

# A Day in Apheresis



The Moffitt Cancer Center Experience

Darlene Rahn, BS, MT, HP (ASCP)

[Darlene.Rahn@Moffitt.org](mailto:Darlene.Rahn@Moffitt.org)

ASFA Annual Meeting

June 3, 2011

# Financial Disclaimer

---

- Within the past twelve months I have received consulting fees from the following:
  - Genzyme

# Objectives

---

- Discuss three types of mononuclear apheresis processes performed in our center.
  - ⊗ Human Progenitor Cell – Apheresis (HPC-A)
  - ⊗ Therapeutic Cell – Apheresis (TC-A)
  - ⊗ Photopheresis
  
- Describe various functions involved in the different therapies, including:
  - ⊗ Instrumentation
  - ⊗ Collection parameters
  - ⊗ Priming & Target goals
  - ⊗ Access devices
  - ⊗ Adverse Events
  - ⊗ Reporting summaries
  - ⊗ Product Follow-up testing

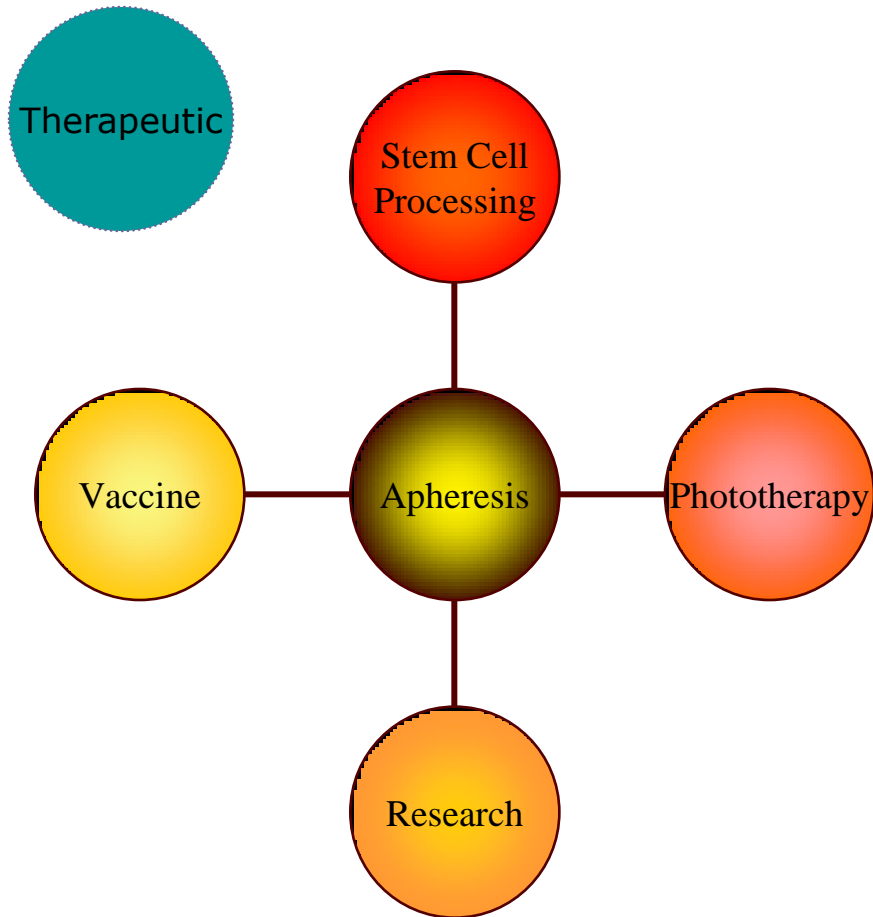
# H. Lee Moffitt Cancer Center

---



# 6 Bed Facility

---



□ 6 beds

□ 4 COBE Spectra's

□ 3 Therakos UVAR XTS

# 2010 Apheresis Statistics

---

**194 auto** with multiple collect  
**+ 68 allo** with multiple collect  
**472 stem cell** procedures

**472 stem cell** procedures  
**+ 90** mononuclear cell collections  
**+ 492 photo** procedures  
**= 1054** apheresis procedures



# Moffitt Apheresis Staff

---



3 Medical  
Technologists

2 HP Certified  
2 Speak Spanish

Nursing support  
provided by BMT  
Treatment

# Pre Planning

---

- ▣ documentation
- ▣ vital signs
- ▣ growth factors
- ▣ blood product parameters

# Patient Preparation

---

- scans
  - blood work
  - dental clearance
  - psychological counseling
  - chemo and other medication challenges
  - central lines or port placements
- 
- travel
  - various valet colors
  - internal building directions
  - wait countless hours after making every effort to arrive on time

# Instrumentation Set Up



- \* COBE Spectra by CaridianBCT
- \* MNC Collection Set
- \* ACD-A with 3000 IU heparin/L
- \* Product bag 1000 IU heparin/100mL
- \* AC ratio of 30:1
- \* Inlet rate 20 – 120 depending on access

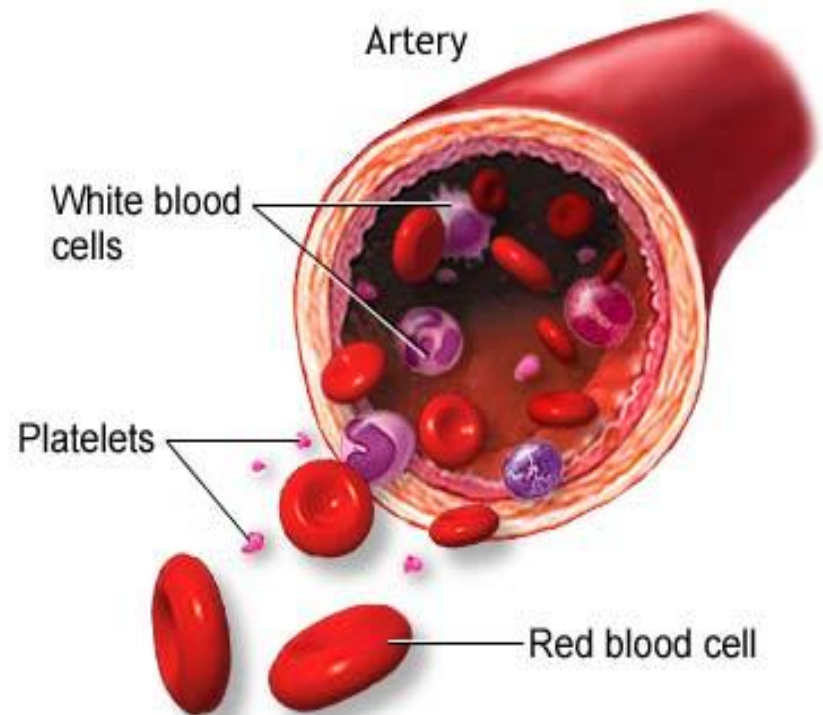
# Bed 1 – Mononuclear Vaccine (TC-A)

---

Melanoma vaccine trial, 14 L

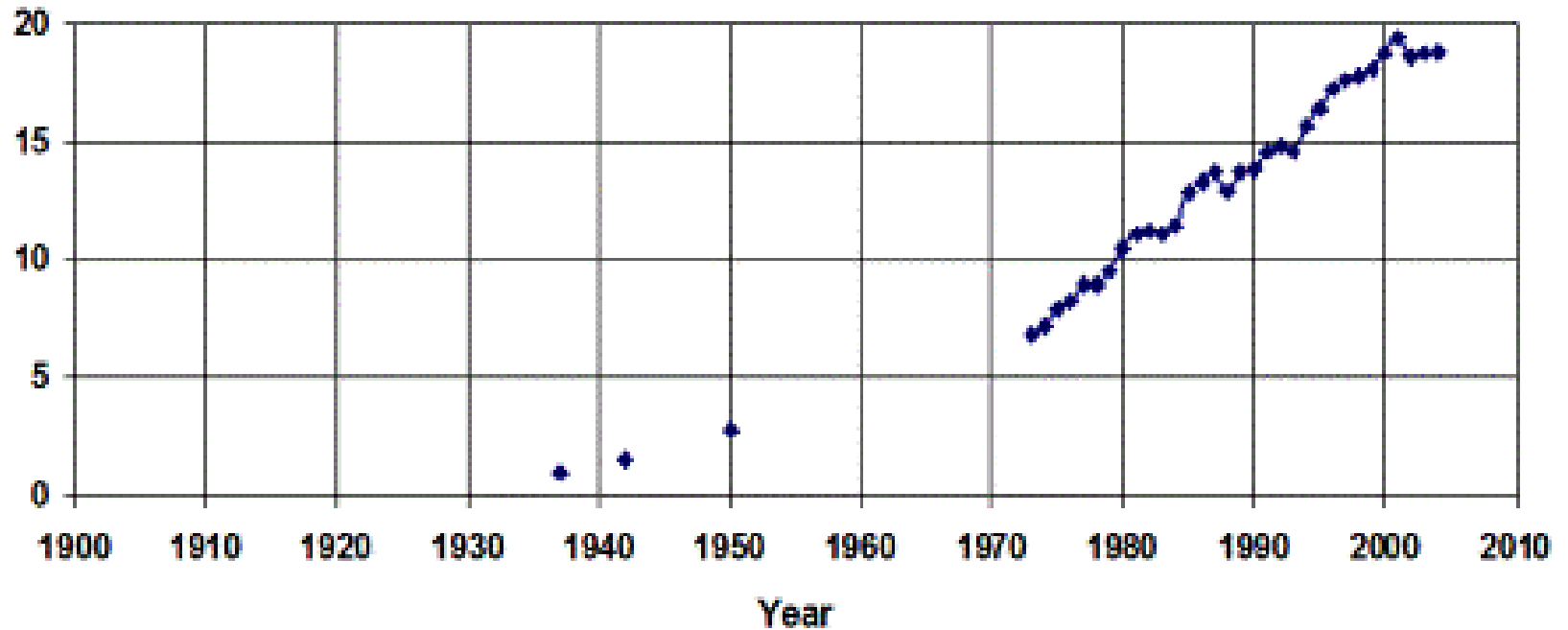
three bags of product.

- 1-process & freeze  
subsequent vaccine  
production.
- 2-process & and freeze  
autologous lymphocyte  
infusion (ALI)
- 3-immune monitoring



[www.topicalinfo.org/Skincancer.htm](http://www.topicalinfo.org/Skincancer.htm)

**US Melanoma Incidence per 100000 people**



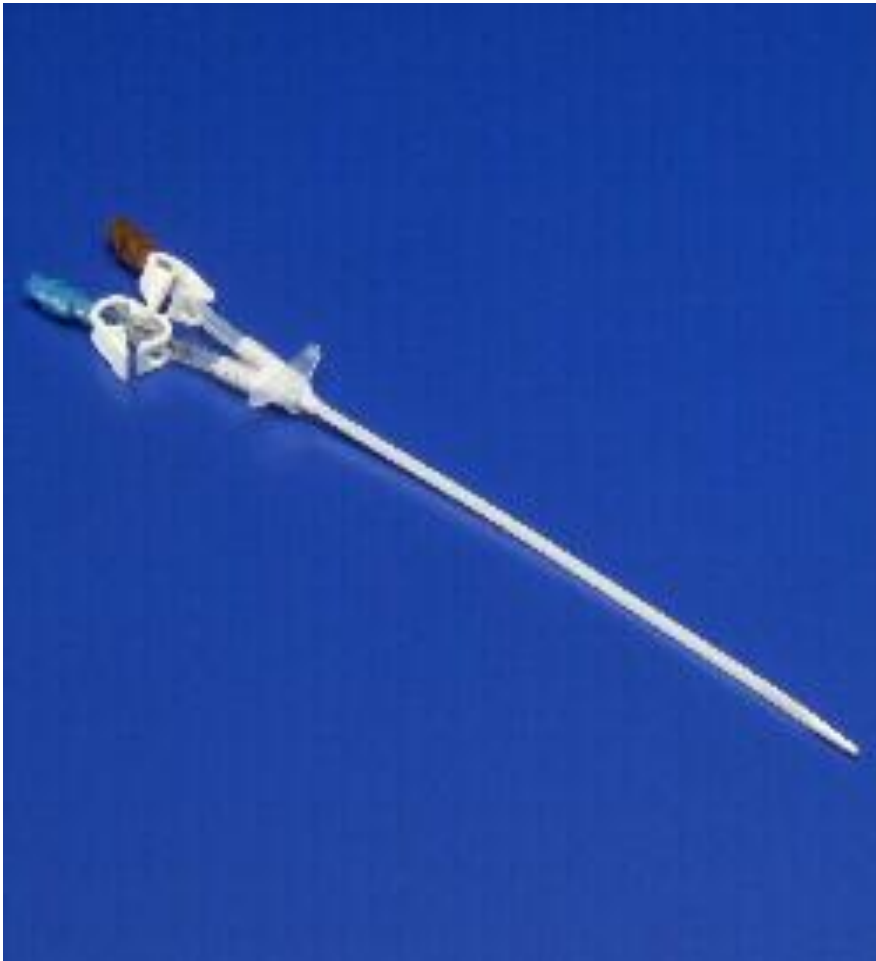
# Femoral Quintons



- ✦ VADS -Quinton at bedside- femoral or IJ.
- ✦ The bed is set up for sterile procedure.
- ✦ Ultrasound is used to place the catheter.
- ✦ No heparin
- ✦ If femoral, the patient is permitted to stand to use the bathroom only.

# Mahurker (Quinton)

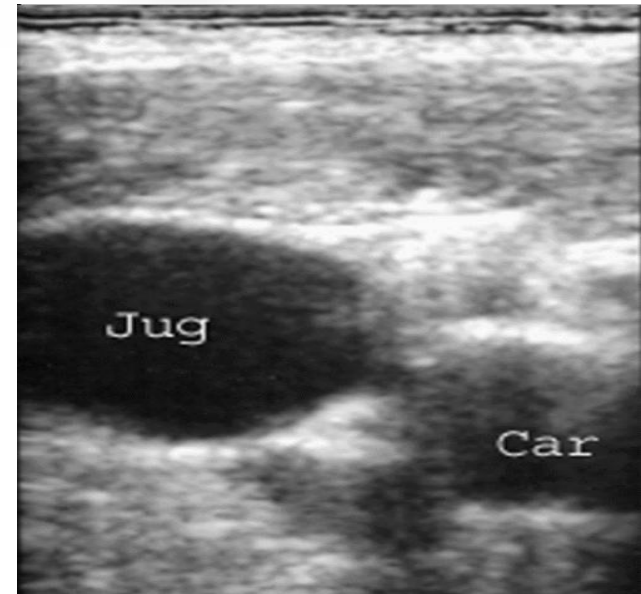
---



Covidien

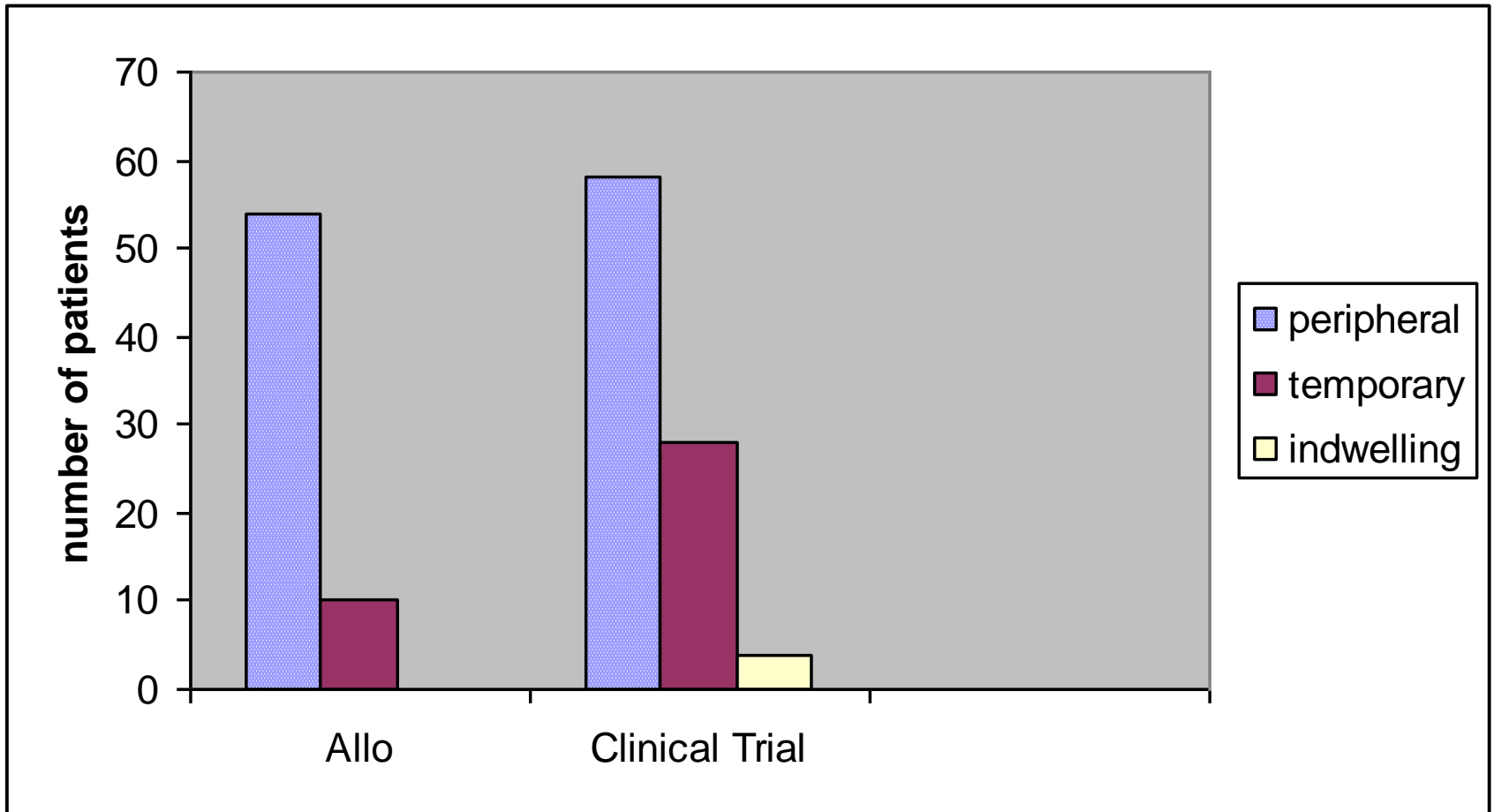


Angio Dynamics



# Method of Access 2010

---



# Changing Product Bags

- ❑ Pause
- ❑ Clamp
- ❑ Seal product
- ❑ Add transfer pack
- ❑ Remove clamp
- ❑ Add 3mL heparin to the new collection bag.



# Quinton Removal

---

- ❑ Removal is simply cutting two sutures and slipping the catheter out.
- ❑ Pressure is held 15 minutes, a pressure dressing applied.
- ❑ Patient lays flat about 45 additional minutes.
- ❑ If there is no bleeding as they move around to dress they are discharged.

# Stem Cell (HPC-A) Collections

---



[www.superstock.com/stock-photos-images/4128R-2657](http://www.superstock.com/stock-photos-images/4128R-2657)

- 6 Total Blood Volumes for auto HPC-A
- GCSF 10 mcg/kg/day or Plerixafor 0.24mg/kg primed autos (rounded up)
- Peripheral CD34 on all
- 1TBV CD34 allo
- DLI (TC-T)by CD3 at 1 TBV
- Allo HPC-A fresh
- Auto HPC-A frozen

# Bed 2 – Allogeneic HPC-A Donor

---

- 43 kg < recipient
- Smokes
- Hypertension
- Ativan, Oxycodone, and Ambien
- BP is 151/102 and pulse 98
- WBC 45.0, H/H 10.4/32, Platelet count 264
- anticoagulant ratio 25:1
- venipuncture is performed
- labs drawn

# Peripheral Access



From Rick Ungars Policy Page posted on [Forbes](#), 1/17/11. Â Etchings by [James Gillray](#), 1804

# Peripheral Access



*Return TV first*

*Pillows*

*Warm blankets*

*Needle Selection*

*Squeeze toys*

*Positions*

*Pressure cuffs*

*Distractions*

*Calm Attitude*

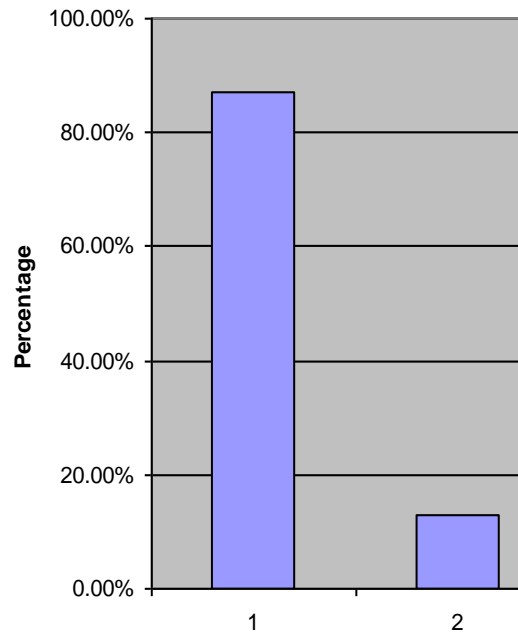
*Soft Voice*

*Low Lighting*

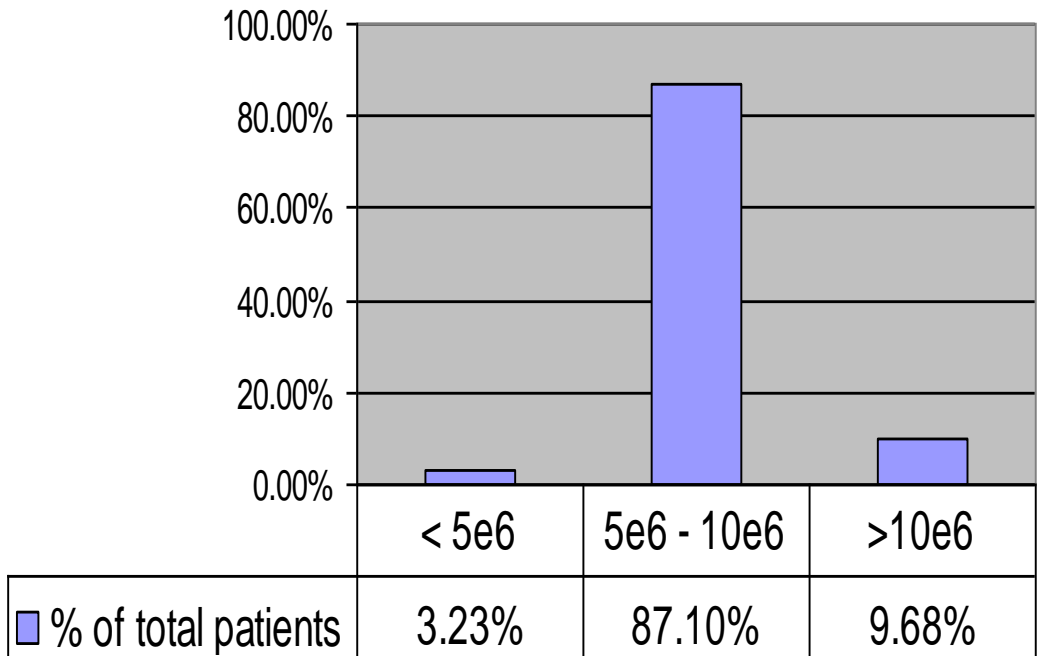
*Slow Inlet*

# Allo HPC-A Statistics 2010

**Number of Days Needed to Collect to Target**



**CD34+ Cell Dose Collected from Allogeneic Donors  
2010**



# Bed 3 – Autologous HPC-A

---

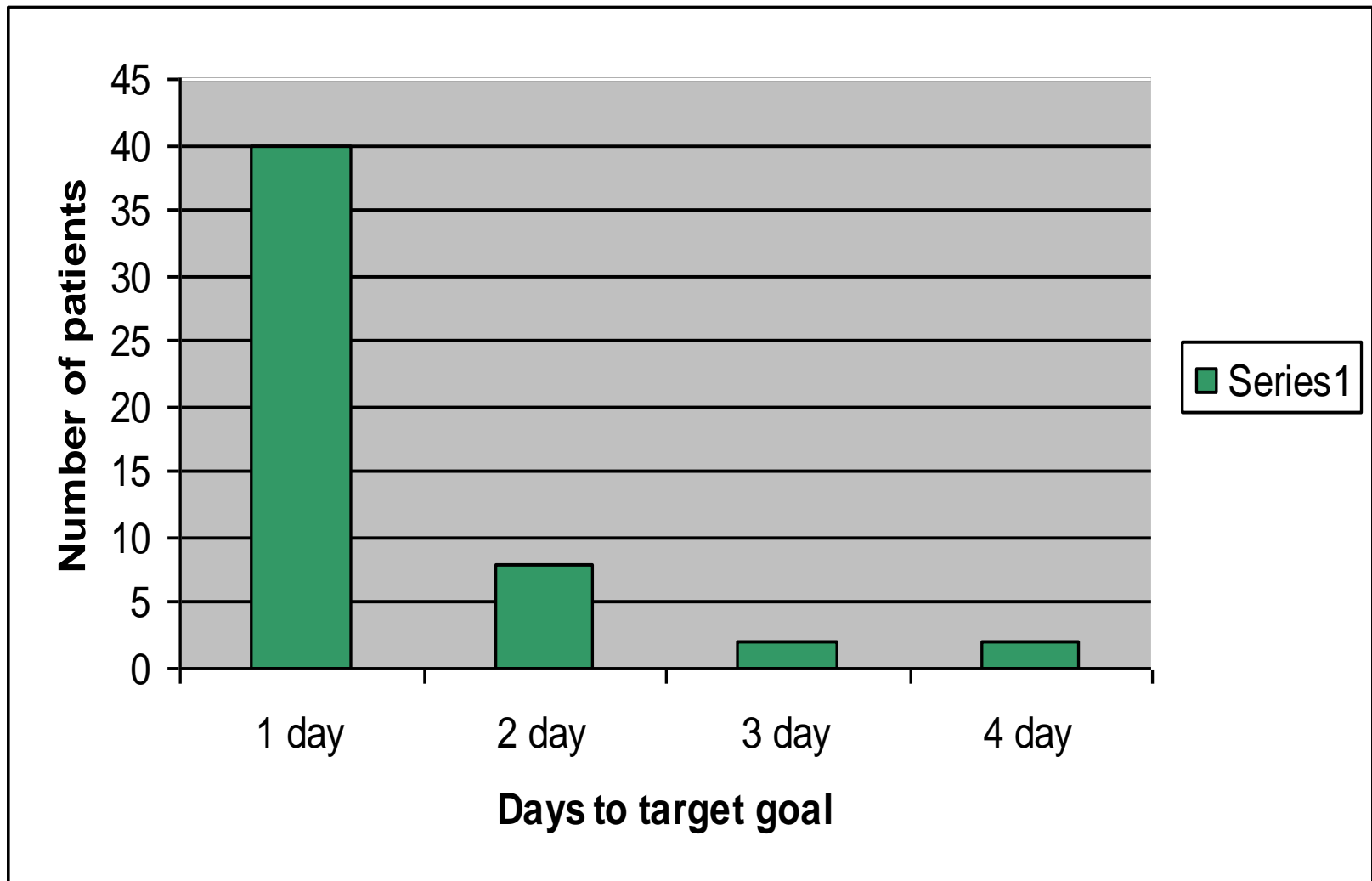
- NHL patient  $>2e6$  CD34 cells. Priming GCSF administered at 6:00pm for 4 days.
- Peripheral CD34 the morning of collection is 3.3 cells/uL (0.0033 e6)
- Post labs reveal the need for magnesium and potassium replacement.

# Plerixafor Algorithm

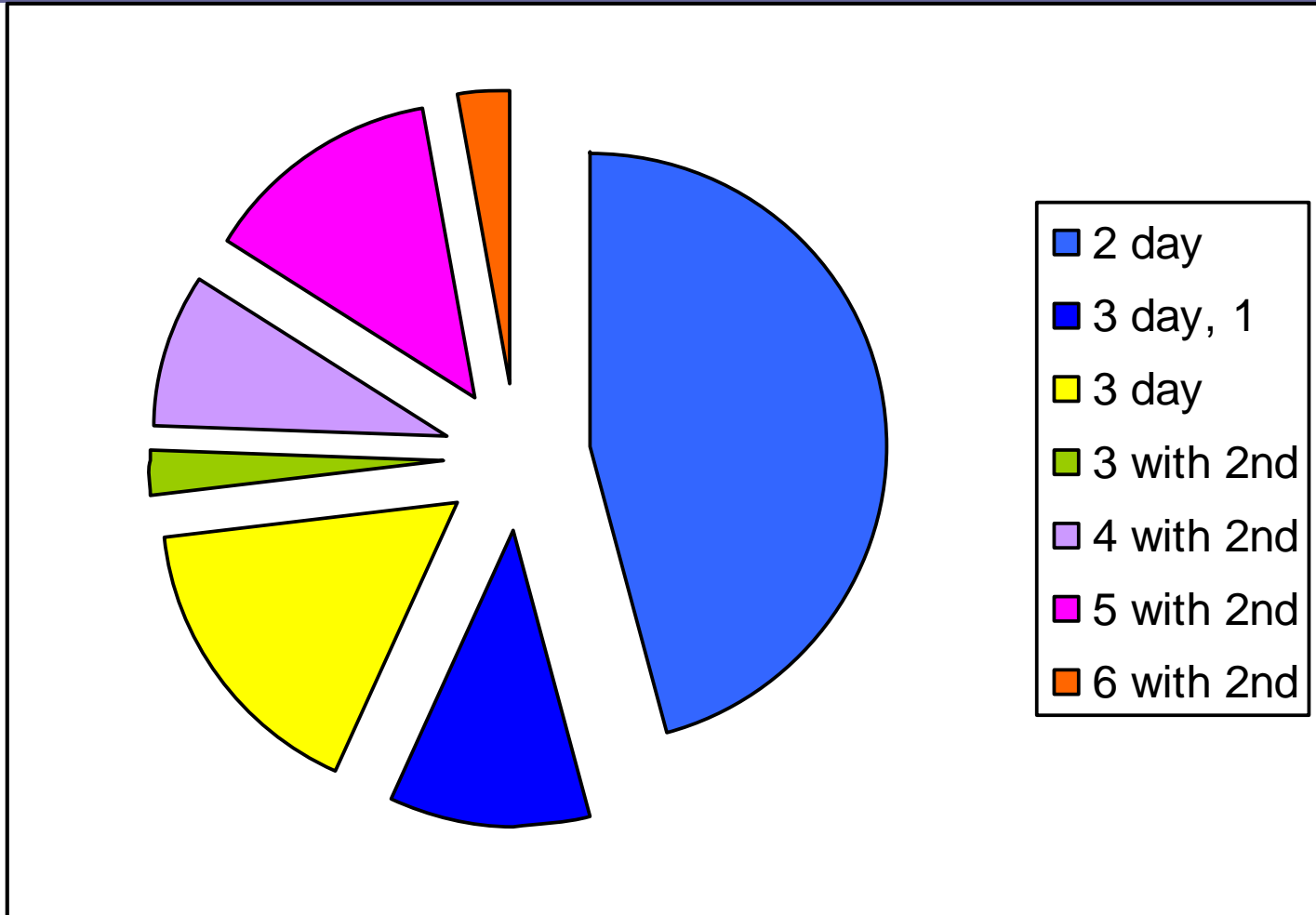
---

- ➔ Having received three lines of chemotherapy.
- ➔ Having received two lines of chemotherapy plus a radioimmunoconjugate (Zevalin or Bexxar).
- ➔ Having received two lines of chemotherapy plus radiation therapy to extensive fields (mantle, craneo-spinal, pelvis).
- ➔ Having received four or more courses of HyperCVAD (arm A x 2, Arm B x 2) or more than 4 courses of lenalidomide.
- ➔ Hypocellular marrow defined as 25% or less cellularity.
- ➔ Platelet count less than  $1 \times 10^5/\mu\text{l}$  in the absence of chemotherapy within the last 3 weeks.
- ➔ Previous failure to collect after G-CSF or chemotherapy priming.

# 2010 Plerixafor Priming Data



# 2010 Plerixafor “Rescue” Data



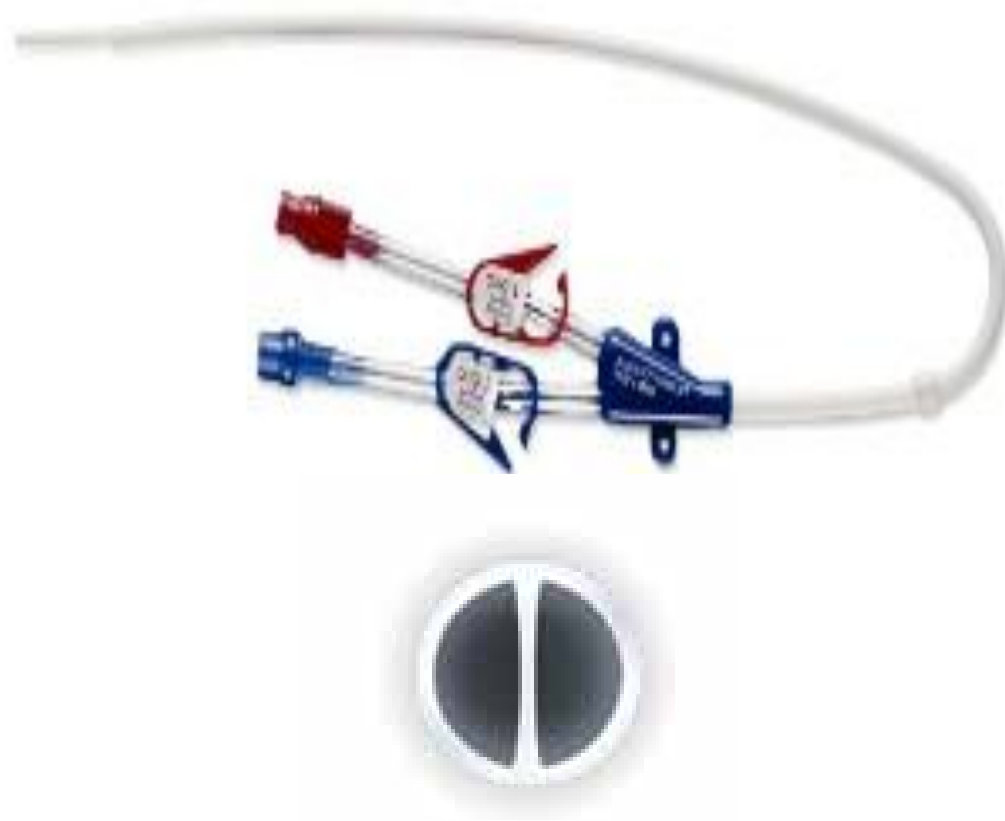
# Bed 4 Autologous HPC-A Tandem

---

- MM patient  $>4e6$  CD34 cells. Priming has been GCSF administered at 6:00pm for 4 days.
- Access is double lumen indwelling catheter with inlet rate of 120mL/min.

# EVENMORE

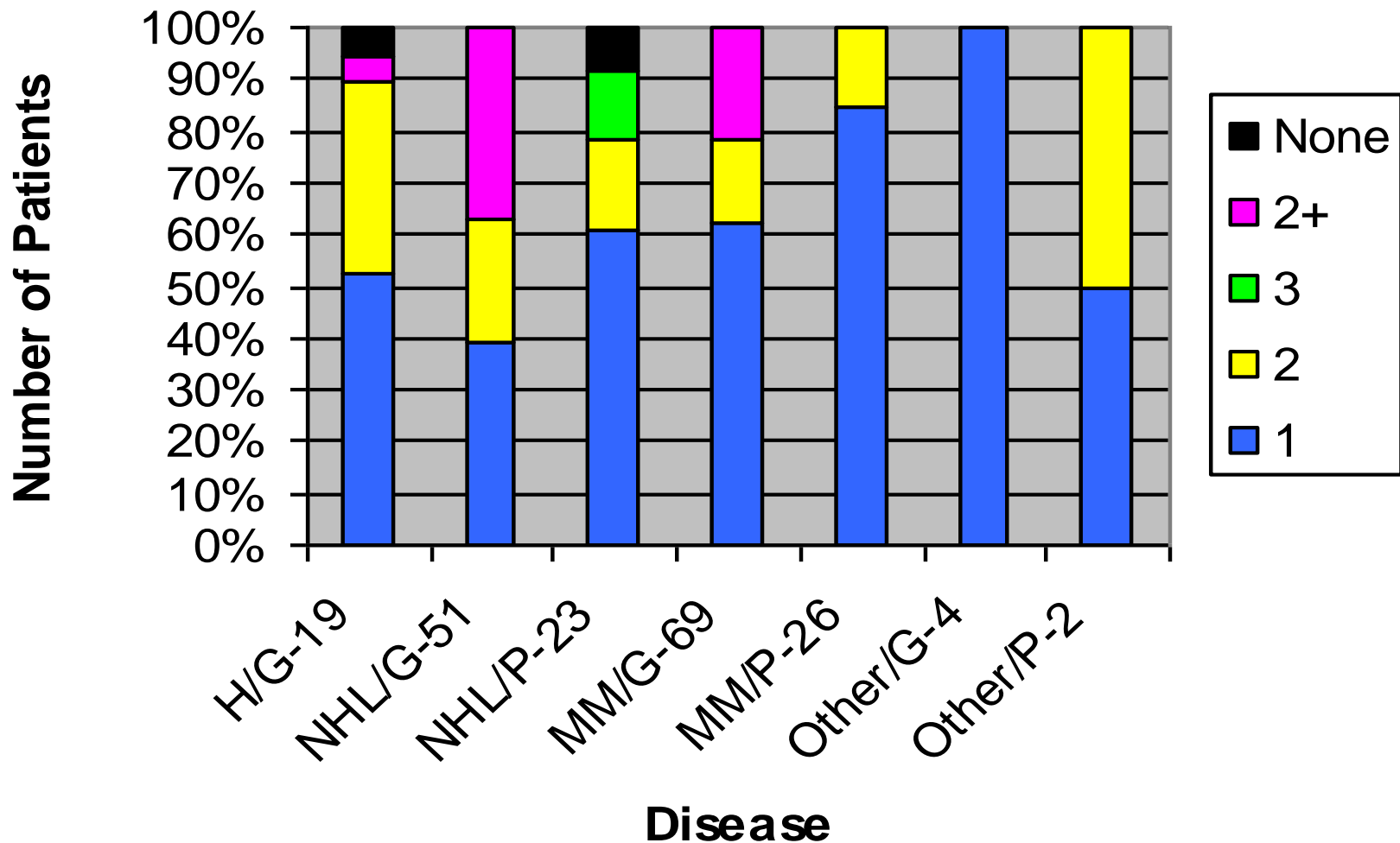
## double lumen indwelling Catheter



Angio Dynamics

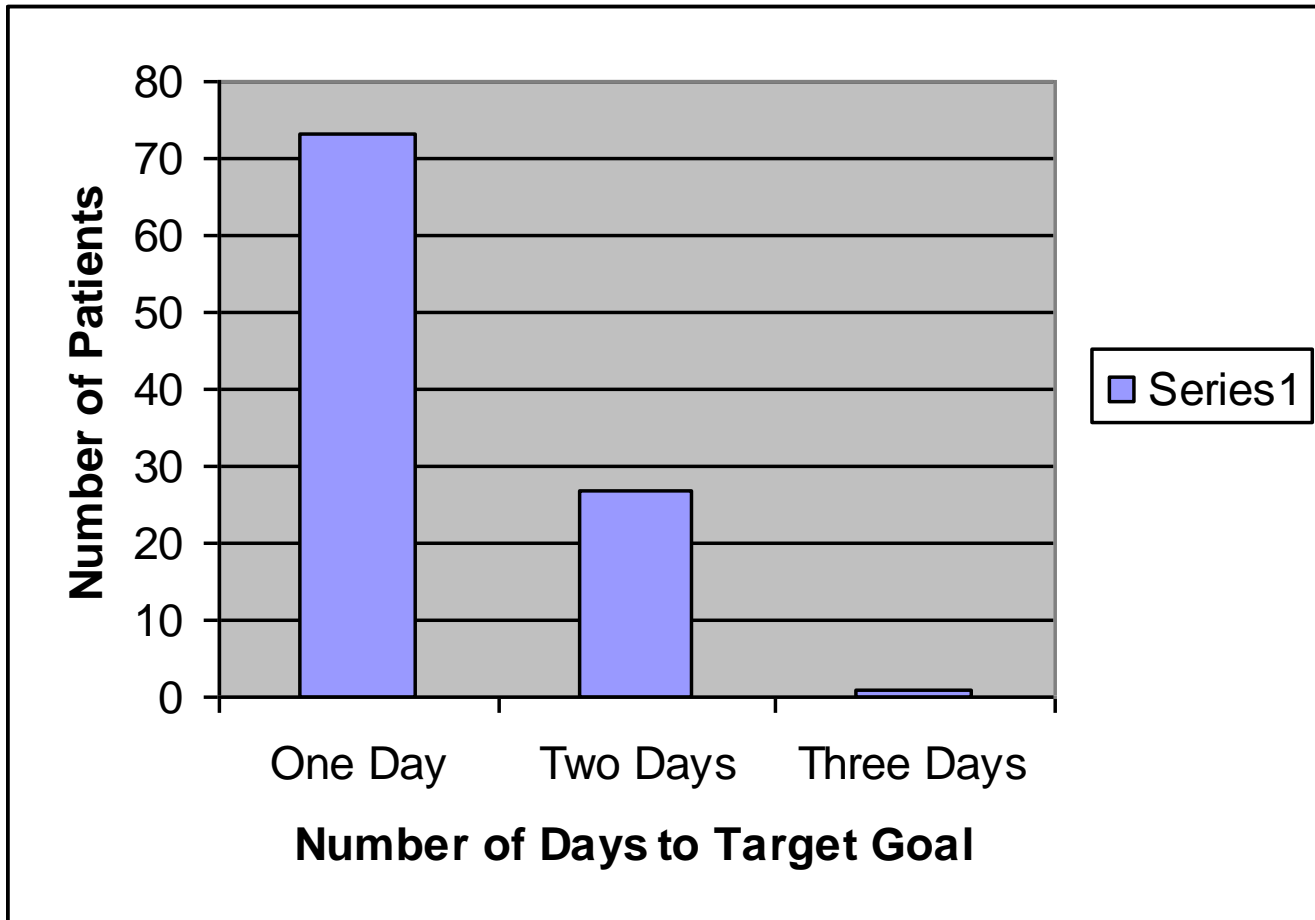
French Gauge	Diameter (mm)	Diameter (inches)
3	1	0.039
4	1.35	0.053
5	1.67	0.066
6	2	0.079
7	2.3	0.092
8	2.7	0.105
9	3	0.118
10	3.3	0.131
11	3.7	0.144
12	4	0.158
13	4.3	0.170
14	4.7	0.184
15	5	0.197
16	5.3	0.210

# 2010 Number of Days to Reach Target Goals



# 2010 GCSF only Priming Data

---



# Collection Efficiency Data

---

## Apheresis Report December 2010

Product Processed	Tech	HCT	Total RBC	ECV Max	MNC vol	TBV
		<4.0	<20.0		<ECV Max	
1W329010100573	YD	2.0	8.7	839	437	6.0
1W329010100574	YD	3.6	9.2	582	259	4.0

---

Product	Product CD34/kg	Peripheral CD34	CE	Predicted CD34/kg (0.33)
1W329010100573	4.99	.0377	.40	4.07
1W329010100574	9.56	.0956	.39	8.14

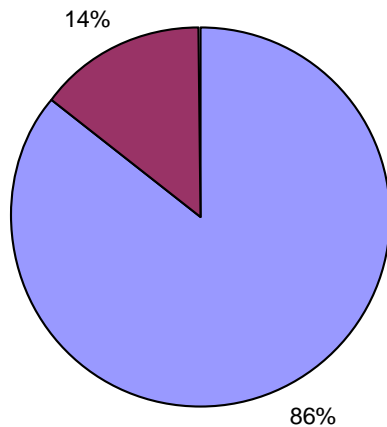
---

CE =  $\frac{\text{product CD34/kg} \text{ (Kg)}}{\text{(process volume - anticoagulant volume)} \text{ ( Peripheral CD34)}}$

Expected product CD34 =  $\frac{\text{CE (processed volume - anticoagulant volume)} \text{ (peripheral CD34)}}{\text{kg}}$

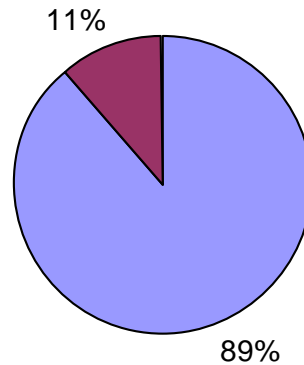
# Adverse Events HPC-A

**Adverse Event during Apheresis  
Autologous Donation for Transplant  
2010**



■ No Adverse Event = 279  
■ At Least One Adverse Event = 47

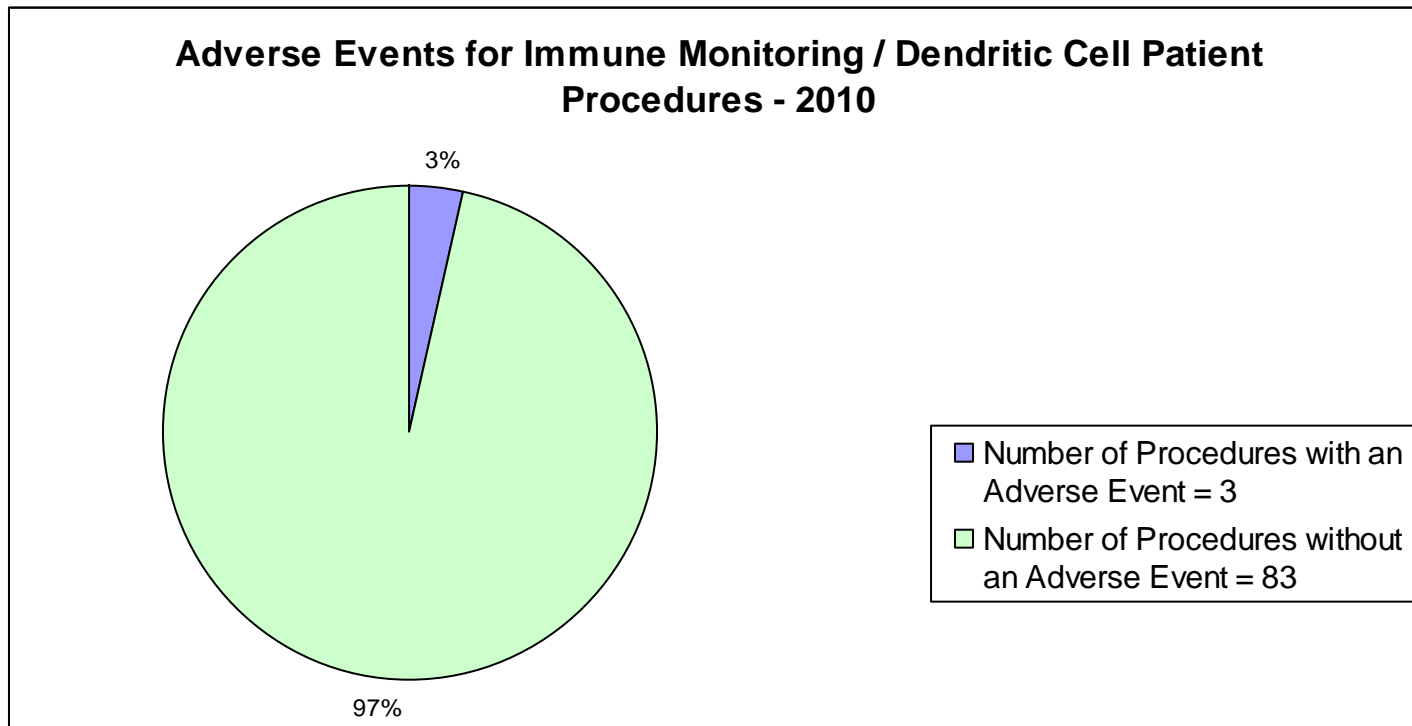
**Adverse Events during Apheresis  
Related Donors  
2010**



■ No Adverse Event = 63  
■ At Least One Adverse Event = 8

# Adverse Events Mononuclear (TC-T)

---



# Adverse Events Mononuclear & HPC-A

---

- parasthesia - low electrolyte levels, **Ca**, K, Phos, Mg
- bone pain – priming agents
- nausea and vomiting – fear, fasting, medication, disease, alcohol
- hematoma – line placement
- diarrhea

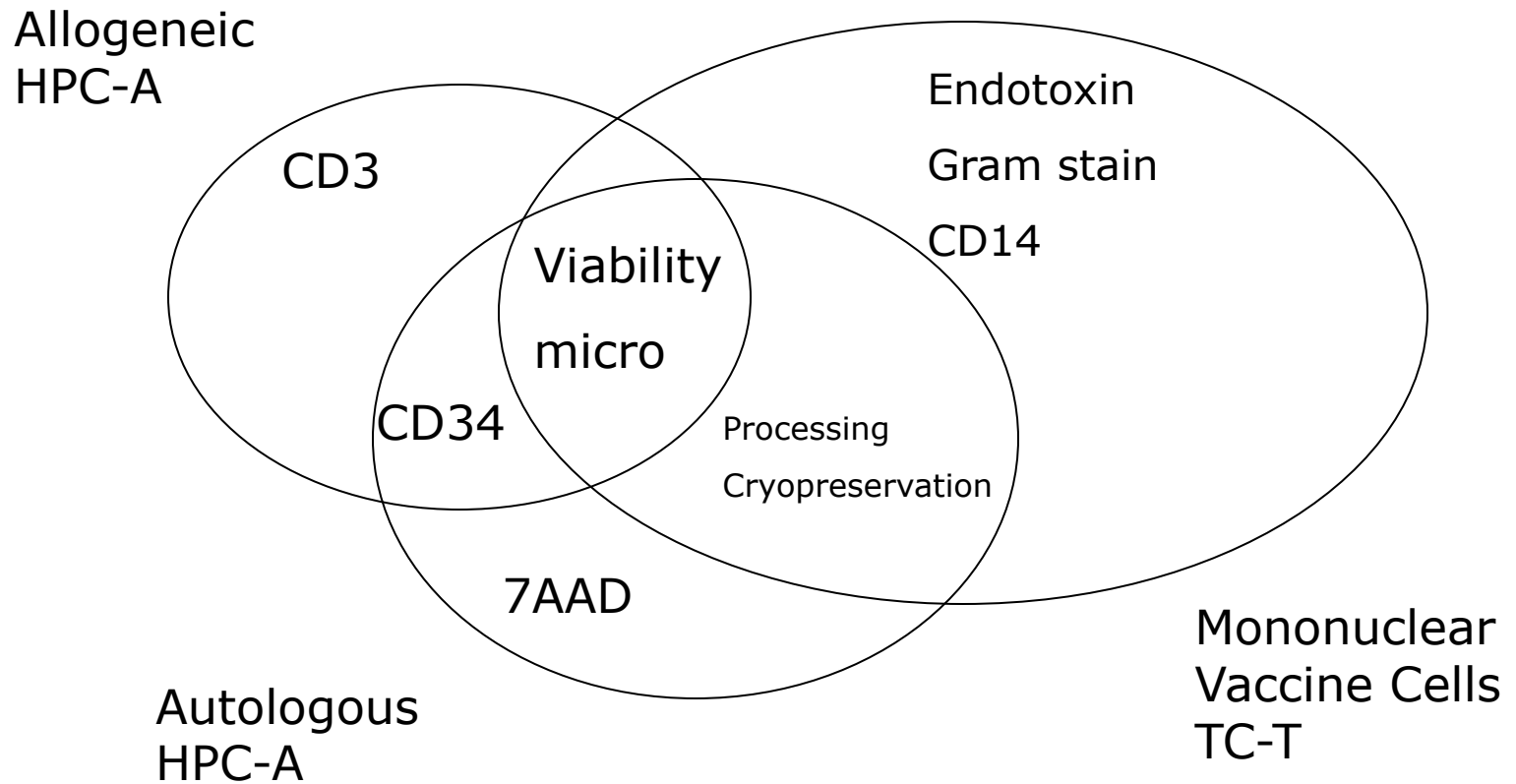
# Rush the product to processing

---



# Follow-up Testing

---



# The Spa

*where photo appointments are made to suit your desires not our availability*

---



# Bed 5 Photopheresis

- ❑ This bed actually received two patients today, the first is a peripheral access.
- ❑ 18g Apheresis needle.
- ❑ Normally able to use a large bowl, this fellow has such lipemic plasma that we're forced to use a small bowl.
- ❑ Hint – pause a lot to pack the cells tighter.



# Bed 5 Photopheresis

---

- The second patient, starting at 1:00 pm, is triple Hickman access.
- This is a GVH patient on Coumadin with an INR of 5.8
- Large bowl with reduced heparin ratio, however, he developed subconjunctival hemorrhage in his eye so the second day of procedure was cancelled.

# Triple Lumen Hickman

---



Angio dynamics 140 101 31 mL/min



Bard Access Systems

# Bed 6 Photopheresis

---



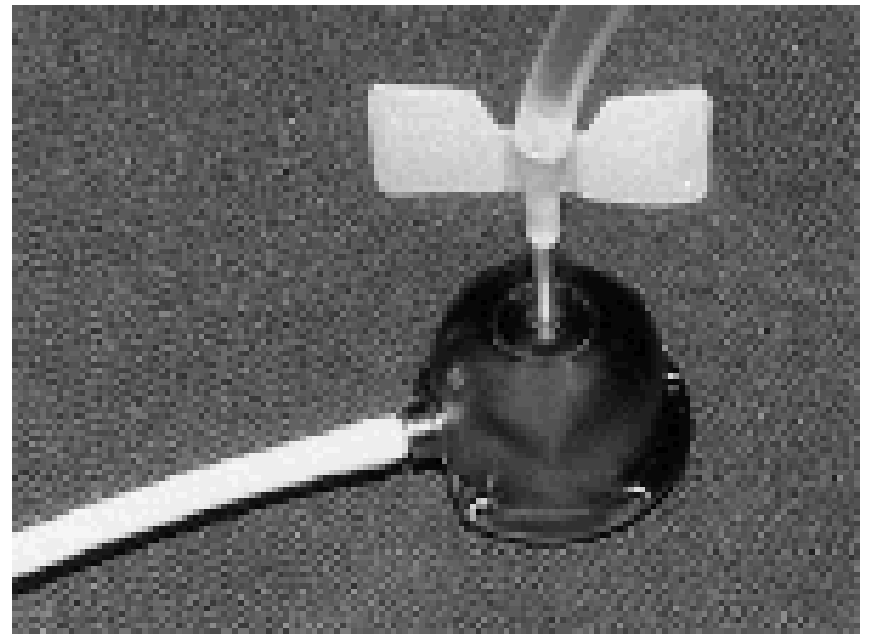
- Vortex Power Port access
- 16g straight, non-coring needle from Angiodynamics
- No extensions
- Flow rates 17-28 mL/min
- TPA on all first days

# Vortex Power Port

---



Angiodynamics



*Kidney International* (1999) **56**, 1-17; doi:10.1046/j.1523-1755.1999.00512.x

# Photo Efficiency Data

---

## Photopheresis Report December 2010

Product	Tech	Product Hct <3.0	Product WBC	Peripheral WBC	WBC Treatment Ratio 1.0 – 1.5 x's <u>Peripheral WBC</u>
ECP2010100470	GB	1.7	9.99	2.27	4.4
ECP2010100471	DR	1.7	20.57	12.11	1.7
ECP2010100472	DR	1.8	15.44	12.11	1.3
ECP2010100473	AL	1.9	9.76	3.39	2.9
ECP2010100474	AL	1.5	11.17	3.47	3.2

# Adverse Events ECP

---

- itching - disease
- increased INR – blood thinners
- decreased peripheral access – chemo, etc.
- Low WBC – GVH
- Low H/H
- dehydration
- hypo/hypertension
- line/peripheral occlusion

# Quality Control

---

- Deviation reporting system
- SOP's protected by PDF, reviewed annually
- Change control and document control system
- Monthly Stem Cell and Photo summary reports
- PICC meetings
- Safety Report system to Risk Management

# Tough Shell

---

- ❑ Labs calling for product arrival times
  - ❑ Physicians calling for product target numbers
  - ❑ Patients calling to change photo schedules
  - ❑ Coordinators calling to overload schedules
- 
- ❑ Director wants to know why there's an empty bed



# Conclusion

---



# Bibliography

---

- 1. (2006), Abstracts From the American Society for Apheresis 27th Annual Meeting, May 23-26, 2006 Las Vegas, Nevada. *Journal of Clinical Apheresis*, 21: 1-48. doi: 10.1002/jca.20098
- 2. Banton, B. *Central Venous Catheters*. Retrieved from: <https://mywebspace.wisc.edu/lbjohnson2/Journal%20Club%20Website/ChemoCourse/Central%20Venous%20Catheters.ppt>
- 3. Douglas, W., McGarvey, M., Sinclair, E., & Drummond, W. (2007). 12th Congress of the European Hematology Association Vienna, Austria, June 7 – 10, 2007: Use of CD34+ cell collection efficiency calculations for dose prediction, process qualification and product specification during PBSC collection using the MNC programme on the Cobe Spectra cell separator. *Haematologica*, 92, 1-548.
- 4. Edelson, R. L., Berger, C. L., Hanlon, D., Kanada, D., & Girardi, M. (2002). Transimmunization, a novel approach for tumor immunotherapy. *Transfusion and Apheresis Science*, 26, 205-216.
- 5. Edelson, R. L. Yale School of Medicine. Transimmunization annotated slides. *Transimmunization Dendritic Cell Immunotherapy for Cancer and T Cell Mediated Disorders*. Retrieved from: <http://medicine.yale.edu/dermatology/clinical/medderm/transimmunization/index.aspx>

# Bibliography

---

- ❑ 6. Fruehauf, S., Seeger, T., & Topaly, J. (2005). Innovative strategies for PBPC mobilization. *Chemotherapy*, 7(5), 438-446.
- ❑ 7. Lysak, D., Koristek, Z., Gasova, Z., Skoumalova, I., & Jindra, P. (2011). Efficacy and safety of peripheral blood stem cell collection in elderly donors; Does age interfere? *Journal of Clinical Apheresis*, 26, 9-16.
- ❑ 8. Malachowski, M.E., Comenzo, R.L., Hillyer, C.D., Tiegerman, K.O., & Berkman, E.M. (1992). Large-volume leukapheresis for peripheral blood stem cell collection in patients with hematologic malignancies. *Transfusion*, 32(8), 732-735.
- ❑ 9. Martin, I., Albert, A, Alcorta, I., Estella, J., Rives, S., Toll, T., & Tuset, E. (2003). Large volume leukapheresis for peripheral blood stem cell collection in children under 10 kg in weight. *Bone Marrow Transplantation*, 31, 517-518. doi:10.1038/sj.bmt.1703907
- ❑ 10. McLeod, B. C., Weinstein, R., Winters, J. L., & Szczepiorkowski, Z. M. (Eds.). (2010). *Apheresis principles and practice 3rd edition*. Bethesda, MD: AABB Press.

# Bibliography

---

- 11. **Natural skin cancer treatment overview.** Retrieved from: [www.topicalinfo.org/Skincancer.htm](http://www.topicalinfo.org/Skincancer.htm)
- 12. **Pahys, J., Fisher, V., Carneval, M., Yomtovian, R, Sarode, R., & Nieder, M. (2000). Case Report: Successful large volume leukapheresis on a small infant allogeneic donor. *Bone Marrow Transplantation*, 26(3), 339-341.**
- 13. **PBSC donation: Risks; Are there risks to donating peripheral blood stem cells (PBSC)? (2007).** Retrieved from: [http://answers.hrsa.gov/app/answers/detail/a\\_id/1106/~/pbsc-donation%3A-risks](http://answers.hrsa.gov/app/answers/detail/a_id/1106/~/pbsc-donation%3A-risks)
- 14. **Rowley, S.D., Yu, J., Gooley, T., Heimfeld, S., Holmberg, L., Maloney, D., & Bensinger, W.I. (2001). Trafficking of CD34+ cells into the peripheral circulation during collection of peripheral blood stem cells by apheresis. *Bone Marrow Transplantation*, 28(7), 649-656.**
- 15. **Woltz, P., Castro, K., and Park, B. J. (2006). Care of patients undergoing extracorporeal photopheresis to treat chronic graft-versus-host disease: Review of the evidence. *Clinical Journal of Oncology Nursing*, 10(6), 795-802. doi: 10.1188/06.**