Do stem cell transplants need to be so expensive?
What is really necessary?

*The Indian Experience*

Alok Srivastava
Christian Medical College
Vellore, India
GLOBAL HEMATOPOIETIC STEM CELL TRANSPLANTATION (HSCT) AT ONE MILLION: AN ACHIEVEMENT OF PIONEERS AND FORESEEABLE CHALLENGES FOR THE NEXT DECADE. A REPORT FROM THE WORLDWIDE NETWORK FOR BLOOD AND MARROW TRANSPLANTATION (WBMT)

Dietger Niederwieser, Marcelo C Pasquini, Mahmoud D. Aljurf, Dennis L. Confer, Helen Baldomero, Luis Fernando Bouzas, Mary M. Horowitz, Minako Iida, Yoshihisa Kodera, Jeffrey H. Lipton, Machteld Oudshoorn, Eliane Gluckman, Jakob R. Passweg, Jeffrey Szer, Nicolas Novitzky, Jon J. van Rood, Luc Noel, J. Alejandro Madrigal, Karl Fruendorfer, Alois Gratwohl and Frederick R. Appelbaum

Blood 2013 122:2133;
The Asia Pacific Region >55% of world pop.

~75% of the first 1 million HSCT for <30% of the world population
All HSCTs in Asia Pacific by country

No. of HSCTs: >20,000 HSCT/year

This data is not for distribution
INDIAN STEM CELL TRANSPLANT REGISTRY (2015)

Number of Transplants – India (N=10389)

*Real issue is ACCESS to HSCT

*COST - a surrogate marker to define ACCESS

*Is COST the only barrier to ACCESS?

*How should COST issues be addressed?
Reasons for limited access to HSCT in India

*Inadequate number of HSCT centers:
  - Primarily due to lack of adequately trained hematologists with transplant expertise
  - Many centers have only 1 transplant physician
    - Not enough takers for training positions: HSCT too demanding
  - Not enough institutions investing in HSCT infrastructure

*Payment for HSCT:
  - Majority pay ‘out of pocket’ (OOP)
  - Health care cover from (<25% of the population)
    - Employer (Public & Private)
    - State Government Health Insurance
    - Personal Health insurance
  - Charity (Philanthropic / ‘Corporate Social Responsibility’)

Cost of HSCT Services

*Cost to establish infrastructure & services
  - Public vs Private (For profit & non-profit models)

*Cost of maintenance
  - Return on Investment: Major issue

*Cost of providing individual HSCT services
  - Direct costs (In Hospital / Out of hospital costs)
  - Indirect costs (Opportunities lost)
### Table 3. Medical costs and resource utilization from date of transplant hospitalization to day 100 post-transplantation

<table>
<thead>
<tr>
<th>Cost category</th>
<th>Transplant type</th>
<th>Autologous HCT</th>
<th>Allogeneic HCT</th>
<th>Not specified&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sample size</strong></td>
<td></td>
<td>1678</td>
<td>1320</td>
<td>367</td>
</tr>
<tr>
<td><strong>Number of hospitalizations, median (range)&lt;sup&gt;b&lt;/sup&gt;</strong></td>
<td></td>
<td>1 (1–8)</td>
<td>1 (1–7)</td>
<td>1 (1–6)</td>
</tr>
<tr>
<td><strong>Number of hospitalizations, N (%)</strong></td>
<td></td>
<td>1275 (76.0)</td>
<td>759 (57.5)</td>
<td>254 (69.2)</td>
</tr>
<tr>
<td>1 (HCT hospitalization)</td>
<td></td>
<td>301 (17.9)</td>
<td>370 (28.0)</td>
<td>75 (20.4)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>69 (4.1)</td>
<td>136 (10.3)</td>
<td>26 (7.1)</td>
</tr>
<tr>
<td>≥4</td>
<td></td>
<td>33 (2.0)</td>
<td>55 (4.2)</td>
<td>12 (3.3)</td>
</tr>
<tr>
<td><strong>Total days hospitalized, median (IQR)</strong></td>
<td></td>
<td>19 (15–23)</td>
<td>31 (23–45)</td>
<td>20 (6–30)</td>
</tr>
<tr>
<td><strong>Total days hospitalized, N (%)</strong></td>
<td></td>
<td>433 (25.8)</td>
<td>125 (9.5)</td>
<td>132 (36.0)</td>
</tr>
<tr>
<td>≤15</td>
<td></td>
<td>1033 (61.6)</td>
<td>523 (39.6)</td>
<td>145 (39.5)</td>
</tr>
<tr>
<td>16–30</td>
<td></td>
<td>180 (10.7)</td>
<td>519 (39.3)</td>
<td>76 (20.7)</td>
</tr>
<tr>
<td>31–60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥61</td>
<td></td>
<td>32 (1.9)</td>
<td>153 (11.6)</td>
<td>14 (3.8)</td>
</tr>
<tr>
<td><strong>Number of outpatient clinic visits, median (range)</strong></td>
<td></td>
<td>12 (8–19)</td>
<td>22 (13–32)</td>
<td>13 (8–25)</td>
</tr>
<tr>
<td><strong>Number of outpatient clinic visits, N (%)</strong></td>
<td></td>
<td>714 (42.6)</td>
<td>267 (20.2)</td>
<td>140 (38.2)</td>
</tr>
<tr>
<td>≤10</td>
<td></td>
<td>599 (35.7)</td>
<td>349 (26.4)</td>
<td>110 (30.0)</td>
</tr>
<tr>
<td>11–20</td>
<td></td>
<td>238 (14.2)</td>
<td>344 (26.1)</td>
<td>70 (19.1)</td>
</tr>
<tr>
<td>21–30</td>
<td></td>
<td>95 (5.7)</td>
<td>189 (14.3)</td>
<td>26 (7.1)</td>
</tr>
<tr>
<td>31–40</td>
<td></td>
<td>37 (2.1)</td>
<td>171 (13.0)</td>
<td>21 (5.7)</td>
</tr>
<tr>
<td>≥40</td>
<td></td>
<td>$784,29 (62,828–123,328)</td>
<td>$174,398 (116,996–269,129)</td>
<td>$90,000 (51,994–170,553)</td>
</tr>
<tr>
<td><strong>Total costs, median (IQR)</strong></td>
<td></td>
<td>$99,899 (73,914–140,555)</td>
<td>$203,026 (141,742–316,426)</td>
<td>$106,782 (54,728–198,963)</td>
</tr>
<tr>
<td><strong>Total outpatient costs, median (IQR)</strong></td>
<td></td>
<td>$74,62 (3079–16038)</td>
<td>$207,67 (8898–41,271)</td>
<td>$78,28 (1771–22,756)</td>
</tr>
<tr>
<td><strong>Total inpatient costs, median (IQR)</strong></td>
<td></td>
<td>$82,606 (59,165–110,881)</td>
<td>$151,899 (106,438–233,282)</td>
<td>$82,641 (46,377–145,326)</td>
</tr>
</tbody>
</table>

USA GDP per capita (2016): $ 51638
Figure 2. Relative contribution of costs of hematopoietic cell transplant hospitalization, costs of any subsequent hospitalization and outpatient costs to total costs of hematopoietic cell transplantation in the first 100 days after transplantation.

- **Direct costs**
  - **In Hospital:**
    - In-Patient for HSCT: 75-80%
    - In-Patient – Post HSCT: 10-15%
    - Out-patient – Pre / Post HSCT: 10-15%
  - **Out of Hospital**
    - Accommodation & board

- **Indirect costs**
  - Wages lost
  - Impact on other family members

**JACIE accreditation had impact on outcome of Allo but not Auto HSCT**
Cost of HSCT – How should it be calculated?

*Components of the cost of HSCT:
- Infrastructure – Bed & environment
- Diagnostic facilities and test costs
- Drugs and disposables
- Blood products
- Personnel

*What is really necessary?
- How to define what is ‘necessary’?
- Definition of minimum standards vs optimal?
- Establishing infrastructure vs Maintenance
- ‘Workable’ standards vs Accreditation – local / international?
- Generic / Biosimilars vs Innovator molecules for drugs
- Public vs Private (For profit & non-profit models) health care
Cost of HSCT in India

*Overall cost of HSCT:

- Autologous: US$ 6-10,000
- Allogeneic:
  - Matched related donor: US$ 15-25,000
  - Matched unrelated donor: US$ 30-40,000*
  - Haplo-identical donor: US$ 30-40,000

*excluding cost of graft

*Breakdown of allogeneic HSCT Cost:

- Drugs: 50-60%
- Bed & Nursing: 15-20%
- Investigations: 10-15%
- Blood products: ~5%
- Professional fees: ~10%

*Cost calculated till discharge after initial Hospital admission
Cost of Health Care & HSCT

*Causes of high cost$ (5-10x between countries)

- Administrative costs
- Drug costs
- Defensive medicine
- Expensive treatment / investigation choices
- Wages (& work rules)
- ‘Branding’

“There is no such thing as a legitimate price for anything in healthcare,” says George Halvorson, the former chairman of health maintenance organization Kaiser Permanente. “Prices are made up depending on who the payer is.”

*Impact of cost of HSCT

- Who bears the burden: Individual vs Society
- How much is the ‘out-of-pocket’ component
- Should be assessed relative to GDP / PPP per capita

<table>
<thead>
<tr>
<th></th>
<th>Auto</th>
<th>Allo</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>~2</td>
<td>~4</td>
</tr>
<tr>
<td>India</td>
<td>~4</td>
<td>~10</td>
</tr>
</tbody>
</table>

Maintaining today’s healthcare, and funding future medical advances, will be difficult without major reforms that will require health and finance ministries to work together, it says.

Although the crisis led to a slowdown in health spending growth, particularly in Europe, public expenditure on health and long-term care in OECD countries is set to increase from around 6% of GDP today to almost 9% of GDP in 2030 and as much as 14% by 2060, unless governments can contain costs, according to OECD projections.

1 Preliminary estimate.
2 Data refer to 2012.

Source: OECD Health Statistics 2015
Table 2. Average annual per capita growth (AAGR) in health spending, in OECD and emerging economies, in real terms, 2009-2013 and share of GDP, 2013

<table>
<thead>
<tr>
<th>Country</th>
<th>AAGR %</th>
<th>Share of GDP %</th>
</tr>
</thead>
<tbody>
<tr>
<td>OECD</td>
<td>0.5</td>
<td>9.3</td>
</tr>
<tr>
<td>Brazil</td>
<td>6.0*</td>
<td>9.1</td>
</tr>
<tr>
<td>China (People's Republic of)</td>
<td>11.0**</td>
<td>5.6</td>
</tr>
<tr>
<td>India</td>
<td>~15.0#</td>
<td>4.0##</td>
</tr>
<tr>
<td>Indonesia</td>
<td>8.9</td>
<td>2.9</td>
</tr>
<tr>
<td>Russia</td>
<td>-0.2</td>
<td>6.5</td>
</tr>
<tr>
<td>South Africa</td>
<td>3.5</td>
<td>8.9</td>
</tr>
</tbody>
</table>

1. Total spending on health (including investments)
* 2009-2011 ** 2009-2012

Source: OECD Health Statistics 2015, WHO Global Health Expenditure Database

## ~70% is private funding
Reduction of Cost of HSCT

*Public healthcare model
- Subsidized by Government
- ‘Standards’ determined by social expectation / funds available

*‘Private’ healthcare model
- Build infrastructure with soft funds
- Cross subsidize within the institutional practices
  ‘Paying’ vs ‘Subsidized’ patients
- Economy of scale – Higher volumes at lower costs

**Two most critical aspects of cost reduction:**
- Locally produced / priced drugs
- “Non-profit” model of healthcare

Goal should be to make this life-saving modality of treatment available to all those who need it
COST OF HEALTHCARE – PROFIT DRIVEN MODEL

* Certain costs inherent for any service / product
* But a lot of the costs in healthcare is ‘branding’ ➔

Profits / ROI – What is reasonable?!

* Becomes a major problem in a user pay environment not covered by insurance / Government

An example of issues with drug pricing

“Imatinib was priced at $26,000/year in 2001, a price that considered the population at risk, the cost of research, and profits envisioned for a successful company market strategy. The price was described then as “high but fair” by Daniel Vasella, Chairman and CEO of Novartis.¹ The price of imatinib has increased by 10%–20% annually, reaching $132,000/year in 2014 and $146,000/year today (Table 1 below).² Global sales of patented imatinib were about $4.7 billion in 2015.³

The advent of generic imatinib into the U.S. market educates us on several important points relevant to cancer care today: (1) the high cancer drug prices (previously detailed in several publications)⁴-⁶; (2) the importance of generics for patient care and to reduce drug prices; and (3) how well-intended legislations like the Hatch-Waxman Act can be distorted by drug companies to maximize profits.

Hagop Kantarjian (www.ascopost.com – May, 2016)

➢ Annual cost of generic Imatinib in India (2016) : <US$ 1000 (>10 manufacturers!)
"As long as greed is stronger than compassion, there will always be suffering."
~Rusty Eric

“Earth provides enough to satisfy every man's needs, but not every man's greed.”
— Mahatma Gandhi