Economic Challenges in Hematopoietic Cell Transplantation:
How will new and old centers face the future?

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Disclosures

None pertinent to this topic

Recent industry relationships
Consultant: Alexion, Amgen, Kadmon, Enlivex
Research support: Alexion
Biotechnology Medicines in Development—by Therapeutic Category

- Autoimmune Disorders: 69
- Blood Disorders: 32
- Cancer/Related Conditions: 352
- Cardiovascular Disease: 59
- Diabetes/Related Conditions: 24
- Digestive Disorders: 27
- Eye Conditions: 20
- Genetic Disorders: 19
- Growth Disorders: 5
- HIV Infection: 39
- Infectious Diseases: 188
- Musculoskeletal Disorders: 22
- Neurologic Disorders: 44
- Respiratory Disorders: 40
- Skin Disorders: 28
- Transplantation: 18
- Other Diseases: 36
Today we are not discussing

• New high cost drugs, biologicals

• Lots of editorials and attention

• Back to basics of cost-appropriate care
Needs Analysis—> How many HCTs?

Using the optimal transplant rate for the population:

The US needs allogeneic (related and unrelated) HCT $\sim 18,000/\text{yr}$.

- Related – 5,500/ yr
- Unrelated – 12,500/ yr

Recent HCT in US only:
- 2015 = $\sim 8,000/\text{yr}$ shortage of $\sim 10,000$
- 2005 = $\sim 2,500/\text{yr}$

*Need Gap is Larger in many parts of the world*

Attributed to NMDP health resource group
**Table 1. Commonly performed procedures with the most rapidly increasing hospital inpatient costs, 2004–2007**

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Bone marrow transplant</td>
<td>$1,282,645,000</td>
<td>15,100</td>
<td>84.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open prostatectomy</td>
<td>$1,032,016,000</td>
<td>88,500</td>
<td>68.6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aortic resection; replacement or anastomosis</td>
<td></td>
<td></td>
<td>31.9%</td>
<td></td>
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</tr>
<tr>
<td>Cancer chemotherapy</td>
<td></td>
<td></td>
<td>14.2%</td>
<td></td>
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<tr>
<td>Spinal fusion</td>
<td></td>
<td></td>
<td>15.6%</td>
<td></td>
<td></td>
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<tr>
<td>Lobectomy or pneumonectomy</td>
<td></td>
<td></td>
<td>24.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incision and drainage of subcutaneous tissue</td>
<td></td>
<td></td>
<td>31.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arthroplasty knee</td>
<td>$9,217,740,000</td>
<td>605,200</td>
<td>27.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nephrectomy and nephrostomy</td>
<td>$682,609,000</td>
<td>38,600</td>
<td>25.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mastectomy</td>
<td>$660,173,000</td>
<td>70,100</td>
<td>23.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total for top 10 procedures</strong></td>
<td><strong>$29,094,452,000</strong></td>
<td><strong>1,657,100</strong></td>
<td><strong>32.3%</strong></td>
<td><strong>$29,094,452,000</strong></td>
<td><strong>1,657,100</strong></td>
</tr>
</tbody>
</table>

*2004 costs were adjusted to 2007 dollars using the overall Consumer Price Index.
Financial Challenges in HCT

HCT- big expense (billions)

Outcomes - unsuccessful for 40-60% of people

→ How many billions of $ can be retargeted for alternate use --- or

→ How must we save per HCT?
## Costs during first 100 days

<table>
<thead>
<tr>
<th></th>
<th>Auto</th>
<th>Allo</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>1678</td>
<td>1320</td>
</tr>
<tr>
<td>Hospital stay in days,</td>
<td>median</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>31</td>
</tr>
<tr>
<td>Outpatient clinic visits</td>
<td>median</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>22</td>
</tr>
<tr>
<td>Total costs, median</td>
<td>$99,899</td>
<td>$203,026</td>
</tr>
<tr>
<td>1st hospitalization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>costs, median</td>
<td>$82,606</td>
<td>$151,899</td>
</tr>
<tr>
<td>Later hospital costs,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>median</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Outpatient costs, median</td>
<td>$7,462</td>
<td>$20,767</td>
</tr>
</tbody>
</table>

Later hospital costs, median:

- Auto: $0
- Allo: $0

Outpatient costs, median:

- Auto: $7,462
- Allo: $20,767

Majhail, BMT 2013
High variation in costs between individual patients

29% of costs for 10% of pts

Maziarz, ASH, 2015
How can we limit the costs of HCT?
What interventions are worth it?
In whom and how often?

Research Costs of HCT tests —> Retail 5x higher.

- CMV DNA PCR $60 weekly thru d 100 $3600 longer if GVHD?
What new interventions are worth it?  
In whom and how often?

Research Costs of HCT tests —> Retail 5x higher.

- CMV DNA PCR $60 weekly thru d 100 $3600 longer if GVHD?

- HHV6 DNA PCR $69 weekly thru d 100 $4140 Only UCB?

- EBV DNA PCR $63 biweekly thru d100 $1890 Only if ATG, mismatched or T cell depleted
What is the value added?

Neutropenic; Fever; Ill-appearing

<table>
<thead>
<tr>
<th>Research costs (x3 for retail)</th>
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</thead>
<tbody>
<tr>
<td>Chest xray</td>
</tr>
<tr>
<td>$75 = $225</td>
</tr>
<tr>
<td>CT scan Chest</td>
</tr>
<tr>
<td>$530 = $1590</td>
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</table>
What is the value added?

Neutropenic; Fever; Ill-appearing

Research costs (x3)

Chest xray $75 = $225

Does a normal CXR eliminate the CT?

If CXR abnormal, then CT follows anyway

CT scan Chest $530 = $1590
What is the value added?

Restaging NHL/HL post HCT

<table>
<thead>
<tr>
<th>CT scan</th>
<th>Chest abd pelvis</th>
<th>Research costs (x3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$530 (x 3 = $1590)</td>
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</tbody>
</table>

PET CT scan Chest abd pelvis | $2050 (x 3 = $6050)

pre-HCT; d100, 6,9,12,18,24 months = 7 scans

$11,130 vs. $42350

When is PET informative? and for whom? Stop at 24m?
THE COST-EFFECTIVENESS PLANE

Existing treatment dominates

New treatment more costly

New treatment more effective but more costly

New treatment less costly

New treatment less effective

New treatment less costly but less effective

New treatment dominates

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THE COST-EFFECTIVENESS PLANE

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New treatment less costly

New treatment less costly but less effective

New treatment dominates

But we often choose what’s NEW anyway
Cost Effectiveness of HCT—limitations of the data

Long term costs
   Chronic GVHD; Late effects

Patient financial burden
   Out of pocket
   Lost wages
   Housing away from home
   Disability before returning to work or school

New techniques, New drugs

Expenses for relapse – or its prevention

Adapted from Khera, Blood 2012
How to Choose wisely

We must study more aspects of the topic

New Drugs; Biologics; Cell therapies

New advances are from Star Wars science
But the costs may be out of this world