

Preparing for an Autologous Stem Cell Transplant

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Disclosures

- ◆ ***The Hospital at the University of Pennsylvania, as our full-time employer, is not financially supporting this presentation***
- ◆ ***We have no financial or pharmaceutical contracts to disclose***

Agenda

- ◆ **Understanding Autologous Stem Cell Transplantation (ASCT)**
- ◆ **Indications for ASCT**
 - Transplant Eligibility
 - Disease specific criteria
 - Patient specific criteria
 - Pre-testing qualifications
- ◆ **Preparations for Autologous Stem Cell Mobilization**
 - Mobilization regimens
 - Mobilization strategies
- ◆ **Preparations for Autologous Stem Cell Transplantation**
 - High-dose chemotherapy transplant regimens & toxicities
 - Post-transplant follow up care

Understanding Autologous Stem Cell Transplantation (ASCT)

◆ *What is ASCT?*

◆ An Autologous Stem Cell Transplant (ASCT) is:

- the process of removing stem cells from a patient
- administering a high dose chemotherapy preparative regimen
- reinfusing the patient's own stem cells back into them self as a rescue therapy

◆ ASCT is most commonly used in patients with:

- Multiple Myeloma
- Relapsed Non Hodgkin's Lymphoma

Disease Indications for Autologous Stem Cell Transplant

◆ Hematologic Malignancies

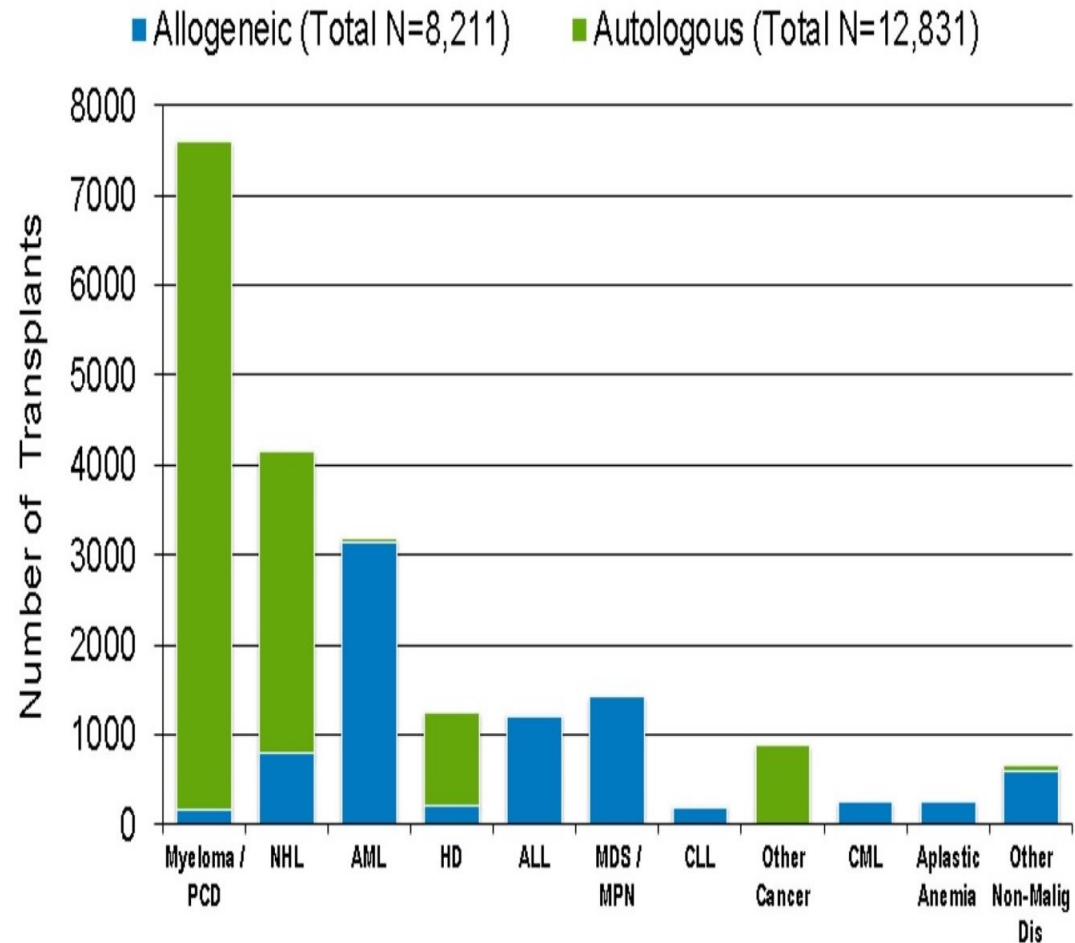
- Multiple Myeloma
- Amyloidosis
- Lymphoma

◆ Solid Tumors

- Germ Cell Tumor (Chemo-sensitive relapse)

◆ Auto-immune Disease

- Scleroderma
- Multiple Sclerosis



*Graph from CIBMTR

Patient Selection Criteria For ASCT

In order to determine if a patient is a good candidate for ASCT, the patient's healthcare team will consider the following:

◆ Performance Status

- measure of how well a person is able to carry on ordinary daily activities while living with cancer, and provides an estimate of what treatments a person may tolerate.

◆ Age

◆ Comorbidities

- Obesity
- Diabetes
- Depression

◆ Organ Function

◆ Disease Status

◆ Overall Prognosis

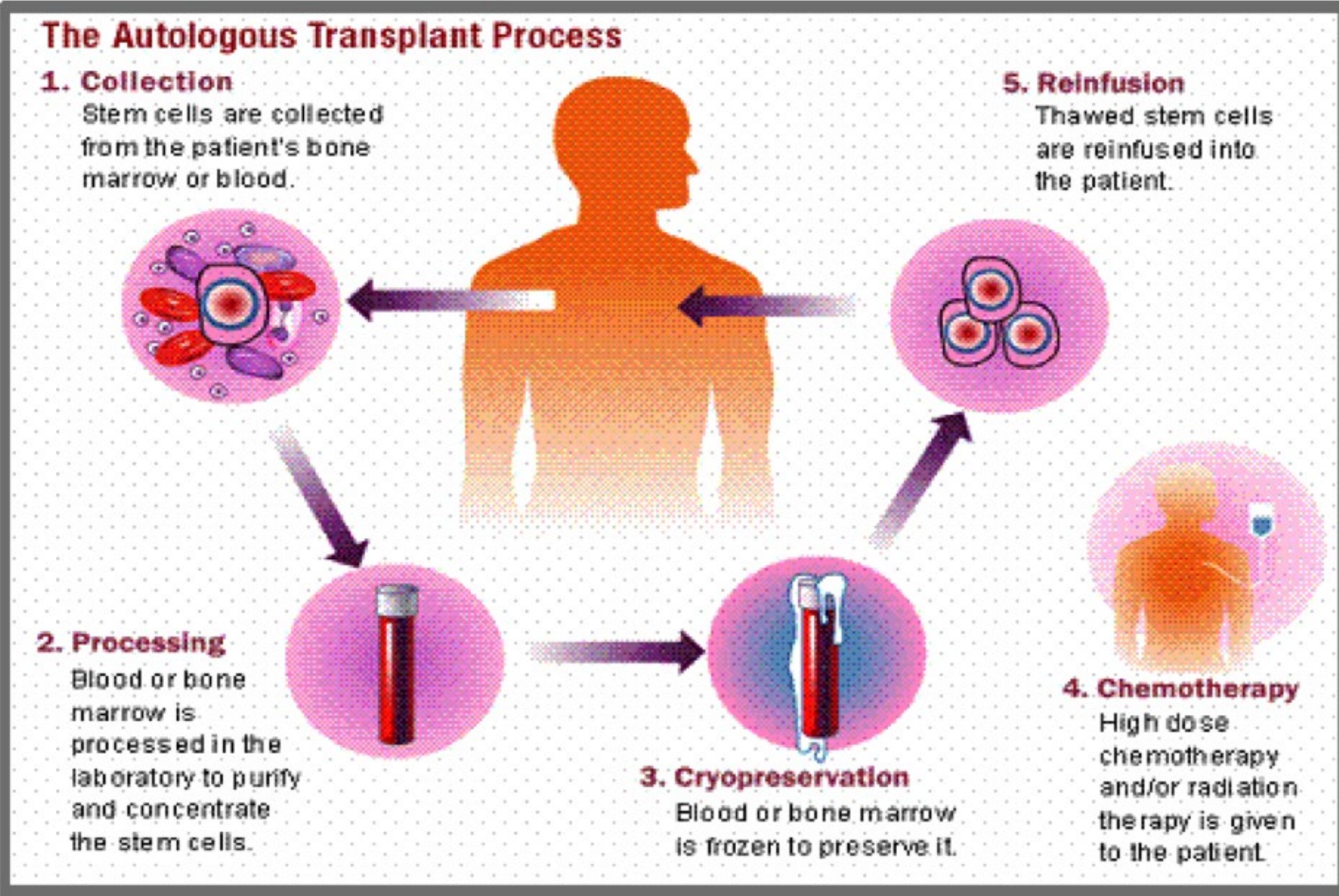
Patient Selection Criteria For ASCT: Pre-Testing & Organ Evaluation

- ◆ **Renal:**
 - dosing modifications made for renal impairment
- ◆ **Cardiac:**
 - Ejection fraction \geq 50%
- ◆ **Lung:**
 - Pulmonary Function Test – DLCO is \geq 50%
- ◆ **Assessing viral labs:**
 - HIV, HSV, HEP C, HEP B antibodies, HEP B antigen, HEP B core, Varicella, Cytomegalovirus

Once we have deemed the patient eligible for auto transplant, we can now proceed onto the next step of the process, which is preparing for autologous stem cell mobilization

DLCO – Diffuse capacity of the lungs for carbon monoxide

Preparation for Autologous Stem Cell Mobilization & Transplant



[autologus+transplant+process.png \(927x641\) \(bp.blogspot.com\)](http://bp.blogspot.com)

Preparation for Autologous Stem Cell Mobilization

- ◆ **What is stem cell mobilization?**
 - Mobilization is a process by which stem cells are released from the bone marrow into the peripheral blood by means of stimulatory hematopoietic growth factors.
- ◆ **What is the goal of stem cell mobilization?**
 - To move an adequate amount of stem cells from the bone marrow into the peripheral blood in order for the patient to successfully harvest the cells by means of apheresis in order to proceed onto transplant.

Beth Faimain- BMTCN Certification review manual p.22



Medications Used for Mobilization

Medication	Description	Intended Use
Chemotherapy <ul style="list-style-type: none"> • Cytoxan • RICE • R-DHAC 	Chemotherapy serves as a stimulus for mobilizing hematopoietic progenitor cells to the peripheral blood	Chemotherapy is used in combination with G-CSF to rapidly increase the amount of stem cells available for harvest
G-CSF <ul style="list-style-type: none"> • Zarxio • Neupogen • Nivestym • Granix 	G-CSF (Filgrastim) is a glycoprotein that stimulates production of hematopoietic cells by binding to certain cell surface receptors	G-CSF is commonly used in conjunction with chemotherapy or plerixafor for stem cell mobilization
Plerixafor <ul style="list-style-type: none"> • Mozobil 	Plerixafor is chemokine antagonist used to induce mobilization of stem cells by interfering with the chemokine stromal-derived factor-1 and its receptor, CXCR4.	When combined with G-CSF, it has proven to increase the number of CD34+ stem cells collected each day

G-CSF: Granulocyte-colony-stimulating factor

Advantages & Limitations of Mobilization Strategies

Regimen	Advantages	Limitations
G-CSF + Chemo (Chemo mobilization)	<ul style="list-style-type: none">• Possible “antitumor” effects• High cell yields	<ul style="list-style-type: none">• Toxicities: Chemo related: Nausea, vomiting, headache, neutropenia, electrolyte deficiencies G-CSF related: bone pain, headache, fatigue, muscle aches • Requires inpatient hospital stay
G-CSF + Plerixafor	<ul style="list-style-type: none">• Low toxicity• Low risk of failure• High cell yields	<ul style="list-style-type: none">• Cost• Additional Plerixafor-specific toxicities which can include severe nausea, vomiting, & diarrhea

Administration Guidelines

Regimen	Administration/Dose
Chemotherapy + G-CSF (Chemo mobilization)	<p>High dose G-CSF is usually initiated 24 - 72 hours post mobilization-related chemotherapy (dosing is 10 mcg/kg SC)</p> <p>Injected daily until stem cell collection is complete (Approx. 10-14 days of administration)</p>
G-CSF+ Plerixafor	<p>G-CSF is started 4 days prior to stem cell collection</p> <p>Plerixafor is started the night before collection (day 4 of G-CSF) until collection is complete (0.24 mg/kg SC or 0.16 mg/kg SC in renal-impaired patients)</p>

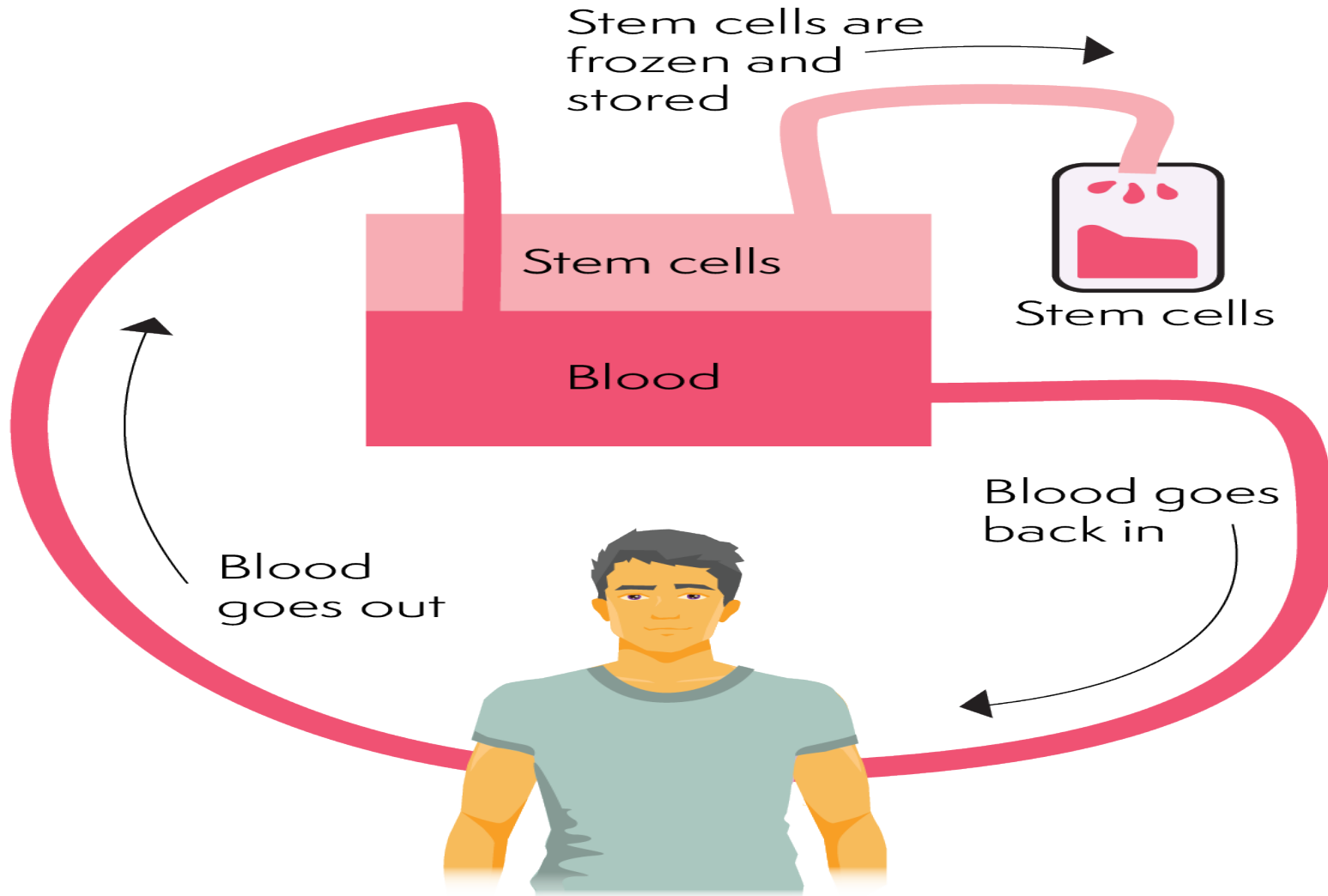
Apheresis Process

Apheresis means “to separate”

Apheresis is the process of which blood of a person is passed through an apparatus that separates out one particular blood component (specifically stem cells) and returns the remainder of the blood back into their body



Apheresis/Collection Process (Cont.)



[auto stem cell collection process - Bing images](#)

Apheresis/Collection Process (Cont.)

◆ Apheresis Evaluation Day:

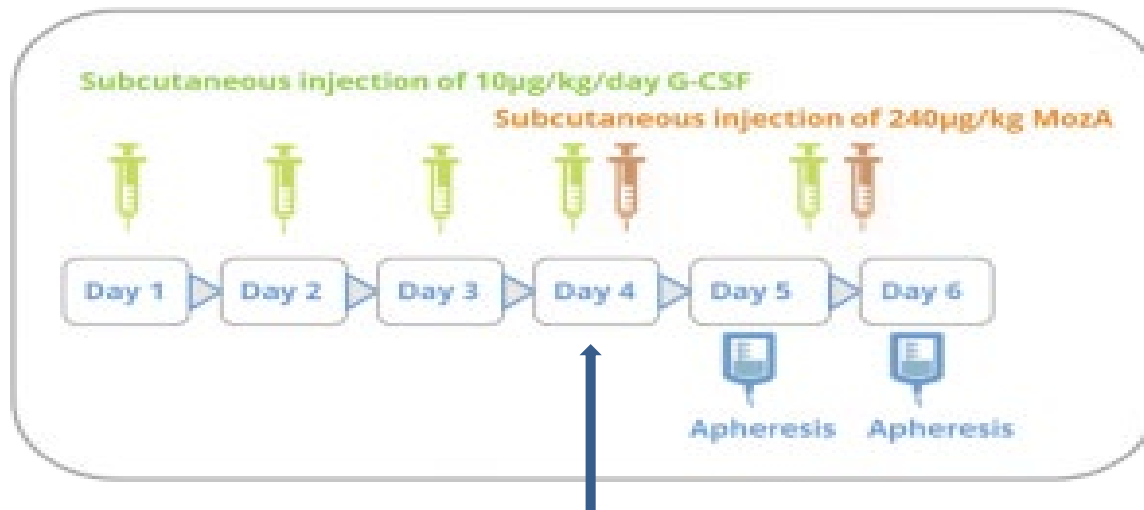
- Takes place after mobilization injections are initiated
- Evaluates basic blood work (CBC & CMP)
- Consents obtained
- Peripheral blood CD34+ sample obtained
- Orientation to the Apheresis Unit
- Home medications reviewed

◆ Apheresis Collection Days:

- Collections approximately 3-5 hours/day
- Blood work assessed daily
- Patient monitored during collection for side effects
- Integrity of apheresis catheter maintained
- Patient receives a call each evening with collection results/further instructions

Importance Of Peripheral Blood CD34

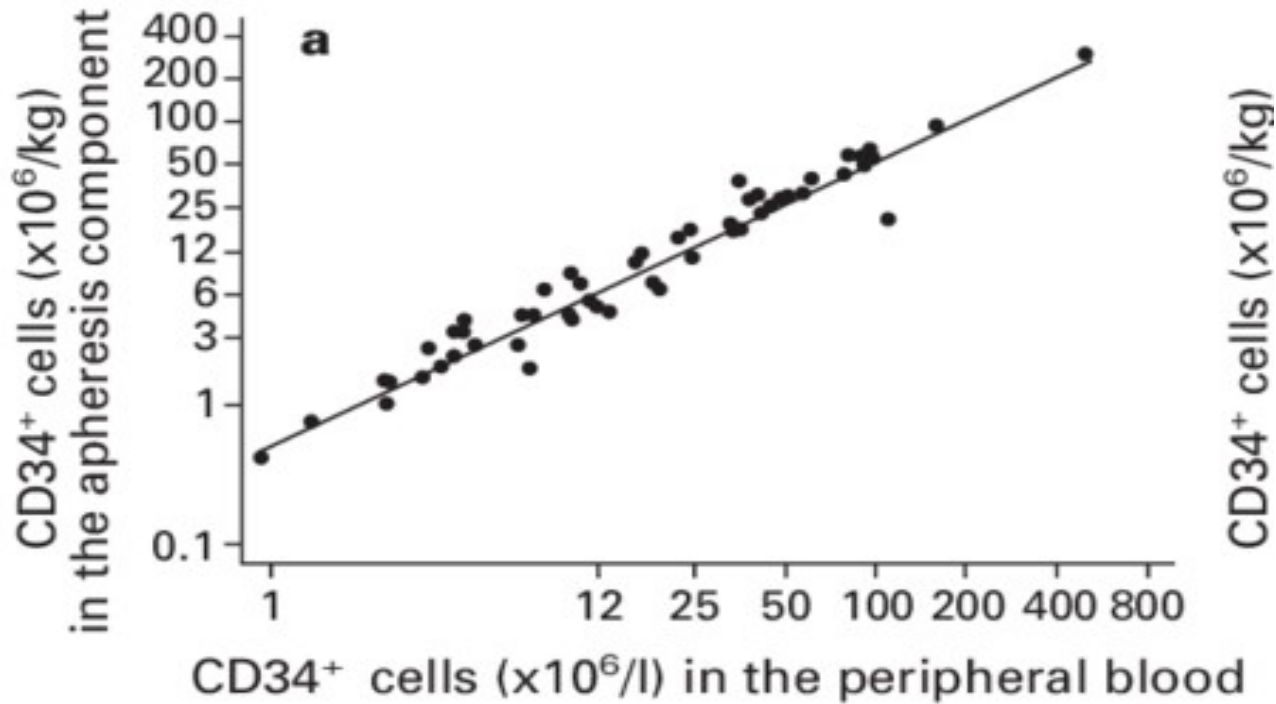
- ◆ CD34 is a surface antigen expressed on stem cells
- ◆ The peripheral blood (PB) CD34 level measures the amount of circulating stem cells present in the bloodstream
- ◆ The PB CD34 level is drawn after:
 - starting mobilization therapies
 - **on the day prior to a patient's first collection**



****CD34 Cell Level drawn prior to first collection the following day***

Importance Of Peripheral Blood CD34

Number of stem cells collected



Peripheral Blood CD34 level (ul)

Faramarz Naeim MD, ... Ryan T. Phan PhD, in [Atlas of Hematopathology \(Second Edition\)](#), 2018

Preparing For ASCT: Conditioning Regimens

◆ Goal:

- Lymphoma: to eradicate cancer (curative intent)
- Multiple Myeloma: to serve as a therapeutic treatment in the setting of a non-curative disease to provide for significant remission, extending survival.

◆ High dose therapy/preparative regimen is chosen based on:

- Disease
- Prior chemotherapy exposure
- Chemo-sensitivity

◆ Common Regimens:

- High Dose Melphalan – Multiple Myeloma
- BCV, BEAM - Lymphoma
- Carboplatin/VP16 – Germ Cell

Typical Myeloablative Treatment Plan

Melphalan

Regimen
Started
Day -2

Peripheral
Stem Cells
Reinfused
Day 0

Growth-Colony
Stimulating
Factors Started
Day +4

Engraftment
Day +14 - +17

BEAM

Regimen
Started
Day -7

Peripheral
Stem Cells
Reinfused
Day 0

Growth-Colony
Stimulating
Factors Started
Day +4

Engraftment
Day +14 - +17

BCV

Regimen
Started
Day -6

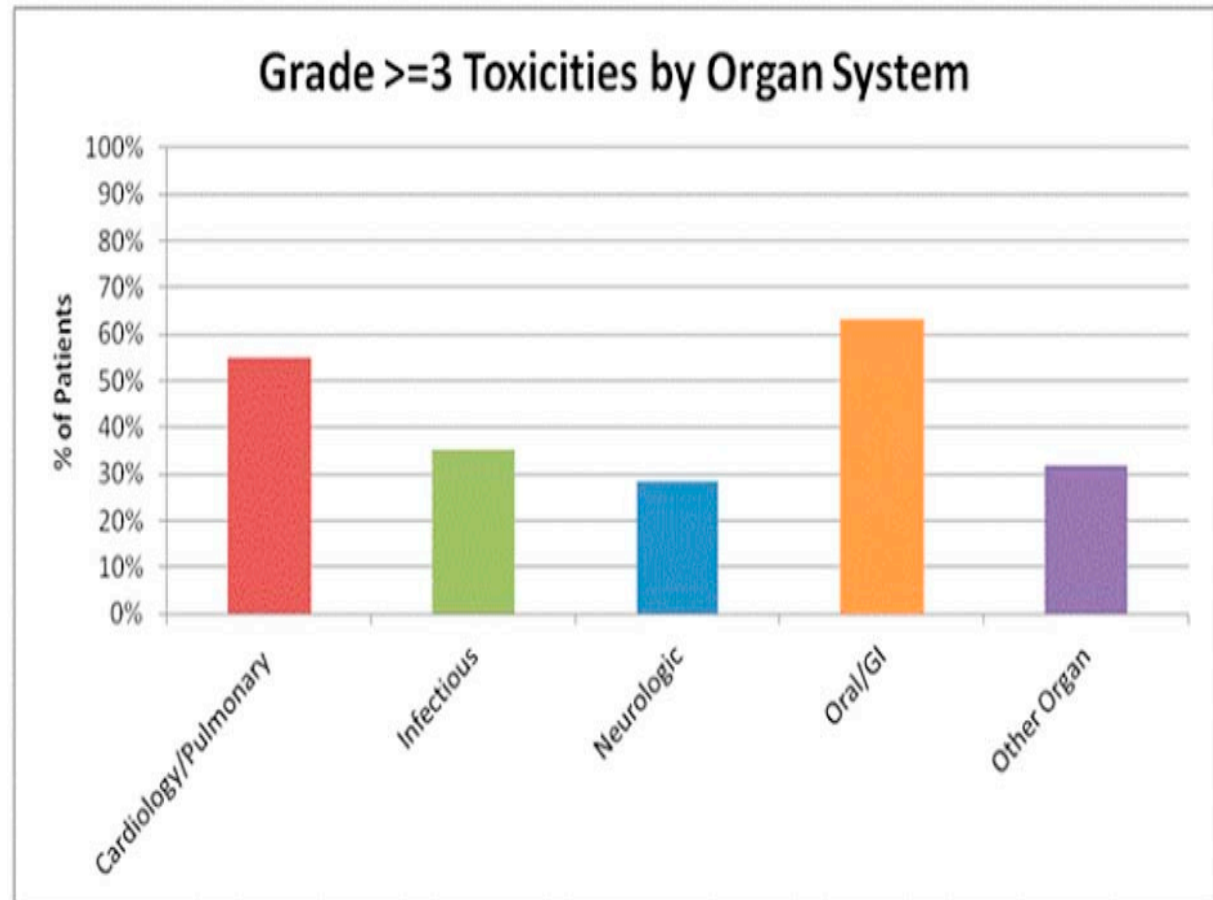
Peripheral
Stem Cells
Reinfused
Day 0

Growth-Colony
Stimulating
Factors Started
Day +4

Engraftment
Day +14 - +17

Toxicities During ASCT

- ◆ Nausea
- ◆ Vomiting
- ◆ Diarrhea
- ◆ Mucositis
- ◆ Electrolyte Imbalances
- ◆ Pancytopenias (transfusion requirements)
- ◆ Alopecia
- ◆ Fatigue
- ◆ Infection
- ◆ Failure to engraft



[Toxicities Associated with High Dose Chemotherapy and Autologous Stem Cell Transplantation in Older Patients with Non-Hodgkin Lymphoma - Biology of Blood and Marrow Transplantation \(tctjournal.org\)](http://tctjournal.org)

Discharge/Follow Up Care Post ASCT

◆ Discharge considerations

- Once engraftment occurs ANC >1000 x 2 days → discharged home
- Bi-weekly bloodwork to ensure count recovery
- Weekly follow-up visits
- Home nursing care if warranted
- Prophylactic medications
 - Antivirals- Acyclovir
 - Antifungals- Fluconazole
 - Antibiotics- broad spectrum
 - PCP prophylaxis-Bactrim

◆ Day 100

- Imaging, restaging, repeat bone marrow biopsy, biochemical response
- Resume dose-reduced maintenance therapy

ANC = Absolute Neutrophil Count

Conclusions

- ◆ There are several variations to successfully mobilize autologous hematopoietic stem cells
- ◆ Type of mobilization does not necessarily influence transplant outcomes
- ◆ Both chemotherapy-based and G-CSF/Plerixafor mobilization can show similar rates of success
- ◆ Several factors, including cost and toxicity, may influence the decision of which way the oncology team chooses to mobilize a patient's stem cells
- ◆ Future studies are still needed for maintaining efficacy, reducing cost and toxicity, and improving transplant outcomes

Q & A Session

Thank You For Participating

Please join us at our Adult Nursing Session Q & A

