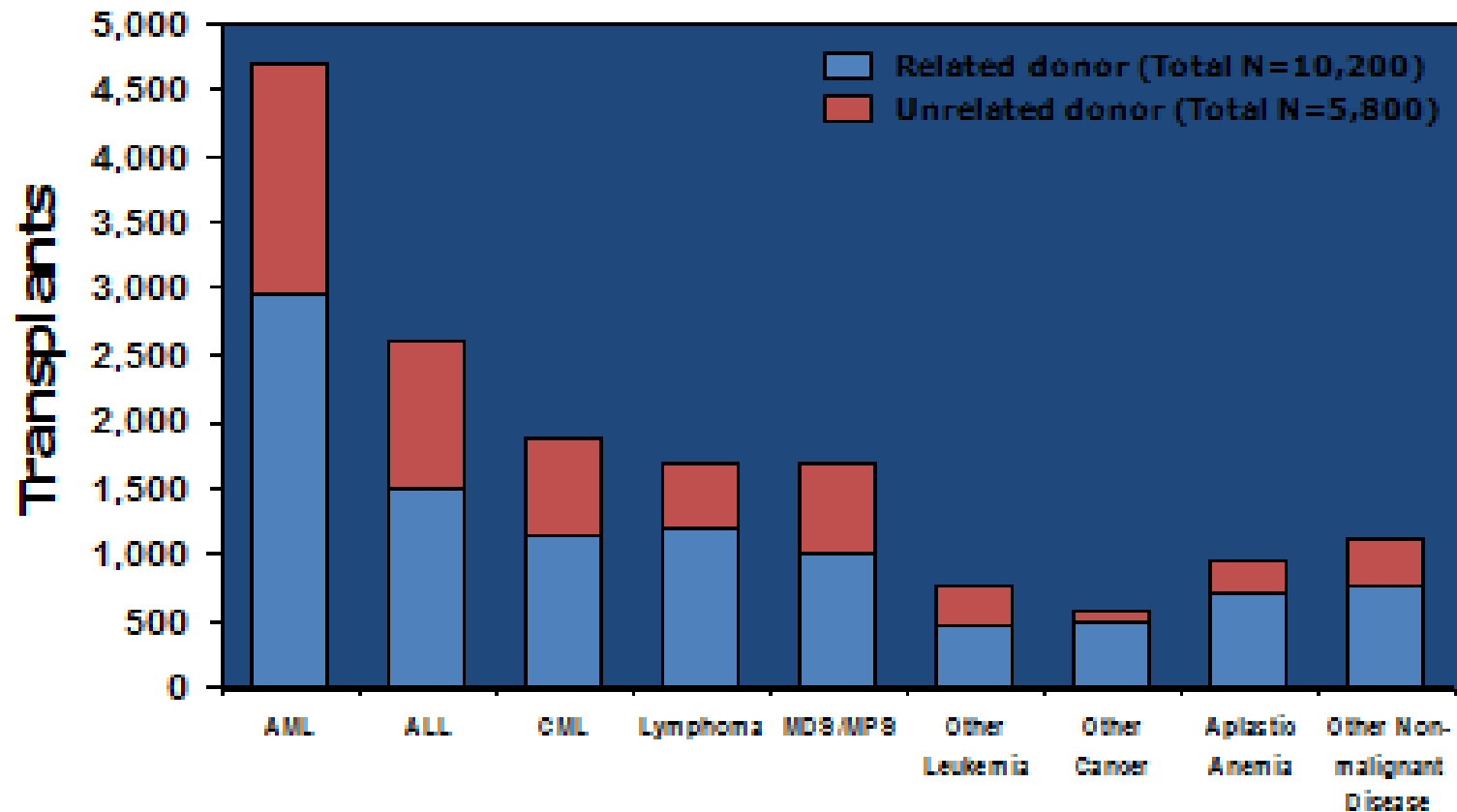
- Age
  - 55 years old or younger (myeloablative)
  - $\leq 65$  years old or younger (non-myeloablative)
- Performance State
  - end organ function
- (Chemosensitivity)

# Allogeneic Indications

- Leukemia
  - Acute leukemia, **MDS** > CML, CLL
- Lymphoma
  - Indolent lymphomas
- Myeloma
  - Uncommon in 2015
- Bone marrow failure: **aplastic anemia**
- Diseased bone marrow

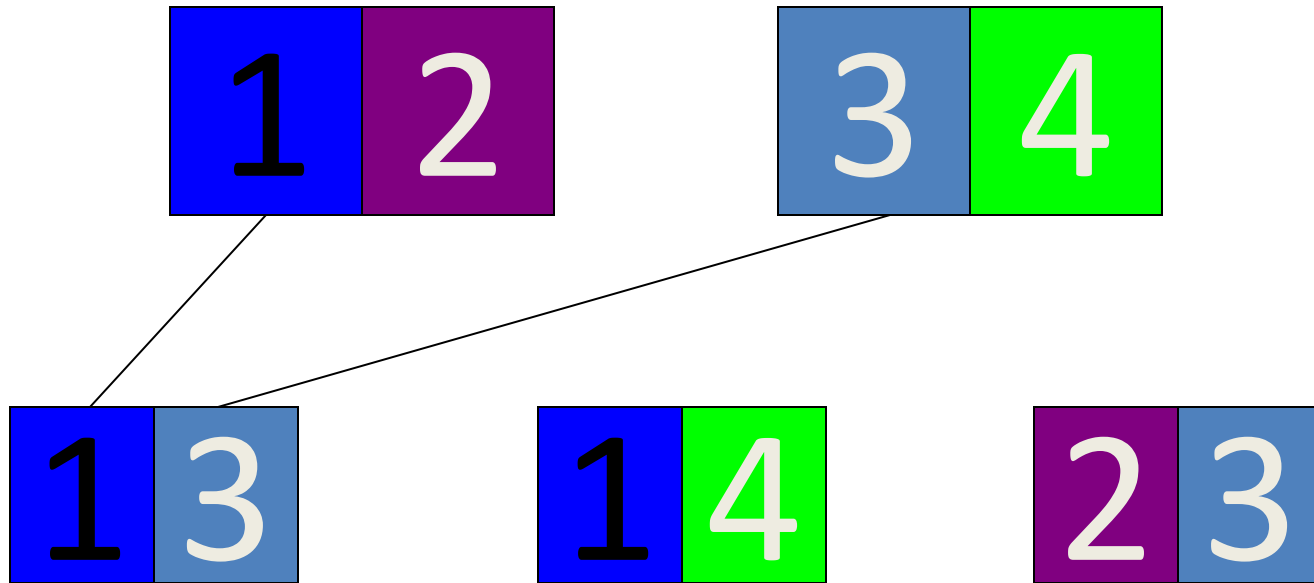


# Indications for Allogeneic Hematopoietic Stem Cell Transplants



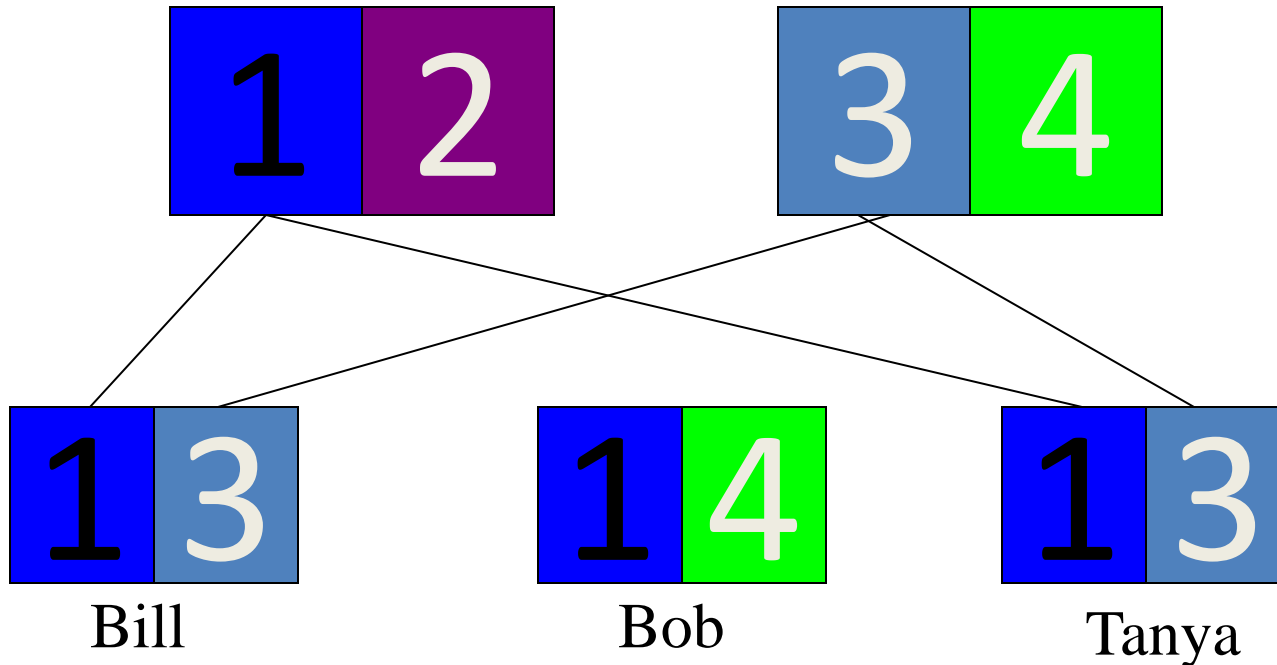
# Allogeneic: The Match

Each child inherits one set of HLA antigens from each parent



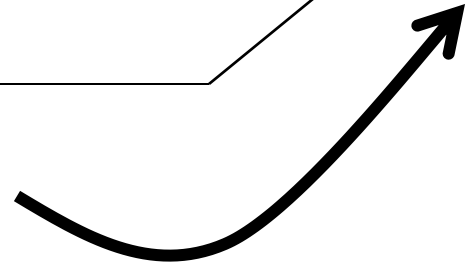
Here, none of the siblings are a match

# Allogeneic: The Match



Bill and Tanya are a match

Parents/children are rarely a match for each other



# Graft versus Host Disease

Reverse of graft rejection

Immune attack of donor cells against  
the recipient

# Acute Graft versus Host Disease (aGvHD)

- Skin: Rash
- Liver: Inflammation
- Gut: Diarrhea

# Chronic Graft versus Host Disease (cGvHD)

- Skin
  - Scleroderma
- GI tract
  - Small, dry mouth
  - Strictures
  - Chronic diarrhea
- Liver
- Eyes
  - Sicca syndrome
  - Corneal ulceration
- Nervous System
  - Peripheral neuropathy
- Lungs
  - Bronchiolitis obliterans
  - (BOOP)
- Muscles and Joints
  - Lupus-like syndrome
  - Myositis

- The Immune Effect in Allogeneic Transplant
  - A double-edged sword
  - Graft vs host disease
  - Graft vs tumour effect
- No benefit of GvHD in aplastic anemia
- Significant benefit in MDS



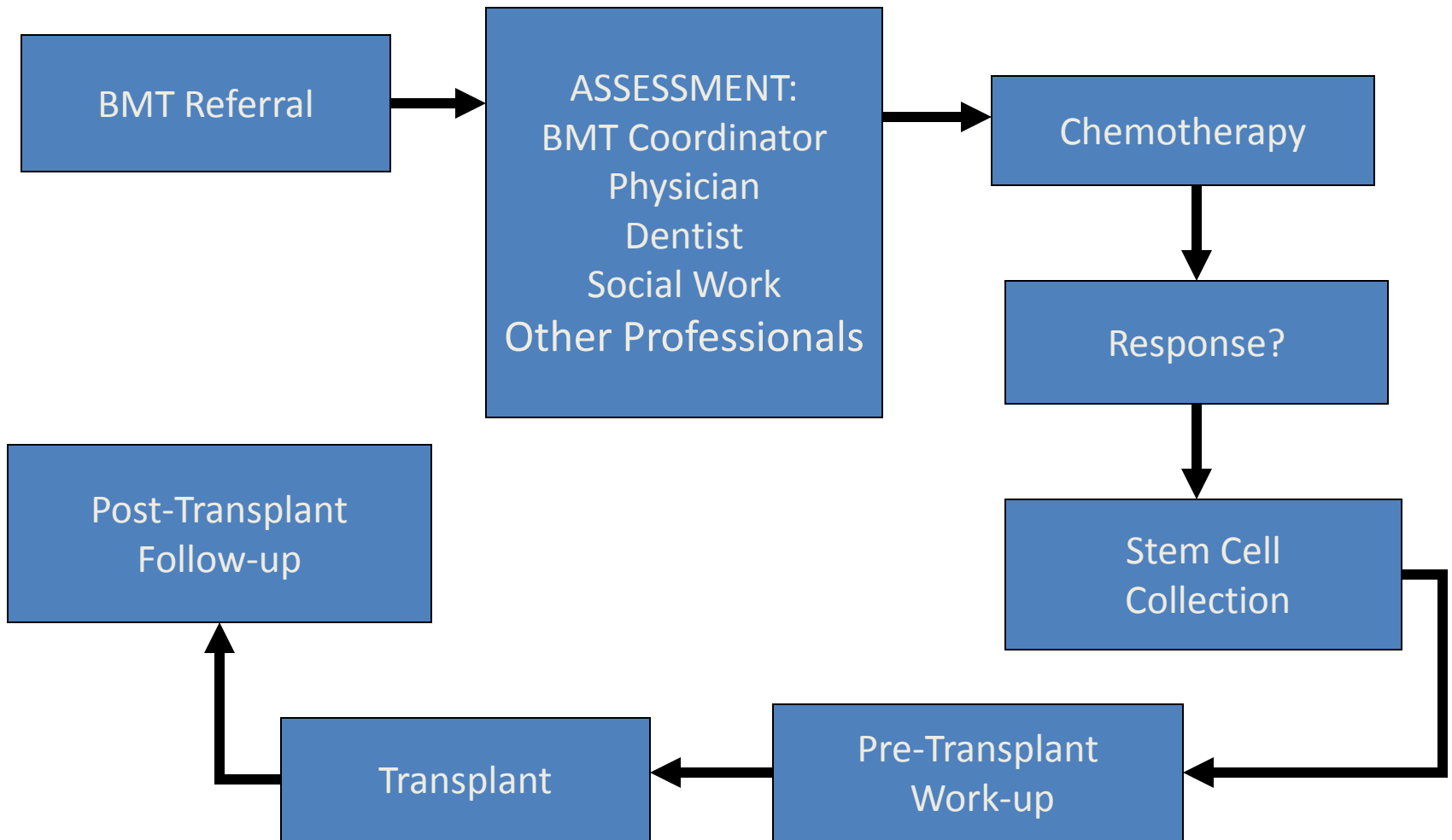
# Conclusions

- Autologous Transplant
  - Identifying which patients will benefit
    - cure (lymphoma)
    - disease control (myeloma)
  - Transplant schema
  - Indications
  - Risks and complications

# Conclusions

- Allogeneic Transplant
  - Identifying which patients will benefit
    - current challenge of CML
  - Transplant schema
  - Indications
  - Complications
  - Immune effect

# Patient Flow



**Thank you**

Questions?

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