CIBMTR Data Life Cycle
Behind the scenes tour
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There are no conflicts of interest to disclose.
Disclosures

• I have no relevant financial or conflicts of interest to disclose
Outline

• What is the CIBMTR Data Life Cycle?
• Who decides what data the CIBMTR collects?
• How is this decision made?
• From whom do we get input on data collection?
Outline

• How do we make it happen?
• How do we ensure quality?
• Can we make it any easier?
• Why does it matter?
What is the CIBMTR Data Life Cycle?
Center Outcomes Cycle and Timeline

Continuous Data Collection, CPI, Data confirmation by centers

- **Data File preparation**
  - January - April

- **Analysis and Review**
  - May - August

- **Draft Report Submitted**
  - September 1

- **HRSA review and approval**
  - November

- **Publication – Centers and Website**
  - Dec - January
Data Life Cycle – Big Picture

- Receive
- Revise
- Review
- Use
- Integrate
Who decides what data CIBMTR collects?
Who decides what data CIBMTR collects?

- The HCT Community!
  - Transplant physicians and scientists
  - CIBMTR Advisory Committee, Working Committee leaders and members, center directors
  - Data professionals
  - Cord blood bank experts, donor experts
  - Peer Reviewers (indirect)

- Government partners (race/ethnicity)
- Industry partners
## Key Stakeholders

<table>
<thead>
<tr>
<th>Group</th>
<th>Stakeholder</th>
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</table>
| Scientists        | • Principal Investigators  
                    • Scientific Directors & Leaders  
                    • Working Committee members |
| Transplant Centers| • Medical Directors  
                    • Data Managers/Clinical Research Professionals  
                    • Hospital Administrators  
                    • IT/Informatics             |
| Government Agencies| • HRSA  
                    • FDA  
                    • NIH  
                    • DoD |
| Industry          | • Pharmaceutical  
                    • Biotechnology  
                    • Insurance  
                    • Vendors |
| Public            | • Donors  
                    • Patients  
                    • Families |
What principles guide data collection decisions?
What principles guide data collection decisions?

• Is there a guiding principle?
What principles guide data collection decisions?

“More is better?”
CIBMTR Mission:

• The CIBMTR collaborates with the global scientific community to advance hematopoietic cell transplantation (HCT) and cellular therapy worldwide to increase survival and enrich quality of life for patients.

• The CIBMTR facilitates critical observational and interventional research through scientific and statistical expertise, a large network of transplant centers, and a unique and extensive clinical outcomes database.
What principles guide data collection decisions?

- Purposes outlined in CIBMTR grants and contracts
- Collect data needed to support credible research
- Collect data needed to support contracts
  - HRSA, others
- Collect data needed to explore an emerging indication that will impact our field
- Business opportunities
What principles guide data collection decisions?

- These principles guide decisions about Utility and Risk/Benefit as data collection is operationalized
  - Can the data element be used?
  - Can the work be done without the data element?
  - Is it practical to collect the data elements?
    - Can it be accurately captured
    - Is the required effort justified by value
Who provides input on data collection?
Who provides input on data collection?

- Virtually speaking, the broad HCT community
  - CIBMTR Scientific Directors
  - Working Committee leadership, participants
  - CIBMTR auditors, data quality teams, CRC
  - CIBMTR Metadata and IT teams
  - Staff at centers
    - Center directors
    - Center administrators
    - Data professionals
Who provides input on data collection?

• Cord blood bankers and scientists
• Donor center staff and scientists
• ASBMT representatives (centers)
  – Quality Outcomes Committee
  – IT subcommittee
• Government representatives
  – Grant or contract-based interests
  – Office of Management and Budget
Who provides input on data collection?

• What are the venues?
  – Formal venues
    • CIBMTR Advisory Committee
    • Forms revision process
    • Center outcomes forum
  – Informal venues
    • Tandem, WC calls, industry requests, study requests
How do we make it happen?
Form Revision and Development Process

• Determine which forms to be revised
  – Age of form, changes in field, etc
• Engage relevant teams
  – Core teams at CIBMTR
  – Scientific expertise
• Solicit suggestions and participation
• Revision committee meets regularly
• Revision committee finishes draft
## Initial Review Committee

### IRC Members

<table>
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<tr>
<th>Role</th>
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<tbody>
<tr>
<td>Form revision coordinator</td>
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<tr>
<td>Scientific director of working committee</td>
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<tr>
<td>Subject matter experts (SMEs)</td>
</tr>
<tr>
<td>Data managers</td>
</tr>
<tr>
<td>CRC representative</td>
</tr>
<tr>
<td>Audit team representative</td>
</tr>
<tr>
<td>Statistician</td>
</tr>
<tr>
<td>Metadata representative</td>
</tr>
<tr>
<td>Management representative</td>
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<td>Stakeholders (as needed)</td>
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CIBMTR

CENTER FOR INTERNATIONAL BLOOD & MARROW TRANSPLANT RESEARCH
Form Revision and Development Process

• Proposed revisions reviewed by Scientific Directors, staff

• Iterative process involving stakeholders until final approval
  – Link changes to relevant published/accepted criteria

• Integrate input of database and AGNIS teams
  – Define the data standards
  – Define CDEs - future interoperability
Form Revision and Development Process

• Testing by staff at centers
  – Any issues with flow or comprehension?
  – Time to complete forms?
• Final iteration of revised form
• Integrate changes to FN, AGNIS, Database
• Prepare list of changes for communication
• Prepare for OMB approval
• Develop release schedule and center awareness
Form Revision and Development Process

• Form Entry and database systems
  – Metadata work
  – Data Operations Form Entry – levels, floating text, validations
  – Development
  – Audit
  – AGNIS
Form Revision and Development Process

• OMB Approval
  – Some forms require OMB approval
  – Can be a long process (6+ months), but there are also exceptions
    • 60 day notice, 30 day notice, review and approval
    • Change request vs. full approval
How do we ensure quality?
Ensuring quality – Study based use

Data collection → Data Validation

Queries → Data Processing

Data Use
Quality is crucial

• Data elements and forms design
  – Question and response structure

• Data capture
  – Input masking, ranges, cross field checks, missing data

• Standard quality checks after entry - DQT

• CPI program – completeness

• Study and project related queries

• Auditing
Data Quality Initiative

• Centralized coordination of data quality efforts to increase data quality and decrease turnaround time while tracking progress

• Collaborate with:
  • CRCs to prioritize workloads and improve data quality
  • Audit Team to enhance manual as issues are identified
  • Training Coordinator to develop materials
  • FormsNet SMEs to improve validation
  • Forms Revision SMEs to request form changes to improve data quality
CPI Requirements

- 90% completion of all forms
- IRB documents current
- Consecutive Reporting of Hematopoietic Cell Transplants (HCTs)
CIBMTR CPI Due Process

- Good Standing
- 1st Warning
- Probation
- Suspension
Audit
Purpose of CIBMTR Audits

• Assess the quality and accuracy of the data submitted to the CIBMTR
• Identify errors in reporting data
• Implement corrective action plans to help prevent future errors
• Provide additional on-site training and address questions about reporting
CIBMTR Audits

- Audits are scheduled on a 4 year cycle
- New transplants will be audited (since the date of previous audit)
- 16 transplants are randomly selected for audit review
- Transplants must have the Pre-TED and 100-Day report form complete (100 Day Post-TED or 100 Day Post-HSCT)
- Once selected, forms are locked in FormsNet
CIBMTR Audit Process

• **Critical Field**
  – Data in these fields is deemed critical to outcomes based research
  – Examples of a critical field: KPS, Disease Status, GVHD, Pre Reg drugs

• **Random Field**
  – Randomly selected non-critical data field
  – Increased validity of audit
  – Examples of a random field: Organ toxicity, drug dosages, prophylaxis drugs (GVHD, Infection)
Audit Results

≤3% Critical Field Error Rate
Passed

>3% Critical Field Error Rate
FAIL

Corrective Action Plan needed when:
>3% Critical Field error rate
Systemic reporting issues
Missing documentation
Consent issues
Can we make it any easier?
Can we make it any easier?

- Improvements in question and form design
- Improvements in data collection platform
- Moving towards greater automation
  - Data standards and interoperability
  - AGNIS
  - EMR User group
- What will Artificial Intelligence do for us?
Background

• AGNIS® (A Growable Network Information System)
  – Powerful open-source messaging system
  – Designed to exchange hematopoietic cell transplant data using a secure, standards-based system
  – Decreases the burden of duplicate manual data entry
  – Valuable for centers that have adopted it directly
  – Integrated into HCT-specific vendor products (Stemsoft, OTTR, Mediware, etc.)
  – Requires significant effort to map from center-based information systems to data standards
Building a better AGNIS

- Use of widely accepted healthcare informatics standards – those that embrace modern approaches to data exchange
- Semantic foundation already developed for AGNIS using
  - cancer Data Standards Registry and Repository Common Data Elements
    - caDSR CDEs
  - HCT domain of the Biomedical Research Integrated Domain Group model
    - BRIDG
    - FDA, CDISC, NCI, HL7, ISO
- Rapidly emerging Health Level Seven® (HL7®) Fast Healthcare Interoperability Resources® (FHIR®)
What is HL7 FHIR?

- Newest Standard for electronic exchange of healthcare information
- Immense interest from biomedical and bio-informatics community
  - Epic, Cerner, MEDITECH, Athena, McKesson, Mayo, Intermountain, Partners
- Increasing adoption at medical centers, lab vendors
- Because it is standards based, could represent opportunity to exchange data with certain entities that have already mapped to data standards and bypass mapping at level of individual centers
  - Laboratory data, genetic/molecular testing, some standard EMR data
- Project underway by CIBMTR to develop foundation and exchange patient data from EMR using HL7 FHIR
- CIBMTR exploring future utility, grant funding
Why does it matter?
Why does it matter?

• CIBMTR’s most essential work products rely on the data
  – Publications
  – Information
  – Analytics and Reports

• Inform
  – Physicians and scientists
  – Patients
  – Payers
  – Policy makers
Cumulative Publications 1972-2016
Working Committee Studies

• >2,800 researchers participate in WCs
• 204 proposals submitted for the 2018 WC meetings; 98 to be presented
• 60 ongoing collaborative studies with numerous organizations, including international and US-based hospitals, research centers, universities, and other registries
SCIENTIFIC WORKING COMMITTEES

15 Scientific Working Committees
47 HCT global experts chair committees in their field – thousands participate

59 publications in 2017
>2,800 worldwide researchers
30 presentations this year
>175 ongoing studies
## PRESENTATIONS

71

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<th>Oral</th>
<th>Poster</th>
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<tr>
<td>BMT Tandem Meetings</td>
<td>13</td>
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<td>19</td>
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<td>American Society of Clinical Oncology (ASCO) Annual Meeting</td>
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<td>3</td>
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<tr>
<td>International Myeloma Workshop</td>
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<tr>
<td>European Federation for Immunogenetics (EFI)</td>
<td>0</td>
<td>2</td>
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<tr>
<td>Other Meetings and Conferences*</td>
<td>5</td>
<td>7</td>
<td>12</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>38</td>
<td>33</td>
<td>71</td>
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PUBLICATIONS BY YEAR – 82 in 2017
It Takes a Village………..
CIBMTR PUBLICATIONS
by Federal U24 Grant Periods

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<td>295</td>
<td>357</td>
<td>585</td>
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<tr>
<td># Different institutions</td>
<td>98</td>
<td>158</td>
<td>211</td>
<td>289</td>
<td>450</td>
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~40% of studies led by junior investigators (paired with senior investigators)

* First 4 years of grant period 2013-2017
One specific use case – Center specific survival analysis

• What happens when – a center gets a “-1”?

• What is the first question the center director asks?
  – Is my data accurate?

• What is the next assertion that is made?
  – CIBMTR’s disease risk adjustment variables are not sufficient to accommodate the patients transplanted at xxx center
Revising data collection?

• In late 2013, CIBMTR revised the TED data collection forms

• Why did we do that?
  – Increase the pain of data professionals?
  – We chose the fields to add using random number generator?
  – Update for studies
  – Response to the HCT community in the Center Outcomes Forum – Center Specific Survival Analysis
Plans for enhanced risk adjustment

- Feedback at Center Outcomes Forum 2010 and 2012 and ASBMT Quality Outcomes Committee led to significant changes in TED-level data collection to improve risk adjustment
  - Careful weighing burden vs. benefit
  - Incorporated October 2013
- These data are now available to test in multivariate modeling.
Enhanced Risk Adjustment

• Demographics – SES using residential Zip
• Myeloma –
  – Cytogenetic risk groups, ISS at dx, Disease status at HCT, plasma cell leukemia
• AML
  – ELN risk (combines cytogenetic and molecular), transformed from MDS, therapy-related or pre-disposing, # induction cycles patients in CR
Enhanced Risk Adjustment

- **ALL**
  - Cytogenetic risk group, molecular markers, induction cycles for pts in CR
- **MDS**
  - IPSS-R (cytogenetic risk group, BM blasts, Hgb, Plt, ANC), therapy related or pre-disposing
- **CLL** – 17p deletion, disease status at HCT