Global Trends in Haemopoietic Stem Cell Transplantation

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The European Group for Blood and Marrow Transplantation

EBMT Activity Survey 2007

- Current status
  - Indication
  - Donor type
  - Stem Cell Source

- Comparison
  - Within region
  - Between regions
  - Population
  - Economics

- Analysis
  - Absolute numbers
  - By population

- Trends
## EBMT Activity survey on HSCT in 2007: main indications

<table>
<thead>
<tr>
<th>Indication</th>
<th>Allogeneic 1st Tx.</th>
<th>Autologous 1st Tx.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leukemias*</td>
<td>7153</td>
<td>908</td>
<td>8061</td>
</tr>
<tr>
<td>Lymphoproliferative disorders</td>
<td>1646</td>
<td>12981</td>
<td>14627</td>
</tr>
<tr>
<td>Bone marrow failures</td>
<td>523</td>
<td>1</td>
<td>524</td>
</tr>
<tr>
<td>Solid tumours</td>
<td>63</td>
<td>1425</td>
<td>1488</td>
</tr>
<tr>
<td>Non-malignant disorders</td>
<td>618</td>
<td>160</td>
<td>778</td>
</tr>
<tr>
<td>Others</td>
<td>69</td>
<td>16</td>
<td>85</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10072</strong></td>
<td><strong>15491</strong></td>
<td><strong>25563</strong></td>
</tr>
</tbody>
</table>

* includes CLL  

Final data
Relative proportion of donor type by main indication: 2007

- Lymphoma
- Leukemia
- Solid tumor
- Non-malignant

- Unrelated
- HLA nid
- HLA id
- Auto

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Relative proportion of stem cell source by main indication: allogeneic HSCT 2007
EBMT Activity Survey on HSCT 1990-2007: donor type

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EBMT Activity Survey on HSCT 1990–2007

Cord blood HSCT

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EBMT Activity Survey on HSCT 1990-2007 changes in AML

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EBMT Activity Survey on HSCT 1990-2007
changes in CML

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Total transplants (1st)
per 10 million 2007
- 0 or no report
- 1 - 50
- 51 - 200
- 201 - 400
- > 400
HSCT for AML - rates in Europe 2007

Total transplants (1st)
per 10 million 2007

AML 1st. CR allo

- White: 0 or no report
- Light green: 0.1 - 5
- Dark green: 5.1 - 20
- Black: > 20

Countries:
- Algeria
- Iran
- Israel
- Lebanon
- Saudi Arabia
- South Africa
- Tunisia
Total transplants (1st) per 10 million 2007
AML 1\textsuperscript{st}. CR auto

- 0 or no report
- 0.1 - 5
- 5.1 - 15
- > 15

HSCT for AML - rates in Europe 2007
Transplant Rates and GNI/capita in Europe 2005

R² = 0.6608

Haematologica 2007

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TR for AML allo HSCT by World Bank Category

High (97.15%)
Medium (96.54%)
Low (82.81%)
Regression line
95% confidence interval

Transplant rates per 10Mio. inhabitants (country weighted)

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Economic Aspects: Changes over time:

- BM - PB auto
- BM - PB allo
- Breast Ca. auto
- CML allo

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Factors associated with process of diffusion

• Macroeconomic factors
  – GNI / capita
  – World Bank Category
  – Team density (N teams /10 million inhabitants)
  – Team distribution (N teams / 10 000 km2)

• Microeconomic factors
  – Team size
  – Team experience (first year of transplant)
  – Innovator status (first 2.5%; Rogers definition)
Change from BM to PB in autologous HSCT by World Bank Category

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Factors associated with diffusion process

<table>
<thead>
<tr>
<th>Diffusion process</th>
<th>Key factor Macro</th>
<th>Key factor Micro</th>
<th>Explanatory content*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in allo HSCT</td>
<td>Team density</td>
<td>Team size</td>
<td>0.69 0.77 0.78</td>
</tr>
<tr>
<td>BM – PB auto</td>
<td>GNI/cap</td>
<td>Innovator</td>
<td>0.18 0.25 0.26</td>
</tr>
<tr>
<td>BM – PB allo</td>
<td>Team distribution</td>
<td>Innovator</td>
<td>0.03 0.09 0.09</td>
</tr>
<tr>
<td>Breast ca. increase</td>
<td>Team density</td>
<td>Team size</td>
<td>0.69 0.61 0.75</td>
</tr>
<tr>
<td>Breast ca. decrease</td>
<td>Team density</td>
<td>Innovator</td>
<td>0.07 0.09 0.10</td>
</tr>
<tr>
<td>CML increase</td>
<td>GNI/cap</td>
<td>Team size</td>
<td>0.47 0.78 0.79</td>
</tr>
<tr>
<td>CML decrease</td>
<td>GNI/cap</td>
<td>Team size</td>
<td>0.31 0.04 0.33</td>
</tr>
</tbody>
</table>

* By coefficient of determination $R^2$
Indications for Allogeneic Haemopoietic Stem Cell Transplants (HCT), Registered with CIBMTR in 2006

- AML
- ALL
- CML
- Lymphoma
- MDS/MPS
- Other Leukemia
- Other Cancer
- Aplastic Anemia
- Other Non-malignant

- Unrelated donor (Total N~2,500)
- Related donor (Total N~3,000)
Trends in Allogeneic Transplants
Recipient Age*
1987-2004

* Transplants for AML, ALL, CML
TRANSPLANT-RELATED MORTALITY BY AGE
Standard vs Reduced Intensity Conditioning

0 5 10 15 20 25 30 35 40 45
30-39y 40-49y 50-59y 60-69y

- Standard
- NST
Allogeneic HCTs for AML in patients younger than 70 years

Expected if

- HCT in CR1 for all patients with intermediate or poor risk disease
- HCT in half of others (after relapse or induction failure)
Unrelated Donor Stem Cell Sources by Recipient Age 1999-2006

- Bone Marrow (BM)
- Peripheral Blood (PB)
- Cord Blood (CB)

Transplants, %

<table>
<thead>
<tr>
<th>Year</th>
<th>Bone Marrow</th>
<th>Peripheral Blood</th>
<th>Cord Blood</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999-2002</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003-2006</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Age ≤20 yrs

Age >20 yrs
Cord Blood Transplantations Registered with the CIBMTR, 1997-2006

- Related
- Unrelated

* Data incomplete
n=\sim14,000 \text{ (estimated number based on CIBMTR, Eurocord and Japanese CB registries)}
1-year Survival over Time, 1988 – 2005

Data from NMDP and CIBMTR for patients <50 yrs, receiving HCT with myeloablative regimens for acute leukemias in any remission, CML or MDS
Probability of Survival after Unrelated Donor HCT

8 of 8 7 of 8 6 of 8

Early  Intermed  Advanced
Transplants Today are Using Better Matched Donors

- 5 or less
- 6 of 8
- 7 of 8
- 8 of 8
Worldwide Blood & Marrow Transplantation

- Founded in 2007: CIBMTR, APBMT, NMDP, EBMT
  - Open for international societies / registries
  - Open for national societies / registries without yet international link

- Mission
  - Promote excellence in HSCT through international societies
  - Collaboration, communication, coordination, lobbying,
  - Global partner for WHO

- First Goals
  - Global Transplant Number
  - Global Activity Survey
  - Global Donor Follow up
  - WHO

Worldwide Network for Blood and Marrow Transplantation
WBMT organisation

- Founded in 2007:
  - Founding institutions: CIBMTR, APBMT, WMDA, EBMT

- Members:
  - Professional societies with international membership
  - Outcome registries with international data collection
  - Accrediting societies with international membership
  - Scientific societies with international membership

- Non voting members
  - organisations involved in HSCT which do not meet requirements
  - for profit organisations (eg Pharma)

- Council
- Committees
WBMT Mission

Mission

- promote excellence in HSCT through international societies
  - collaboration between and within societies
  - communication between organisations
  - coordination on global level
  - lobbying
    - political institutions
    - pharmaceutical industry
    - public (patient and donor organisations)

- global partner for WHO

Worldwide Network for Blood and Marrow Transplantation
WBMT and WHO: global partnership

◆ WHO needs
  – HSCT definition (BM, PB, CB, future)
  – HSCT donation (BM, PB, CB, future)
  – Improve access to HSCT
  – Dissemination of information

◆ Common needs
  – vigilance and surveillance
    » (EUSTITE; European Union Standards and Training for the Inspection of Tissues Establishment)
  – World day
  – Public awareness
  – Technical harmonisation; e.g. nuclear accidents, templates for data collection

◆ WBMT needs
  – Funding for research
  – Funding for transplants
  – Equitable access
    » patients
    » Countries

◆ Data collection and analysis is integral part of therapy
Global Transplant Center Number GTCN

- **Background**
  - Multiple registries
  - Patient travel
  - Global donors

- **Goal**
  - Unique identification

- **Tool**
  - 16 (+) digit number by CIBMTR, APBMT, EBMT, other
  - GTCN XXXXXX-XXXXX-XXXXXX

*Worldwide Network for Blood and Marrow Transplantation*
Global Patient Number

- **Background**
  - Patients travel
  - Multiple registries
  - Multiple transplants (allo, auto; BM, PB, CB; DLI; etc)
  - Global donors

- **Goal**
  - Unique identification

- **Main concern**
  - Confidentiality

- **Tool**
  - Fingerprint encryption
  - DNA encryption
  - ???

*Worldwide Network for Blood and Marrow Transplantation*
# Global Activity Survey 2006

<table>
<thead>
<tr>
<th>Region</th>
<th>Allogeneic 1st Tx.</th>
<th>Autologous 1st Tx.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia/NZ</td>
<td>319 (28%)</td>
<td>818</td>
<td>1137</td>
</tr>
<tr>
<td>Brazil</td>
<td>800 (53%)</td>
<td>703</td>
<td>1503</td>
</tr>
<tr>
<td>Canada</td>
<td>416 (46%)</td>
<td>498</td>
<td>914</td>
</tr>
<tr>
<td>EMRO</td>
<td>682 (67%)</td>
<td>330</td>
<td>1012</td>
</tr>
<tr>
<td>Europe</td>
<td>9661 (39%)</td>
<td>15389</td>
<td>25050</td>
</tr>
<tr>
<td>Japan</td>
<td>1946 (66%)</td>
<td>1008</td>
<td>2954</td>
</tr>
<tr>
<td>US</td>
<td>4840 (44%)</td>
<td>6164</td>
<td>11004</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18664 (43%)</strong></td>
<td><strong>24910</strong></td>
<td><strong>43574</strong></td>
</tr>
</tbody>
</table>

Preliminary data

*Worldwide Network for Blood and Marrow Transplantation*
Relative proportion: Allo vs Auto HSCT in 2006

Preliminary data

Worldwide Network for Blood and Marrow Transplantation
Main Indications: Allo HSCT in 2006

Europe | Japan | US | Brazil | AU/NZ | EMRO | Canada
---|---|---|---|---|---|---
NM | 868 | 120 | 373 | 169 | 35 | 175 | 23
ST | 85 | 11 | 26 | 2 | 0 | 1 | 0
LPD | 1597 | 240 | 959 | 54 | 32 | 22 | 111
Leuk | 6784 | 1546 | 3279 | 551 | 246 | 409 | 282

Preliminary data

Worldwide Network for Blood and Marrow Transplantation
Main Indications: Auto HSCT in 2006

Worldwide Network for Blood and Marrow Transplantation
Leukemia: allo HSCT in 2006

Preliminary data

<table>
<thead>
<tr>
<th></th>
<th>EU</th>
<th>JPN</th>
<th>US</th>
<th>Brazil</th>
<th>AU/NZ</th>
<th>EMRO</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLL/others</td>
<td>294</td>
<td>107</td>
<td>200</td>
<td>6</td>
<td>14</td>
<td>2</td>
<td>21</td>
</tr>
<tr>
<td>MDS/MPS</td>
<td>1160</td>
<td>273</td>
<td>562</td>
<td>46</td>
<td>30</td>
<td>29</td>
<td>39</td>
</tr>
<tr>
<td>CML</td>
<td>619</td>
<td>91</td>
<td>238</td>
<td>136</td>
<td>21</td>
<td>103</td>
<td>38</td>
</tr>
<tr>
<td>ALL</td>
<td>1689</td>
<td>385</td>
<td>711</td>
<td>145</td>
<td>67</td>
<td>122</td>
<td>51</td>
</tr>
<tr>
<td>AML</td>
<td>3022</td>
<td>690</td>
<td>1568</td>
<td>218</td>
<td>114</td>
<td>153</td>
<td>133</td>
</tr>
</tbody>
</table>

Worldwide Network for Blood and Marrow Transplantation
Transplants rates for all HSCT in 2006

Total (1st.) HSCT per 10 million pop. in 2006

- 0
- < 100
- 100 - 300
- > 300

Preliminary data

Worldwide Network for Blood and Marrow Transplantation
Acknowledgments

- Alois Gratwohl
- Mary Horowitz
- ABMTRR (Australia + New Zealand)
- APBMT (Asian-Pacific)
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- CBMTG (Canada)
- EBMT (Europe)
- EMRO (Eastern Mediterranean)
- SBTMO (Brazil)