CME Disclosure

I have no financial relationships to disclose
Objectives

• Define what is a HCT
• Understand the basics of HLA
• Provide overview of transplant process
• Recognize post-transplant events that need to be reported
Key Milestones in the History of Hematopoietic Cell Transplantation

• In 1956 (E. Donnall Thomas), a successful transplant was performed involving identical twins

• In 1959 (Mathé), the first bone marrow transplants for radiation accident victims

• In 1968 (Good), the first successful HLA-matched sibling (non-twin) transplant was performed for an immunological deficiency disease
Key Milestones in the History of Hematopoietic Cell Transplantation

- In 1972 (Mortimer M. Bortin), the International Bone Marrow Transplant Registry (IBMTR) started collecting outcomes data on transplant patients.

- In 1973, the first successful unrelated donor transplant was performed at Memorial Sloan-Kettering Cancer Center.
Key Milestones in the History of Hematopoietic Cell Transplantation

• In 1979, Laura Graves became the first Hutchinson Center patient to receive marrow from an unrelated marrow donor to treat her leukemia
• In 1986, the National Bone Marrow Donor Registry was federally funded
• In 1987, The National Marrow Donor Program (NMDP) facilitated their first unrelated transplant
• In 2004, the IBMTR and NMDP formed the Center for International Blood and Marrow Transplant Research (CIBMTR)
Data Collection Forms

- Transplant Essential Data
  - TED
  - Pre & Post
  - 2400, 2450, etc

- Comprehensive Report Forms
  - CRF
  - Report or research forms
  - 2000, 2100, 2200, 2300, 2900, 2010, 2110, etc
Research Goals

- Determine and evaluate factors that affect HCT outcomes
- Improve recipient recovery from transplant
- Assess long-term outcomes after HCT
- Determine how to improve access to HCT for different groups of patients
- Assess donor recovery from collection procedures
- Study the application and success of HCT in the management of marrow-toxic injuries
What is Hematopoietic Cell Transplantation (HCT)?
Hematopoietic Cell Transplant (HCT)

- Infusion of a product that contains hematopoietic progenitor cells (HPCs)
  - Also known as CD34+ cells or stem cells.
- Intention to restore hematopoiesis and immunity
- Usually preceded by a preparative regimen
What is Bone Marrow?

Soft tissue inside the bones that produces blood forming cells
Blood Forming Cells

Immature cells that can grow into red blood cells, white blood cells or platelets

Average life of:
Red blood cell (RBC): 120 days
Platelet: 10 days
Neutrophil: 1-3 days
Blood Cell Maturation
Role of Bone Marrow

- Source of Blood
- Immune System
- Highly Regulated Production
Sources of Stem Cells for Transplant

- Bone marrow
- Cord Blood
- PBSC
Marrow Donation

- Typically, the donor will be lying on his stomach
- Several small incisions through the skin over the back of the pelvic bones
- A needle is inserted through these incisions and a syringe is attached to the needle to draw out the marrow
Peripheral Blood Stem Cell Collection

- Peripheral blood stem cells (PBSC) are collected via apheresis procedure
- Donor receives Filgrastim prior to the donation
Cord Blood

The blood collected from the umbilical cord and placenta after a baby is born
Form 2400
Pre-Transplant Essential Data (TED)

45. Sex (adult/infant): □ Male □ Female

Specify product type:
46. Bone marrow: □ Yes □ No
47. PBSC: □ Yes □ No
48. Single cord blood unit: □ Yes □ No

50. Specify other product type: ___________________________

A series of collections should be considered a single product when they are all from the same donor and use the same collection method and technique (and mobilization, if applicable), even if the collections are performed on different days.

51. Specify number of products infused from this donor: ______

Questions 52 – 59 are for autologous HCT recipients only. If other than autologous skip to question 60

52. Did the recipient have more than one mobilization event to acquire cells for HCT?
□ Yes □ No

53. Specify the total number of mobilization events performed for this HCT (regardless of the number of collections or which collections were used for this HCT): ______

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Transplants by Cell Source
Adult Recipients (18 years and older)
Types of Hematopoietic Cell Transplantation

- **Autologous (from the patient)**
  - Collected from the patient’s bloodstream and stored for transplant
  - May be an option for patients with certain diseases

- **Allogeneic**
  - Cells from a family member, unrelated donor or umbilical cord blood unit
  - Syngeneic (identical twin)
  - Related (from a relative)
  - Unrelated (from a volunteer donor)
Form 2400
Pre-Transplant Essential Data (TED)

29. Multiple donors?
   - Yes
   - No

30. Specify number of donors: ___ ___

To report more than one donor, copy questions 31-62 and complete for each donor.

31. Specify donor:
   - Autologous - Go to question 46
   - Autologous cord blood unit - Go to question 35
   - NMDP unrelated cord blood unit - Go to question 32
   - NMDP unrelated donor - Go to question 33
   - Related donor - Go to question 40
   - Related cord blood unit - Go to question 35
   - Non-NMDP unrelated donor - Go to question 34
   - Non-NMDP unrelated cord blood unit - Go to question 35

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Trends in Transplants
by Transplant Type and Recipient Age*
1990-2010

Transplants for AML, ALL, NHL, Hodgkin Disease, Multiple Myeloma
One-year Survival by Year of Transplant, Donor and Age, Worldwide, 1997-2010
- In any remission, Acute Leukemia, CML or MDS-
Donor Selection
Factors in Donor Selection

- Patient’s disease & disease stage
- HLA typing of donor
- Donor availability
- Age (patient & donor)
- Donor sex
- CMV status (patient & donor)
- Number of pregnancies or blood transfusions for the donor
HLA

• Human Leukocyte Antigens (HLA)
• Proteins found on the surface of most cells in the body
• Immune system uses HLA to verify that a given cell is part of the body and not foreign
• A suitably-matched donor is important to reduce the risk of post-transplant complications
HLA Protein Types (Classes)

- **Class I**
  - HLA-A
  - HLA-B
  - HLA-C

- **Class II**
  - HLA-DR
  - HLA-DQ
  - HLA-DP
HLA Haplotypes

- Haplotypes
  - Possible sets of HLA combinations
  - Billions of combinations
  - One haplotype from each parent
Probability of a sibling match:
One sibling = 25%
Two siblings = 44%
Six siblings = 82%
Why is HLA matching Important?

• Improves the chance for a successful transplant
• Promotes engraftment
• Reduces the risk of Graft Versus Host Disease (GVHD)
Form 2400
Pre-Transplant Essential Data (TED)

32. NMDP cord blood unit ID: ___________________________ - Go to question 46
38. NMDP donor ID: ___________________ - ___________ - ___ - Go to question 46
34. Non-NMDP unrelated donor ID: (not applicable for related donors)
   ___________________________ - Go to question 38
35. Non-NMDP cord blood unit ID: (include related and autologous CBUs)
   ___________________________

36. Is the CBU ID also the ISBT DIN number?
   □ Yes
   □ No → 37. Specify the ISBT DIN number: ___________________________

38. Registry or UCB Bank ID: _____ _____ ___ - If ‘Other registry’ go to 39, otherwise go to question 41
39. Specify other Registry or UCB Bank: ___________________________ - Go to question 41

40. Specify the related donor type:
   □ Syngeneic (monozygotic twin)
   □ HLA-identical sibling (may include non-monozygotic twin)
   □ HLA-matched other relative
   □ HLA-mismatched relative

41. Date of birth (donor/infant): ___________________________
### Reporting NMDP Allele Codes

#### HLA Typing Results

<table>
<thead>
<tr>
<th>Name / Lab ID</th>
<th>Relation</th>
<th>Hap A*</th>
<th>B*</th>
<th>C*</th>
<th>DRB1*</th>
<th>DRB3*</th>
<th>DRB4*</th>
<th>DRB5*</th>
<th>DQB1*</th>
<th>Sample Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient</td>
<td></td>
<td>28:01</td>
<td>40:01</td>
<td>03:04</td>
<td>04:04</td>
<td>01:01:01G</td>
<td>01:01:01G</td>
<td>03:02</td>
<td>08/19/12</td>
<td></td>
</tr>
<tr>
<td>Patient</td>
<td></td>
<td>29:02</td>
<td>44:03</td>
<td>16:01</td>
<td>07:01</td>
<td>01:01:01G</td>
<td>02:02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>673570</td>
<td>Unrelated</td>
<td>28:KDTG</td>
<td>40:KEHT</td>
<td>03:RCUS</td>
<td>04:04</td>
<td>03:02</td>
<td>10/16/12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>673570</td>
<td>Unrelated</td>
<td>29:KDTP</td>
<td>44:KEHU</td>
<td>16:RCVV</td>
<td>07:01</td>
<td>02:02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mismatch:

|          | 0 | 0 | 0 | 0 | 0 |

HLA typing was performed by one or more of the following molecular methods: SSOP, SBT, SSP.
Form 2005
Confirmation of HLA Typing

Class I
14. Locus A
   - Known
   - Unknown
   - First A* allele designations: 26:01
   - Second A* allele designations: 29:02

16. Locus B
   - Known
   - Unknown
   - First B* allele designations:
   - Second B* allele designations:

18. Locus C
   - Known
   - Unknown
   - First C* allele designations:
   - Second C* allele designations:

Class II
20. Locus DRB1
   - Known
   - Unknown
   - First DRB1* allele designations:
   - Second DRB1* allele designations:
Preparing for Transplant
Should I have a transplant?

- Benefits of Transplant
  - Provide stem cell replacement
  - Destroy malignancy - Remission
  - Extension of a good quality of life
  - Graft vs. Leukemia Effect
- Donor availability & match
- Other treatment options
### Diseases Treatable by HCT

#### Malignant
- Leukemias and lymphomas
- Myelodysplastic syndromes
- Multiple myeloma and other plasma cell disorders
- Solid Tumors

#### Non-malignant
- Severe aplastic anemia and other marrow failure states
- Autoimmune Diseases
- Inherited metabolic disorders, such as Hurler's syndrome and leukodystrophies
- Inherited immune system disorders, such as severe combined immunodeficiency (SCID) and Wiskott-Aldrich syndrome
- Sickle cell disease and thalassemia
Form 2400
Pre-Transplant Essential Data (TED)

<table>
<thead>
<tr>
<th>Myelodysplastic (MDS) / myeloproliferative (MPN) Diseases (50) (Please classify all pre-leukemias) (If recipient has transformed to AML, indicate AML as the primary disease)</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Refractory cytopenia with unilineage dysplasia (RCUD) (includes refractory anemia (RA)) (51)</td>
</tr>
<tr>
<td>☐ Refractory anemia with ringed sideroblasts (RARS) (55)</td>
</tr>
<tr>
<td>☐ Refractory anemia with excess blasts-1 (RAEB-1) (61)</td>
</tr>
<tr>
<td>☐ Refractory anemia with excess blasts-2 (RAEB-2) (62)</td>
</tr>
<tr>
<td>☐ Refractory cytopenia with multilineage dysplasia (RCMD) (64)</td>
</tr>
<tr>
<td>☐ Childhood myelodysplastic syndrome (Refractory cytopenia of childhood (RCC)) (68)</td>
</tr>
<tr>
<td>☐ Myelodysplastic syndrome with isolated del(5q) (5q− syndrome) (66)</td>
</tr>
<tr>
<td>☐ Myelodysplastic syndrome (MDS), unclassifiable (50)</td>
</tr>
<tr>
<td>☐ Chronic neutrophilic leukemia (165)</td>
</tr>
<tr>
<td>☐ Chronic eosinophilic leukemia, NOS (166)</td>
</tr>
<tr>
<td>☐ Essential thrombocythemia (includes primary thrombocytosis, idiopathic thrombocytosis, hemorrhagic thrombocythemia) (58)</td>
</tr>
</tbody>
</table>
Steps to Prepare for Transplant

- Complete health history & physical exam
- Blood tests, such as a complete blood count, blood chemistries, and screening for viruses like hepatitis B, CMV, and HIV
- Heart testing (Echocardiogram (ECHO), MUGA scan, or electrocardiogram (EKG))
- Lung studies, such as a chest x-ray and PFTs (pulmonary function tests)
- CT (computed tomography) scan or MRI (magnetic resonance imaging)
- PET scan (Positron emission tomography)
- Bone marrow biopsy
- Lumbar puncture or spinal tap
Additional Steps to Prepare for Transplant

- HLA tissue typing, including high-resolution typing
- Discuss/decision on fertility options
- Evaluation of your psychological and emotional strengths
- Identifying who will be your primary caregiver throughout the transplant process
- Consultations with other members of the transplant team, such as a dentist, dietitian, or social worker
Form 2400
Pre-Transplant Essential Data (TED)

Co-morbid Conditions

94. Is there a history of mechanical ventilation?  □ Yes  □ No
95. Is there a history of proven invasive fungal infection?  □ Yes  □ No
96. Were there *clinically significant* co-existing diseases or organ impairment at time of patient assessment prior to preparative regimen?
Source: Blood, 2005 Oct 15;106(8):2912-2919
□ Yes  □ No

97. Arrhythmia - *For example, any history of atrial fibrillation or flutter, sick sinus syndrome, or ventricular arrhythmias requiring treatment*
□ Yes  □ No  □ Unknown

98. Cardiac - *Any history of coronary artery disease (one or more vessel-coronary artery stenosis requiring medical treatment, stent, or bypass graft), congestive heart failure, myocardial infarction, OR ejection fraction ≤ 50% on the most recent test*
□ Yes  □ No  □ Unknown

99. Cerebrovascular disease - *Any history of transient ischemic attack, subarachnoid hemorrhage or cerebrovascular accident*
□ Yes  □ No  □ Unknown

100. Diabetes - *Requiring treatment with insulin or oral hypoglycemics in the last 4 weeks but not diet alone*
□ Yes  □ No  □ Unknown

101. Heart valve disease - *Except asymptomatic mitral valve prolapse*
□ Yes  □ No  □ Unknown
Central Line Placement

• It is a tube that is surgically inserted into a large vein in the chest or neck, just above the heart
• May be called a central venous, Hickman or Broviac catheter
• Used to administer medications, blood products and the transplant product
• Used to draw blood for blood tests
HCT Timeline

- Preparative Regimen
- Day 0 Infusion
- Neutrophil Engraftment
- Platelet Engraftment
- Acute GVHD
- Chronic GVHD

Time Line

-12 -4 -2

Days

0 15 30 60 100 180+
Preparative Regimen (Conditioning)

• Destroys diseased & healthy cells
• Given over 1-10 days
• Length of the preparative regimen depends on the patient’s:
  – Disease, age, previous treatments, coexisting diseases, treatment protocol
• Weakening the immune system helps to prevent it from attacking the donated cells after the transplant
  – Immune suppressing medications given to prevent GVHD
Myeloablative Regimen (High Dose)

- Higher doses of chemotherapy with or without radiation
- Intent is to destroy immune system (killing both diseased and healthy cells) to allow donor cells to engraft
- Used for patients:
  - Aggressive diseases
  - Usually experience more side effects
Non-Myeloablative/Reduced Intensity Regimens

- Lower doses of chemotherapy with or without radiation
- Intent is to suppress immune system to allow donor cells to engraft
- Used for patients:
  - Slower growing diseases
  - Who are less likely to tolerate the side effects of a high dose preparative regimen
Radiation

- Total body irradiation (TBI)
  - Used most often for patients with leukemia, lymphoma or myeloma
- Total lymphoid or nodal regions
- Thoraco-abdominal region
- Additional radiation
  - CNS, gonadal, splenic
Form 2400
Pre-Transplant Essential Data (TED)

157. Was a pre-HCT preparative regimen prescribed?
- Yes
- No

158. Classify the recipient's prescribed preparative regimen: (Allogeneic HCTs only)
- Myeloablative
- Non-myeloablative (NST)
- Reduced intensity (RIC)

159. Date pre-HCT preparative regimen began (irradiation or drugs):
___/___/___
YYY MM DD
(Use earliest date from questions 163, or 168-315)

160. Was irradiation planned as part of the pre-HCT preparative regimen?
- Yes → 161. What was the prescribed radiation field?
- No
- Total body
- Total body by tomotherapy
- Total lymphoid or nodal regions
- Thoracoabdominal region

162. Total prescribed dose (dose per fraction x total number of fractions)
___ ___ ___ __Gy __cGy

163. Date started: ___/___/___

Form 2000
Recipient Baseline Data

79. Was irradiation performed as part of the pre-HCT preparative regimen?
- Yes → 80. What was the radiation field?
- No
- Total body
- Total body by tomotherapy
- Total lymphoid or nodal regions
- Thoracoabdominal region

81. Total dose: ___ ___ ___ (dose per fraction x total number of fractions)
- Gy
- cGy

82. Date started: ___/___/___
YYY MM DD

83. Was the radiation fractionated?
- Yes → 84. Dose per fraction: ___ ___ __Gy
- No
- cGy

85. Number of days: ___ (include "rest" days)

86. Total number of fractions: ___

87. Was additional radiation given to other sites within 14 days of the pre-HCT preparative regimen?
- Yes → Specify radiation field:
Preparative Regimen (Conditioning)

Drugs

- Report the prescribed dose of each drug per protocol
- Do not include drugs that are intended to offset the side effects of the systemic therapy
  - corticosteroids for nausea
  - MESNA for hemorrhagic cystitis

Form 2400
Pre-Transplant Essential Data (TED)
Preparative Regimen (Conditioning) Drugs

- Report the total dose of each drug that was actually given.
- Do not include drugs given for prophylaxis of infection, GVHD, or organ toxicity.
- Do not include drugs that are intended to offset the side effects of the systemic therapy.

Form 2000
Recipient Baseline Data

105. Were drugs given for pre-HCT preparative regimen?
   - yes 106. Dosing body weight used for pre-HCT preparative regimen
   - no

   (adjusted body weight): ___ ___
   - pounds
   - kilograms

107. ALG, ALS, ATG, ATS
   - yes 108. Total dose: ___ ___ ___ ___ ___ mg
   - no

109. Date started: ___ ___ / ___ ___ ___

110. Specify source
   - Horse
   - Rabbit
   - Other 111. Specify other source:

112. Anthracycline
   - yes 113. Daunorubicin
   - no

   - yes 114. Total dose: ___ ___ ___ ___ mg
   - no

115. Date started:
Allogeneic Transplants
Registered with the CIBMTR, 2001-2010
- by Conditioning Regimen Intensity & Age -

* Data incomplete
Side Effects of the Preparative Regimen

- Nausea
- Vomiting
- Diarrhea
- Lack of appetite
- Mouth sores
- Hair loss
- Skin rash

**Common**

- VOD (Damage to the liver)
- Damage to the lungs
- Damage to the heart muscle

**Serious**
HCT Timeline

-12 -4 -2 0 15 30 60 100 180+

Day 0 Infusion

Preparative Regimen

Days

Acute GVHD

Neutrophil Engraftment

Platelet Engraftment

Chronic GVHD
Stem Cell Product

- Autologous Products
- Product Arrival
- Product Manipulation
- Cell count infused
- Adverse events
Form 2006 - Hematopoietic Stem Cell Transplant (HCT) Infusion

<table>
<thead>
<tr>
<th>Pre-Collection Therapy</th>
<th>Questions: 16-27</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. Did the donor receive therapy, prior to any stem cell harvest, to enhance the product collection for this HCT?</td>
<td></td>
</tr>
<tr>
<td>□ yes</td>
<td>□ no</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>17. Growth and mobilizing factor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ yes → 18. G-CSF</td>
</tr>
<tr>
<td>□ no → 19. Pegylated G-CSF</td>
</tr>
<tr>
<td>□ yes</td>
</tr>
<tr>
<td>□ yes → 20. GM-CSF</td>
</tr>
<tr>
<td>□ yes</td>
</tr>
<tr>
<td>□ yes → 21. Plerixafor (Mozobil)</td>
</tr>
<tr>
<td>□ yes</td>
</tr>
<tr>
<td>□ yes → 22. Other growth or mobilizing factor</td>
</tr>
<tr>
<td>□ yes → 23. Specify other growth or mobilizing factor:</td>
</tr>
<tr>
<td>□ no</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>24. Systemic therapy (chemotherapy) (autologous only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ yes → 25. Anti-CD20 (rituximab, Rituxan) (autologous only)</td>
</tr>
<tr>
<td>□ yes</td>
</tr>
<tr>
<td>□ yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>26. Other therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ yes → 27. Specify other therapy:</td>
</tr>
<tr>
<td>□ no</td>
</tr>
</tbody>
</table>

Autologous, related & non-NMDP unrelated donors
Form 2400
Pre-Transplant Essential Data (TED)

Product Processing/Manipulation

71. Was the product manipulated prior to infusion?
- Yes
- No

72. Specify portion manipulated:
- Entire product
- Portion of product

Specify all methods used to manipulate the product:

73. Washed
- Yes
- No

74. Diluted
- Yes
- No

75. Buffy coat enriched (buffy coat preparation)
- Yes
- No
Form 2006 - Hematopoietic Stem Cell Transplant (HCT) Infusion

<table>
<thead>
<tr>
<th>71. Was the product manipulated prior to infusion?</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ yes □ no</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>72. Specify portion manipulated □ entire product □ portion of product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify all methods used to manipulate the product:</td>
</tr>
<tr>
<td>73. Washed □ yes □ no</td>
</tr>
<tr>
<td>74. Diluted □ yes □ no</td>
</tr>
<tr>
<td>75. Buffy coat enriched (buffy coat preparation) □ yes □ no</td>
</tr>
<tr>
<td>76. B-cell reduced □ yes □ no</td>
</tr>
<tr>
<td>77. CD8 reduced □ yes □ no</td>
</tr>
<tr>
<td>78. Plasma reduced (removal) □ yes □ no</td>
</tr>
<tr>
<td>79. RBC reduced □ yes □ no</td>
</tr>
<tr>
<td>80. Cultured (ex-vivo expansion) □ yes □ no</td>
</tr>
<tr>
<td>81. Genetic manipulation (gene transfer/transduction) □ yes □ no</td>
</tr>
<tr>
<td>82. PUVA treated □ yes □ no</td>
</tr>
<tr>
<td>83. CD34 enriched (CD34+ selection) □ yes □ no</td>
</tr>
<tr>
<td>84. CD133 enriched □ yes □ no</td>
</tr>
<tr>
<td>85. Monocyte enriched □ yes □ no</td>
</tr>
<tr>
<td>86. Mononuclear cells enriched □ yes □ no</td>
</tr>
</tbody>
</table>
Form 2006 - Hematopoietic Stem Cell Transplant (HCT) Infusion

The following questions refer to all stem cell products except for autologous marrow and autologous PBSC products. If this HCT used an autologous marrow or autologous PBSC product, continue with the signature lines.

209. Were there any adverse events or incidents associated with the stem cell infusion?

☐ yes  ☐ no

Specify the following adverse event(s):

210. Brachycardia

☐ yes  211. In the Medical Director’s judgment, was the adverse event a direct result of the infusion?

☐ no     ☐ yes  ☐ no

212. Chest tightness/pain

☐ yes  213. In the Medical Director’s judgment, was the adverse event a direct result of the infusion?

☐ no     ☐ yes  ☐ no

214. Chills at time of infusion

☐ yes  215. In the Medical Director’s judgment, was the adverse event a direct result of the infusion?

☐ no     ☐ yes  ☐ no

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Form 2006 - Hematopoietic Stem Cell Transplant (HCT) Infusion

158. Specify the timepoint in the product preparation phase that the product was analyzed
   - [ ] Product arrival
   - [ ] Pre-cryopreservation
   - [ ] Post-thaw
   - [ ] At infusion

159. Date of product analysis: __ __ / __ __ / __

160. Total volume of product plus additives: __ __ __ __ __ __ • __
Form 2006 - Hematopoietic Stem Cell Transplant (HCT) Infusion

<table>
<thead>
<tr>
<th>In this section, report the total number of cells (not cells per kilogram) not corrected for viability</th>
</tr>
</thead>
<tbody>
<tr>
<td>161. Total nucleated cells (TNC) (Includes nucleated red and nucleated white cells)</td>
</tr>
<tr>
<td>□ Done</td>
</tr>
<tr>
<td>□ Not done</td>
</tr>
<tr>
<td>162. Total nucleated cells: __________ • ___ x 10 ____</td>
</tr>
<tr>
<td>163. Nucleated white blood cells</td>
</tr>
<tr>
<td>□ Done</td>
</tr>
<tr>
<td>□ Not done</td>
</tr>
<tr>
<td>164. Total number of nucleated white blood cells: _________ • ___ x 10 ____</td>
</tr>
<tr>
<td>165. Mononuclear cells</td>
</tr>
<tr>
<td>□ Done</td>
</tr>
<tr>
<td>□ Not done</td>
</tr>
<tr>
<td>166. Total number of mononuclear cells: _________ • ___ x 10 ____</td>
</tr>
<tr>
<td>167. Nucleated red blood cells</td>
</tr>
<tr>
<td>□ Done</td>
</tr>
<tr>
<td>□ Not done</td>
</tr>
<tr>
<td>168. Total number of nucleated red blood cells: _________ • ___ x 10 ____</td>
</tr>
<tr>
<td>169. CD34+ cells</td>
</tr>
<tr>
<td>□ Done</td>
</tr>
<tr>
<td>□ Not done</td>
</tr>
<tr>
<td>170. Total number of CD34+ cells: _________ • ___ x 10 ____</td>
</tr>
<tr>
<td>171. CD3+ cells</td>
</tr>
<tr>
<td>□ Done</td>
</tr>
<tr>
<td>□ Not done</td>
</tr>
<tr>
<td>172. Total number of CD3+ cells: _________ • ___ x 10 ____</td>
</tr>
</tbody>
</table>
Day of Transplant (Day 0)

- The donated cells arrive in blood bags
  - similar to the ones used for blood transfusion.
- The cells are infused through the central line
- Side effects include fever, chills, rash
Early Days of Post-HCT

• 14-28 days of extreme immune suppression
  – Very low WBC, RBC & platelets
  – May receive growth factors

• At risk for infections & hemorrhaging
  – Antibiotics, blood & platelet transfusions

• Mucositis

• Monitor for potential organ damage from preparative regimen
Form 2100
100 Days Post-HSCT Data

<table>
<thead>
<tr>
<th>Specify agents and provide dates for the first course of each agent given in this reporting period.</th>
</tr>
</thead>
<tbody>
<tr>
<td>9  G-CSF</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>10 Date G-CSF therapy started: __ __ __ __ __</td>
</tr>
<tr>
<td>11 Therapy: ______________________</td>
</tr>
<tr>
<td>12 Specify drug given:</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>13 GM-CSF</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>14 Date GM-CSF therapy started: __ __ __ __ __</td>
</tr>
<tr>
<td>15 Therapy: ______________________</td>
</tr>
<tr>
<td>16 Erythropoietin</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>17 Date therapy started: __ __ __ __</td>
</tr>
<tr>
<td>18 Therapy: ______________________</td>
</tr>
<tr>
<td>19 Specify drug given:</td>
</tr>
</tbody>
</table>
HCT Timeline

- Preparative Regimen
  -12 -4 -2

- Day 0 Infusion
  0

- Neutrophil Engraftment
  15 30 60 100 180+

- Platelet Engraftment

- Acute GVHD

- Chronic GVHD

Time Line

Days
What is engraftment?

- The stem cells will create a new hematopoietic and immune system for the recipient
  - New blood-forming cells in bone marrow
  - Healthy blood cells in blood stream
Neutrophil Engraftment

- Marrow or PBSC HCT
  - ANC recovery occurs 14-20 days post-transplant
  - Can occur as early as 10 days post-transplant
- Cord blood HCT
  - ANC recovery occurs approximately 25 days post-transplant
  - Can take as long as 42 days
Equivalent Cell Counts

\[ n \times 10^9/L = n \times 10^6/mL = \frac{n \text{ cells/mL or mm}^3}{1000} \]

Example:

ANC: 500/mm$^3$ = 0.5 $\times$ 10$^9$/L
Form 2100
100 Days Post-HSCT Data

34 Is (was) there evidence of hematopoietic recovery following the initial HSCT? (check only one)
   ○ Yes, ANC >= 500/mm³ achieved and sustained for 3 lab values * with no subsequent decline
   ○ Yes, ANC >= 500/mm³ for 3 lab values * with subsequent decline in ANC to < 500/mm³ for >= 3 days
   ○ No, ANC >= 500/mm³ was not achieved * and there was no evidence of recurrent disease in the bone marrow
   ○ No, ANC >= 500/mm³ was not achieved * and there was documented persistent disease in the bone marrow post-HSCT
   ○ ANC never dropped below 500/mm³ at any time after the start of the preparative regimen

35 Date ANC >= 500/mm³ (first of 3 lab values): * ___ ___ ___ - ___- ___
Form 2450  
Post-Transplant Essential Data (TED)

<table>
<thead>
<tr>
<th>Initial ANC Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Was $\geq 0.5 \times 10^9/L$ achieved for 3 consecutive labs?</td>
</tr>
<tr>
<td>□ Yes</td>
</tr>
<tr>
<td>□ No</td>
</tr>
<tr>
<td>□ never below</td>
</tr>
<tr>
<td>□ previously reported (answer is only valid on &gt; d100 evaluation)</td>
</tr>
<tr>
<td>□ Unknown</td>
</tr>
</tbody>
</table>

9. First date of 3 consecutive labs: __________ - ______ - ______

10. Date of last assessment: __________ - ______ - ______
Platelet Engraftment

- Marrow or PBSC HCT
  - Platelet engraftment often happens a little bit after neutrophil engraftment
- Cord Blood HCT
  - Platelet engraftment occurs ~8 weeks or longer after transplant
### Reporting Platelet Engraftment

<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Platelet Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 13</td>
<td>0</td>
<td>10,000</td>
</tr>
<tr>
<td>June 14</td>
<td>1</td>
<td>30,000</td>
</tr>
<tr>
<td>June 15</td>
<td>2</td>
<td>25,000</td>
</tr>
<tr>
<td>June 16</td>
<td>3</td>
<td>10,000</td>
</tr>
<tr>
<td>June 17</td>
<td>4</td>
<td>15,000</td>
</tr>
<tr>
<td>June 18</td>
<td>5</td>
<td>19,000</td>
</tr>
<tr>
<td>June 19</td>
<td>6</td>
<td>23,000</td>
</tr>
<tr>
<td>June 20</td>
<td>7</td>
<td>25,000</td>
</tr>
<tr>
<td>June 21</td>
<td>8</td>
<td>40,000</td>
</tr>
<tr>
<td>June 22</td>
<td>9</td>
<td>50,000</td>
</tr>
<tr>
<td>June 23</td>
<td>10</td>
<td>56,000</td>
</tr>
<tr>
<td>June 24</td>
<td>11</td>
<td>65,000</td>
</tr>
<tr>
<td>June 25</td>
<td>12</td>
<td>72,000</td>
</tr>
</tbody>
</table>

- Last platelet transfusion
- 1st of 3 consecutive laboratory values $\geq 20 \times 10^9$/L
- 1st of 3 consecutive laboratory values $\geq 50 \times 10^9$/L
Form 2100
100 Days Post-HSCT Data

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>44 Was an initial platelet count $\geq 20 \times 10^9$/L achieved?</td>
<td>Yes, No, platelet count never dropped below $20 \times 10^9$/L</td>
</tr>
<tr>
<td>45 Date platelets $\geq 20 \times 10^9$/L: * <strong>.</strong>.<strong>.</strong>.<strong>.</strong>.<strong>.</strong>.</td>
<td>date estimated, Date unknown</td>
</tr>
<tr>
<td>46 Was an initial platelet count $\geq 50 \times 10^9$/L achieved?</td>
<td>Yes, No, platelet count never dropped below $50 \times 10^9$/L</td>
</tr>
<tr>
<td>47 Date platelets $\geq 50 \times 10^9$/L: * <strong>.</strong>.<strong>.</strong>.<strong>.</strong>.<strong>.</strong>.</td>
<td>date estimated, Date unknown</td>
</tr>
</tbody>
</table>
Form 2450
Post-Transplant Essential Data (TED)

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 Initial platelet recovery</td>
<td>Yes, No, never below, previously reported</td>
</tr>
<tr>
<td></td>
<td>(answer is only valid on &gt; d100 evaluation)</td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
</tr>
</tbody>
</table>

| Date Platelet > 20 x 10^9/L:                                            |     |
| Date of last assessment:                                                |     |
Chimerism

- Two or more cell populations of different chromosomal constitutions, derived from different individuals
  - Host
  - Donor
Graft versus Host Disease (GVHD)

- Immune cells from the donor (graft) attack the body of the transplant patient (host)

- Acute GVHD
  - Usually, occurs 10 to 40 days post transplant
  - Affects skin, gut and/or liver

- Chronic GVHD
  - Usually, occurs after 100 days post transplant
  - Affects skin, eyes, mouth, lung, gastrointestinal tract, liver, genitourinary tract, musculoskeletal, hematologic and/or other such as serositis or weight loss
Factors Influencing the Severity of GVHD

• Donor or graft factors
  – Degree of HLA match
  – Female donor to male recipient
  – Donor parity
  – Older donors
  – T-cell dose

• Recipient factors
  – Age
  – Prior infections

• Treatment-related factors
  – Myeloablative preparative regimen
  – Inadequate GVHD prophylaxis
### Form 2100

**100 Days Post-HSCT Data**

<table>
<thead>
<tr>
<th>Acute Graft vs. Host Disease (GVHD)</th>
<th>Questions: 110 - 187</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>110</strong> Was specific therapy used after the start of the preparative regimen to prevent acute GVHD or graft rejection (note: do not include growth factors reported in question 8, or <em>ex vivo</em> T-cell depletion reported on the Product Insert), or for autologous HSCT to induce acute GVHD?</td>
<td></td>
</tr>
<tr>
<td><img src="yes/no" alt="Radio buttons" /></td>
<td></td>
</tr>
<tr>
<td><strong>111</strong> ALS, ALG, ATS, ATG</td>
<td></td>
</tr>
<tr>
<td><img src="yes/no" alt="Radio buttons" /></td>
<td></td>
</tr>
<tr>
<td><strong>112</strong> Specify source:</td>
<td></td>
</tr>
<tr>
<td><img src="Horse/Rabbit/Other" alt="Radio buttons" /></td>
<td></td>
</tr>
<tr>
<td><strong>113</strong> Specify source:</td>
<td></td>
</tr>
<tr>
<td><img src="__________________________" alt="Text field" /></td>
<td></td>
</tr>
<tr>
<td><strong>114</strong> Corticosteroids (systemic)</td>
<td></td>
</tr>
<tr>
<td><img src="yes/no" alt="Radio buttons" /></td>
<td></td>
</tr>
<tr>
<td><strong>115</strong> Cyclosporine (CSA) <em>(Sandimmune, Neoral)</em></td>
<td></td>
</tr>
<tr>
<td><img src="yes/no" alt="Radio buttons" /></td>
<td></td>
</tr>
<tr>
<td><strong>116</strong> ECP <em>(extra-corporeal photopheresis)</em></td>
<td></td>
</tr>
<tr>
<td><img src="yes/no" alt="Radio buttons" /></td>
<td></td>
</tr>
</tbody>
</table>
Graft versus Leukemia Effect

- Mild GVHD may be beneficial
- Donor’s immune system is working to destroy any remaining cancer cells
- Patients who experience some GVHD have a lower risk of relapse
GVHD Classification Change

• In the past, GVHD was classified as acute or chronic based on:
  – Time to diagnosis following transplant
    • <100 days post-transplant – acute GVHD
    • >100 days post-transplant – chronic GVHD
  – Other clinical and histological (biopsy or post-mortem) features.

• Currently, GVHD is classified as acute or chronic based on:
  – clinical and histological features
  – Not based on time post-transplant
Acute GVHD Grading Scale

- Based on clinical evidence (physician observation)
- Based on the criteria published by Przepiorka et al., Bone Marrow Transplant 1995; 15(6):825-8
# Acute GVHD Staging

<table>
<thead>
<tr>
<th>Stage</th>
<th>Skin</th>
<th>Liver</th>
<th>Gut</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rash on &lt;25% of skin&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Bilirubin 2-3 mg/dl&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Diarrhea &gt; 500 ml/day&lt;sup&gt;c&lt;/sup&gt; or persistent nausea&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>2</td>
<td>Rash on 25-50% of skin</td>
<td>Bilirubin 3-6 mg/dl</td>
<td>Diarrhea &gt;1000 ml/day</td>
</tr>
<tr>
<td>3</td>
<td>Rash on &gt;50% of skin</td>
<td>Bilirubin 6-15 mg/dl</td>
<td>Diarrhea &gt;1500 ml/day</td>
</tr>
<tr>
<td>4</td>
<td>Generalized erythoderma with bullous formation</td>
<td>Bilirubin &gt;15 mg/dl</td>
<td>Severe abdominal pain with or without ileus</td>
</tr>
</tbody>
</table>
### Acute GVHD Grading

<table>
<thead>
<tr>
<th>Grade&lt;sup&gt;e&lt;/sup&gt;</th>
<th>Stage 1-2</th>
<th>None</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Stage 3 or</td>
<td>Stage 1 or</td>
<td>Stage 1</td>
</tr>
<tr>
<td>II</td>
<td>—</td>
<td>Stage 2-3 or</td>
<td>Stage 2-4</td>
</tr>
<tr>
<td>III</td>
<td>Stage 4</td>
<td>Stage 4</td>
<td>—</td>
</tr>
</tbody>
</table>

<sup>e</sup> Use “Rule of Nines” (Table 4) or burn chart to determine extent of rash.

<sup>f</sup> Range given as total bilirubin. Downgrade one stage if an additional cause of elevated bilirubin has been documented.

- Volume of diarrhea applies to adults. For pediatric patients, the volume of diarrhea should be based on body surface area. Downgrade one stage if an additional cause of diarrhea has been documented.
- Persistent nausea with histological evidence of GVHD in the stomach or duodenum.
- Criteria for grading given as minimum degree of organ involvement required to confer that grade.
- Grade IV may also include lesser organ involvement with an extreme decrease in performance status.
Form 2450
Post-Transplant Essential Data (TED)

15 Maximum Grade of Acute GVHD

- 0
- I
- II
- III
- IV
- Present, grade unknown

16 Maximum extent of Chronic GVHD during this period:

- None
- Limited
- Extensive
- Unknown

17 Date of diagnosis of chronic GVHD: __ __ __ - __ __ __

18 Continued from last report (answer is only valid on > d100 evaluation)

- Yes
- No
Form 2100
100 Days Post-HSCT Data

140 Did acute GVHD occur?
- Yes
- acute GVHD persists from prior HSCT / DCI
- No
- Unknown

141 Date of acute GVHD diagnosis: __ __ __ __ __ __ __ __
☐ Date is greater than 100 days; date is correct

142 Was the diagnosis based on evidence from a biopsy (histology)?
- yes
- no

Specify result(s):
143 gastrointestinal (GI)
- Positive
- Negative
- Inconclusive
- Not tested

144 Liver
- Positive
- Negative
- Inconclusive
- Not tested

145 Lung
List the maximum severity of organ involvement:

153 Skin
- no skin acute GVHD / rash not attributable to acute GVHD
- stage 0 – no rash
- stage 1 – maculopapular rash, < 25% of body surface
- stage 2 – maculopapular rash, 25–50% of body surface
- stage 3 – generalized erythroderma
- stage 4 – generalized erythroderma with bullae formation and desquamation

154 Lower intestinal tract: (use mL/day for adult recipients and mL/m²/day for pediatric recipients)
- no gut acute GVHD / diarrhea not attributable to acute GVHD
- Stage 0 – no diarrhea
- stage 0 – diarrhea <= 500 mL/day or < 280 mL/m²/day
- stage 1 – diarrhea > 500 but <= 1000 mL/day or 280-555 mL/m²/day
- stage 2 – diarrhea > 1000 but <= 1500 mL/day or 556-833 mL/m²/day
Maximum Grade of GVHD

• **Limited**
  – Includes only localized skin involvement and/or liver dysfunction.

• **Extensive**
  – Includes:
    • Generalized skin involvement and/or liver dysfunction
    • Liver histology showing chronic aggressive hepatitis, bridging necrosis, or cirrhosis
    • Involvement of the eye
    • Involvement of the salivary glands or oral mucous membranes
    • Involvement of any other target organ
Form 2100
100 Days Post-HSCT Data

<table>
<thead>
<tr>
<th>Chronic Graft vs. Host Disease (GVHD)</th>
<th>Questions: 188 - 259</th>
</tr>
</thead>
</table>

188. Has recipient developed clinical chronic GVHD?
- Yes
- chronic GVHD persists from prior HSCT / DCI
- No
- Unknown

189. Date of chronic GVHD diagnosis: ______-____-____
- Date is less than 100 days; date is correct

190. Onset of chronic GVHD was:
- Progressive (acute GVHD progressed directly to chronic GVHD)
- Interrupted (acute GVHD resolved, then chronic GVHD developed)
- De novo (acute GVHD never developed)
- chronic GHVD flare (symptoms reactivated within 30 days of drug tapering or discontinuation)

If the recipient is 16 years of age or older, complete the Karnofsky Scale. If the recipient is younger than 16 years of age, complete the Lansky Scale.

191. Karnofsky / Lansky score at diagnosis of chronic GVHD: ____________________________
Severity of GVHD

Mild

Signs and symptoms of chronic GVHD do not interfere substantially with function and do not progress once appropriately treated with local therapy or standard systemic therapy (corticosteroids and/or cyclosporine or FK 506)

Moderate

Signs and symptoms of chronic GVHD interfere somewhat with function despite appropriate therapy or are progressive through first line systemic therapy (corticosteroids and/or cyclosporine or FK 506)

Severe

Signs and symptoms of chronic GVHD limit function substantially despite appropriate therapy or are progressive through second line therapy
### Form 2100

**100 Days Post-HSCT Data**

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
</table>
| **194** Maximum grade of chronic GVHD: | - limited – localized skin involvement and/or hepatic dysfunction due to chronic GVHD  
- extensive - one or more of the following:  
  - generalized skin involvement, or,  
  - liver histology showing chronic aggressive hepatitis, bridging necrosis or cirrhosis, or,  
  - involvement of eye: Schirmer’s test with < 5 mm wetting, or,  
  - involvement of minor salivary glands or oral mucosa demonstrated on labial biopsy, or,  
  - involvement of any other target organ |
| **195** Overall severity of chronic GVHD: | - mild – signs and symptoms of chronic GVHD do not interfere substantially with function and do not progress once appropriately treated with local therapy or standard systemic therapy (corticosteroids and/or cyclosporine or FK 506)  
- moderate – signs and symptoms of chronic GVHD interfere somewhat with function despite appropriate therapy or are progressive through first line systemic therapy (corticosteroids and/or cyclosporine or FK 506)  
- severe – signs and symptoms of chronic GVHD limit function substantially despite appropriate therapy or are progressive through second line therapy |

---

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CENTER FOR INTERNATIONAL BLOOD & MARROW TRANSPLANT RESEARCH
Symptoms/Signs of Chronic GVHD

- Skin changes: thickening of skin, rashes, skin pigment changes
- Fingernails and toenails: texture changes or brittleness
- Eye: dryness or irritation, blurred or double vision
- Mouth: dryness, trouble swallowing, pain, sensitivity or sores
- Joints: pain, stiffness, decreased range of motion, tightness in fingers, wrists, elbows, ankles or knees
- Changes in weight
- Severe fatigue
- Coughing, shortness of breath, chest pain
- Difficulty or discomfort with urination
Form 2100
100 Days Post-HSCT Data

<table>
<thead>
<tr>
<th>Question</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>196</td>
<td>Sclerosis of skin</td>
</tr>
<tr>
<td></td>
<td>- yes</td>
</tr>
<tr>
<td>197</td>
<td>Was involvement proven by biopsy?</td>
</tr>
<tr>
<td></td>
<td>- yes</td>
</tr>
<tr>
<td>198</td>
<td>Other skin or hair involvement (rash, ulcers, pruritus or itching, dyspigmentation, alopecia, lichenoid skin changes, etc.)</td>
</tr>
<tr>
<td></td>
<td>- yes</td>
</tr>
<tr>
<td>199</td>
<td>Was involvement proven by biopsy?</td>
</tr>
<tr>
<td></td>
<td>- yes</td>
</tr>
<tr>
<td>200</td>
<td>Eyes (xerophthalmia (dry eyes), abnormal Schirmer’s test, abnormal slit lamp, corneal erosion / conjunctivitis, etc.)</td>
</tr>
<tr>
<td></td>
<td>- yes</td>
</tr>
<tr>
<td>201</td>
<td>Was involvement proven by biopsy?</td>
</tr>
<tr>
<td></td>
<td>- yes</td>
</tr>
<tr>
<td>202</td>
<td>Mouth (lichenoid changes, mucositis / ulcers, erythema, etc.)</td>
</tr>
<tr>
<td></td>
<td>- yes</td>
</tr>
</tbody>
</table>
Other Side Effects of Transplant

- Pulmonary abnormalities
- Liver toxicities
- New malignancies
- Depression
- Fatigue
- Memory/Concentration problems
- Infertility
- Sexual problems
Form 2100
100 Days Post-HSCT Data

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>376</td>
<td>avascular necrosis</td>
<td></td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>377</td>
<td>Date of diagnosis:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>378</td>
<td>cataracts</td>
<td></td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>379</td>
<td>Date of diagnosis:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>380</td>
<td>congestive heart failure (EF &lt; 40%)</td>
<td></td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>381</td>
<td>Date of diagnosis:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>382</td>
<td>diabetes / hyperglycemia</td>
<td></td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>383</td>
<td>Date of diagnosis:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>384</td>
<td>gonadal dysfunction / infertility requiring hormone replacement (testosterone or estrogen)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Form 2100
### 100 Days Post-HSCT Data

<table>
<thead>
<tr>
<th>Question</th>
<th>Description</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>433</td>
<td>Melanoma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>434</td>
<td>Date of diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>435</td>
<td>Other skin malignancy (basal cell, squamous)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>436</td>
<td>Date of diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>437</td>
<td>Specify other skin malignancy:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>438</td>
<td>Myelodysplasia (MDS) / myeloproliferative (MPS) disorder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>439</td>
<td>Date of diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>440</td>
<td>Oropharyngeal cancer (tongue, buccal mucosa)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>441</td>
<td>Date of diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>442</td>
<td>Sarcoma</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CIBMTR**

[Center for International Blood & Marrow Transplant Research](https://www.cibmtr.org)
Probability of Survival after Allogeneic Transplants for SAA, 2000-2010
- By Donor Type and Age -

\[
\begin{align*}
\leq 20\text{y, Sibling Donor (N=1,375)} & \quad > 20\text{y, Sibling Donor (N=1,425)} \\
\leq 20\text{y, Unrelated Donor (N=654)} & \quad > 20\text{y, Unrelated Donor (N=634)}
\end{align*}
\]
Resources

- Cibmtr.org
- LMS
- CRCs
- Mentors
Questions?
What we do for fun in Minnesota & Wisconsin during the winter