How do we achieve the outcomes that are important to patients?
HCT AS HEALTH CARE ROLE MODEL

• Standard of care and only potentially curative therapy for many diseases.
  − Dramatic improvements in effectiveness/survival

• Ahead of the curve for health care reform:
  − Bundled payment model = global case rate
  − Quality/Value based networks = Transplant “Centers of Excellence” Model
  − Mandated reporting to central registry = CIBMTR and the SCTOD
  − Public reporting of outcomes = Center-specific 1-year survival

• True partnership with payers:
  − Active, engaged multidisciplinary Advisory Group
  − Collaboration to co-author publications, develop unifying standards

SO, WHY ARE WE TALKING ABOUT VALUE??
WHAT IS VALUE?

Value proposition= HCT is potentially curative, but expensive.

20 YEARS OF CLINICAL PROGRESS = DRAMATIC IMPROVEMENT IN SURVIVAL

Improved Survival with Unrelated Transplantation

<table>
<thead>
<tr>
<th>TRANSPLANT PERIOD</th>
<th>ONE-YEAR SURVIVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009-2011</td>
<td>63.6%</td>
</tr>
<tr>
<td>2008-2010</td>
<td>61.8%</td>
</tr>
<tr>
<td>2007-2009</td>
<td>60.3%</td>
</tr>
<tr>
<td>2004-2008</td>
<td>57.9%</td>
</tr>
<tr>
<td>2003-2007</td>
<td>56.3%</td>
</tr>
<tr>
<td>2002-2006</td>
<td>54.0%</td>
</tr>
<tr>
<td>2001-2005</td>
<td>51.5%</td>
</tr>
<tr>
<td>2000-2004</td>
<td>48.5%</td>
</tr>
<tr>
<td>1996-2001</td>
<td>42.2%</td>
</tr>
</tbody>
</table>

1st allogeneic HCT, U.S. transplant centers
SOURCE: CIBMTR®, the research program of NMDP/Be The Match
## AND...
### 20 YEARS OF CLINICAL PROGRESS = INCREASING EXPENSE

<table>
<thead>
<tr>
<th>Year</th>
<th>Auto HCT</th>
<th>Auto PMPM</th>
<th>Allo HCT</th>
<th>Allo PMPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>$378,000</td>
<td>$1.11</td>
<td>$930,600</td>
<td>$2.22</td>
</tr>
<tr>
<td>2011</td>
<td>$363,800</td>
<td>$1.22</td>
<td>$805,400</td>
<td>$1.60</td>
</tr>
<tr>
<td>2008</td>
<td>$300,400</td>
<td>$0.93</td>
<td>$676,800</td>
<td>$1.61</td>
</tr>
<tr>
<td>2007</td>
<td>$273,100</td>
<td>$0.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RD: $478,600</td>
<td>URD: $602,200</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RD: $0.66</td>
<td>URD: $0.53</td>
</tr>
<tr>
<td>2005</td>
<td>$219,300</td>
<td>$0.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RD: $386,300</td>
<td>URD: $481,900</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RD: $0.59</td>
<td>URD: $0.37</td>
</tr>
</tbody>
</table>

Source: Milliman Cost of Transplant Report, 2005-2014
Estimated billed charges, 30 days prior to 180 days post
PMPM = Per member, per month; Under 65 years of age.

"BUT IF IT CURES PEOPLE, THEY WILL NEED TO PAY FOR IT."

7/20/2015
“THEY” IS NOT WHO YOU THINK IT IS.

Patients and Families

Physicians and Hospital Groups

Employers and HIX Shoppers

Value proposition= HCT is potentially curative but expensive

Value = Quality/Cost
EMERGING PAYMENT MODELS WILL TAKE VARIOUS FORMS

HCT CONTRACTING STRUCTURE

Pre-transplant period
- Transplant consult
- Evaluation of disease status
- Evaluation of organ function
- Identification of donor
- Psychosocial evaluation
- Specialty consultation
- Patient and donor qualification

Transplant period
- Mobilization and collection of HC
- Conditioning regimen (In or outpt)
- Infusion of HC
- Hospitalization/and/or outpatient post transplant supportive care
- Management of HCT related complications

Post-transplant period
- Hospitalization or outpatient supportive care
- Management of HCT related complications
HCT Contracting Structure

Pre-transplant period  ➔  Transplant period  ➔  Post-transplant period

Structure
- Facilities
- Staffing
- Credentialing

Process
- Quality assurance
- SOPs
- Pathways/Protocols

Outcome
- 100 day survival
- 1 year survival

CIBMTR  FACT  SCTOD  Volume

VALUE OF CIBMTR

900+ publications; 250 active research studies
Data on 300,000 HCTs
1 Year Survival Outcome Measure

Actionable Information on What Works
“JACIE” accreditation status of the transplant team by November 2012 and outcome of patients transplanted between 1999 and 2006.

OUTCOMES

Adjusted Survival Rates for Transplant Centers with 81–100 Transplants

Adjusted Survival with 95% Confidence Interval

Dashed line indicates overall network survival rate of 56.6%.
A dot below (above) the box indicates an under (over)-performing center relative to the network.
Improvement in composite process measures among hospitals engaged in both pay for performance and public reporting and those engaged only in public reporting.

**WHAT IS VALUE?**

Value proposition = HCT is potentially curative but expensive

Value = Quality/Cost

Value = Health outcomes that matter to patient Cost of Delivery

Adapted from Porter 2015
HCT PROCESS: Achieving outcomes that matter to patients

- Diagnosis
- Induction
- Consolidation
- Referral
- Coordination of care:
  - Right patient
  - Right treatment
  - Right time

MDS CED Resulted in Greater Access for Beneficiaries

Assessment of allogeneic HCT in Medicare beneficiaries with MDS (10 CMS-MDS-1).
SURVIVAL OF PATIENTS WITH EARLY, INTERMEDIATE, AND ADVANCED DISEASE BY DEGREE OF HLA MATCHING


©2007 by American Society of Hematology

HCT in advanced disease:
- inferior outcomes
- more expensive

BLOOD CANCER – CRITERIA FOR CENTERS OF EXCELLENCE*

Leadership
- Defined Structure
- Multidisciplinary Oversight
- Hematological Malignancy tumor boards

Accreditations / Eligibility
- 50 new Acute Leukemia pts/yr

Facility / Equipment
- ICU, OR, ER, dedicated IP services
- Apheresis, Dialysis, and OP services, close proximity to XRT
- IP & OP Imaging services

Physicians & APPs
- Licensed, residency in IM and fellowship in Hem/Med Onc
- Licensed, specific training and competency in hematology-related cognitive and procedural skill

Nurses
- Formally trained/ experienced in management of acute leukemic and hematological cancers – ONS Chemio Certified
- Competencies to intervene and manage complications, i.e. neutropenic fever, infectious and non-infectious processes, nausea, pain management

Support Teams
- Oncology PharmD, Dieticians, Social Workers
- Participates in multidisciplinary care
- Participates in developing order sets and treatment guidelines

TREATMENT OF AML IN A SARAH CANNON BLOOD CANCER CENTER OF EXCELLENCE ASSOCIATED WITH FAVORABLE OUTCOMES

AML 5-Year Observed Survival
PSLMC Analytic Cases Compared to NCDB

Data specific to Presbyterian-St. Luke’s Hospital in Denver, CO (2003-2009)

HCT PROCESS: ACHIEVING OUTCOMES THAT MATTER TO PATIENTS

Diagnosis → Pre-transplant period → Transplant period → Post-transplant period → Survivorship

Dimensions

- Survival
- Degree of health or recovery
- Time to recovery and time to return to normal activities
- Disability of care or treatment process (e.g., ineffective care, complications)
- Sustainability of health or recovery and nature of recurrences

Hematopoietic cell transplant

- Survival rate (1-yr, 5-yr, longer)
- Remission, functional status, QOL
- Time to achievement of functional status, return to work
- GVHD, infections, acute organ toxicity, hospital readmissions, length of hospital stay
- Cancer recurrence, non-relapse mortality, sustainability of functional status and QOL
- Late organ toxicity, late infections, second cancers, long-term QOL impairment
HCT PROCESS: ACHIEVING OUTCOMES THAT MATTER TO PATIENTS

What can we do to improve value for HCT global period?

- Improve care coordination
- Improve efficiency of care
- Reduce unnecessary care

Shift in Payer Mix: Disappearing Margins

Adult HCT Programs, NMDP data

2005

- Commercial: 84%
- Medicare: 10%
- Medicaid: 5%
- Other: 1%

2015

- Commercial: 25%
- Medicare: 15%
- Medicaid: 54%
- Other: 1%
Medicare Reimbursement Does Not Cover Costs

- Inpatient (IPPS) Payment Base, FY15:
  - MS-DRG 014: Allogeneic: $64,432
  - MS-DRG 016: Auto w/ MCC/CC: $34,477
  - MS-DRG 017: Auto w/o MCC/CC: $24,402

- Outpatient (OPPS):
  - Allo and Auto Transplant. APC 112, CY15: $2,844.69

These rates **INCLUDE** payment for donor search & acquisition. - NMDP invoices, TC labs, testing of patient and siblings, etc.

Cell source treated as blood product, becomes expense for TC.
- TCs starting to choose least expensive effective option.

**SARAH CANNON/VELOS PRODUCT OVERVIEW**

- CIBMTR Submission and Retrieval of 15 Key Forms through the AGNIS interface
- Data residing in Velos to automate to forms
- Data Managers to Validate and complete form
- Submission to CIBMTR

- Management of Processing of Stem Cell Products
- ISBT-128 embedded into the workflow
- Inventory Management of Cells for Cryopreservation
- Storage, Release, Shipping, Infusion captured

- Real Time Monitoring and Alert system that manages the overall quality and compliance at the local and enterprise level
- Integrated protocols and standards
- Corrective Action Workflow management

- Management of Recipients & Donors from Referral through Transplant
- Up to Date information on all patients in the program utilizing a built in Patient Tracker

- Management of the Collection Process for Donors
- Implementing ISBT-128 Standards for Product Management

**MEDITECH Data Feed**

**Cell Therapy Lab.**

**Apheresis**

**Clinical**

**Data Mgmt**

**SARAH CANNON/VELOS PRODUCT OVERVIEW**

**SARAH CANNON**

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POSSIBLE MEASURES FOR PAY FOR PERFORMANCE

<table>
<thead>
<tr>
<th>Measure</th>
<th>Meaningful</th>
<th>Measureable</th>
<th>Actionable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Yr. OS</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>FACT</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>100 day OS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Readmission</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cGVHD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pt. Reported Outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Marrow vs PBSC</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time to ABX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Survivorship Measures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eligibility Criteria/Pathways</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

INCIDENCE OF CHRONIC GVHD

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Log[Hazard Ratio]</th>
<th>SE</th>
<th>PBSC Total</th>
<th>EMT Total</th>
<th>Weight</th>
<th>Hazard Ratio, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5.1 Related donor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coombes 2002</td>
<td>-0.09</td>
<td>0.16</td>
<td>103</td>
<td>118</td>
<td>28.2%</td>
<td>0.91 [0.87, 1.25]</td>
</tr>
<tr>
<td>Friederichs 2010</td>
<td>-0.53</td>
<td>0.17</td>
<td>163</td>
<td>166</td>
<td>25.0%</td>
<td>0.59 [0.42, 0.82]</td>
</tr>
<tr>
<td>Powles 2009</td>
<td>-0.33</td>
<td>0.16</td>
<td>220</td>
<td>16</td>
<td>4.4%</td>
<td>0.72 [0.52, 1.04]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>292</td>
<td>303</td>
<td>57.3%</td>
<td>0.74 [0.60, 0.92]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5.2 Unrelated donor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amoselli 2012</td>
<td>-0.26</td>
<td>0.13</td>
<td>262</td>
<td>264</td>
<td>42.7%</td>
<td>0.70 [0.54, 0.90]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td></td>
<td></td>
<td>554</td>
<td>567</td>
<td>100.0%</td>
<td>0.72 [0.61, 0.85]</td>
</tr>
</tbody>
</table>

Heterogeneity: Not applicable
Test for overall effect: Z = 2.77 (P = 0.006)

Bone marrow versus peripheral blood allogeneic haematopoietic stem cell transplantation for haematological malignancies in adults.
Holtick U, Albrecht M, Chemnitz JM, Theurich S, Skoetz N, Scheid C, von Bergwelt-Baldon M

### TIME TO INITIAL ANTIBIOTICS

<table>
<thead>
<tr>
<th>Study and Setting</th>
<th>Definition of Malaria</th>
<th>ED Patient Shocks</th>
<th>Mean-AUC</th>
<th>Demographic Distribution</th>
<th>Antimicrobial in the ED</th>
<th>Overall Mortality</th>
<th>Time to Initial Antibiotic Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pirofsky et al., 2004 Hospital of the University of Pennsylvania (USA)</td>
<td>Cholestroltherapy or radiation therapy</td>
<td>55</td>
<td>488/698</td>
<td>Mean age 56.9y, -1/3 men</td>
<td>100%</td>
<td>10.2%</td>
<td>150 minutes (mean)</td>
</tr>
<tr>
<td>Neumann et al., 2004 New York Presbyterian Hospital/Columbia University (USA)</td>
<td>Cholestroltherapy</td>
<td>09</td>
<td>488/698</td>
<td>Mean age 56.9y, -1/3 men</td>
<td>100%</td>
<td>10.2%</td>
<td>150 minutes (mean)</td>
</tr>
<tr>
<td>Courtois et al., 2007 Northwestern Memorial Hospital (USA)</td>
<td>Cholestroltherapy</td>
<td>09</td>
<td>488/698</td>
<td>Mean age 56.9y, -1/3 men</td>
<td>100%</td>
<td>10.2%</td>
<td>150 minutes (mean)</td>
</tr>
<tr>
<td>Loo et al., 2012 University of Alberta Hospital (Canada)</td>
<td>Cholestroltherapy</td>
<td>09</td>
<td>488/698</td>
<td>Mean age 56.9y, -1/3 men</td>
<td>100%</td>
<td>10.2%</td>
<td>150 minutes (mean)</td>
</tr>
<tr>
<td>Sharp et al., 2012 Royal Alexandria Hospital, Sunnybrook, and Michael Garron Community Hospital (Canada)</td>
<td>Cholestroltherapy</td>
<td>09</td>
<td>488/698</td>
<td>Mean age 56.9y, -1/3 men</td>
<td>100%</td>
<td>10.2%</td>
<td>150 minutes (mean)</td>
</tr>
<tr>
<td>Andre et al., 2012 47 French Hospitals (France)</td>
<td>Cholestroltherapy</td>
<td>09</td>
<td>488/698</td>
<td>Mean age 56.9y, -1/3 men</td>
<td>100%</td>
<td>10.2%</td>
<td>150 minutes (mean)</td>
</tr>
</tbody>
</table>

#### Door to ABX

<table>
<thead>
<tr>
<th>Time in minutes</th>
<th>Pre-ABX ONC ALERT</th>
<th>Post-ABX ONC ALERT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>144</td>
<td>63</td>
</tr>
<tr>
<td>Median</td>
<td>159</td>
<td>52</td>
</tr>
<tr>
<td>Range</td>
<td>41-234</td>
<td>35-114</td>
</tr>
</tbody>
</table>

#### Audit Period

<table>
<thead>
<tr>
<th>2nd Audit Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Median</td>
</tr>
<tr>
<td>Range</td>
</tr>
</tbody>
</table>

---

**Recommended Post-Transplant Care**

Recommended Screening and Preventive Practices for Long-Term Survivors after HCT

Navneet S. Majhail et al. BBMT 2012. 18 (3):348–371

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**Recommended Screening and Preventive Practices**

**for Long-Term Survivors after HCT**

Navneet S. Majhail et al. BBMT 2012. 18 (3):348–371
SUMMARY

Goals need to be clearly defined
- In the long term, must be outcome based
- In the near term, need to define high value processes leading to best outcomes
  - Improve care coordination and efficiency while reducing unnecessary care
  - Integrate pre and post transplant care into outcome goals

Careful consideration must be given to metrics
- Meaningful, measurable, actionable
- Metrics that leverage CIBMTR data sets preferable
- Partnership with patients and payers in determining comparative effectiveness and value going forward

Incentives need to be aligned with responsible parties