International Medical Physics Education and Training Needs Over the Next 20 Years

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Objectives

- Review recent reports on the need for international medical physicists over next 20 years
- Review obstacles to providing adequate training
- Address ways and means of supporting international education
- How AAPM and other MP organizations can “connect our pathways and unify our profession” internationally

AAPM 2017

• Objectives
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UICC 2013

• Union for International Cancer Control (UICC)
  - Global Task Force on Radiotherapy of Cancer Control (GTFCC)
    • Single question:
      “What does it cost to close the gap between what exists today and reasonable access to radiotherapy globally?”
GTFRCC Outcome

- Lancet Oncology Commission report
- 18 authors

What is the “Gap”?

- GTFRCC determined
  - Cancer incidence by site by country
    - Number patients needing RT
    - Number of fractions by country
  - Number of departments, machines, personnel by country income level (LIC, LMIC, UMIC, HIC)

The “Gap”

2013 ... Existing
  ~ 4,200 MV machines in LMICs

2035 ... Need ... Additional
  ~ 13,000 linacs in LMICs
  ~ 22,000 MPs in LMICs
  > 1,000 new MPs/yr in LMICs

This is for RT only
  - Add another 20-30% for imaging physicists
  ~ 27,000 MPs in LMICs
  > 1,300 new MPs/yr in LMICs

Atun et al, Lancet Oncol Sept 2015
Call for Action 3

Action 3: human resources for radiotherapy

Target: 7500 radiation oncologists, 20,000 radiation technologists, and 6000 medical physicists to be trained in low-income and middle-income countries by 2025.

RO Medical Physicists ... Where?

<table>
<thead>
<tr>
<th>Region</th>
<th>Upper-middle income countries</th>
<th>Lower-middle income countries</th>
<th>Low-income countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Physicists to be trained</td>
<td>12,500</td>
<td>7,200</td>
<td>2,400</td>
</tr>
</tbody>
</table>

Beijing, 2012

Where? ... Relative Increase

AF = Africa
AP = Asia Pacific
EU = Europe
LA = Latin America
NA = North America

Analysis of Global Radiotherapy Needs and Costs by Geographical Region and Income Level

Clin Oncol 29: 84-92; 2017
Problems ... in LMICs

- In Society ... some countries
  - Weak/dysfunctional health systems
  - Corruption and lack of transparency
  - Lack of enabling infrastructure
- In Education
  - Lack of education and training programs
  - Inadequate equipment for proper training
  - Lack of experienced trainers
  - Minimal resources for training programs
  - Brain drain

JVD - IAEA ICARO2 Survey Results

2. From your perspective, how would you rate (on a scale of 1 to 10) the following barriers to the implementation of new radiotherapy-related techniques or technologies in your context or country?

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of money for professional staff</td>
<td>7.41</td>
</tr>
<tr>
<td>Lack of proper training for professional staff due to lack of priority</td>
<td>7.15</td>
</tr>
<tr>
<td>Lack of proper training for professional staff due to unavailability of funds</td>
<td>6.54</td>
</tr>
<tr>
<td>Lack of proper training for professional staff due to unavailability of staff</td>
<td>6.22</td>
</tr>
<tr>
<td>Lack of money for new building or facilities upgrade</td>
<td>6.37</td>
</tr>
<tr>
<td>Lack of money for maintenance servicing</td>
<td>6.31</td>
</tr>
<tr>
<td>Absence of national radiotherapy plan</td>
<td>6.21</td>
</tr>
<tr>
<td>Lack of proper training for professional staff due to unavailability of nearby training programs</td>
<td>6.37</td>
</tr>
<tr>
<td>Lack of appropriate diagnostic services such as pathology, diagnostic imaging or other relevant clinical service</td>
<td>6.04</td>
</tr>
<tr>
<td>Physical infrastructure (lack of uniform and consistent electrical power and chilling water)</td>
<td>3.09</td>
</tr>
<tr>
<td>Inadequate national radiation safety regulatory process</td>
<td>2.06</td>
</tr>
</tbody>
</table>

JVD - IAEA ICARO2 Survey Results

3. Considering your context or country, please rate the following factors or considerations (on a scale of 1 to 10) that could help overcome some of the barriers listed in question 2?

<table>
<thead>
<tr>
<th>Factor</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriate prioritization by informed decision makers and/or upper level managers of resources for new techniques or technologies</td>
<td>9.04</td>
</tr>
<tr>
<td>Partnering with the IAEA or non-government organizations to provide partial educational and training support</td>
<td>8.62</td>
</tr>
<tr>
<td>Encouragement by government agencies to support the development of training programs for radiation oncology professionals</td>
<td>8.33</td>
</tr>
<tr>
<td>Negotiation support from the IAEA or non-government organization with suppliers to provide lower cost technologies</td>
<td>7.08</td>
</tr>
<tr>
<td>Management support for the IAEA or non-government organization to provide training and education support</td>
<td>6.67</td>
</tr>
<tr>
<td>Partial funding by the IAEA or non-government organization to support national education and training</td>
<td>6.32</td>
</tr>
<tr>
<td>Development and training support by the IAEA or non-government organizations</td>
<td>6.21</td>
</tr>
<tr>
<td>Partial funding by the IAEA or non-government organization to provide partial financial support</td>
<td>6.05</td>
</tr>
<tr>
<td>Partnership with the IAEA or non-government organization to provide part financial support</td>
<td>5.04</td>
</tr>
<tr>
<td>Donation of money for purchase of technology by the IAEA or non-government organizations</td>
<td>5.03</td>
</tr>
<tr>
<td>Development of national radiation safety regulatory process</td>
<td>5.02</td>
</tr>
</tbody>
</table>

Major barriers
- Lack of money
- Lack of training
Solution to Training

• No simple answer
• No single answer
• Multiple approaches
• Collaboration and partnering

Partnering organizations

• > 35 RT related partnering organizations

Education ... How?

• Undergraduate ... in native country
• Graduate .... as close to home as possible  
  – Outside support/partnering/mentoring
• Residency as close to home as possible  
  – Outside support/partnering/mentoring
• Partnering/Mentoring  
  – On site visits  
    • Lecturing  
    • “Hands-on”  
  – E-mail/web-conferencing  
    • Weekly  
    • As needed  
    • “Bottom-up” approach
Partnering

• Who?
  – Medical Physicists from better resourced contexts

• How?
  – Retired MPs
  – Sabbaticals
  – Early career
    • Global health interests
  – Donated vacation/work time

“Modest” Proposal

• \( X \% \) of collective MP FTE for global health support in LMICs

• \( X = ? \)

• If 1% of >7,000 AAPM full members = 70 FTE

• Could be ...
  – 1% donated by institution (20 hr/yr)
  – 1% donated by individuals (20 hr/yr)
    • e.g., sabbatical/vacation/leave of absence
  – Not for everyone ... only those with an interest
  – % can vary significantly from one institution to another

“Modest” Proposal Considerations

• Requires philosophical endorsement
  1. Institutions and MPs agree that altruistic support for less developed environments is of value
  2. Needs to be built into the psyche of
    a. Our MP profession (e.g., AAPM/CAMPEP/COMP/CCPM)
    b. Our MP leadership (e.g., department heads)
    c. Our administration (e.g., hospital VPs/administrators)
    d. Our MP education & training programs (grad/residency/CAMPEP)
Summary

- The Medical Physics training needs in LMICs are enormous
- HIC contexts are extremely well resourced & able to provide modest support
- Altruistic support should be considered an imperative of HIC contexts
  - Small % contribution can be built into our infrastructure assuming philosophical agreement that such support is of value
- This modest proposal should be presented to all MP leaders in US/Canada for consideration and implementation

AAPM and other MP organizations can “connect our pathways and unify our profession” internationally
- By education through...
  - AAPM’s International Affairs Committee (IAC)
  - AAPM’s International Education Activities Committee (IEAC)
  - AAPM's International Scientific Exchange Program (ISEP)
  - AAPM/IOMP's joint Equipment Donation Program (EDPSC)
  - AAPM's Exchange Scientist Program (ESPSC)
  - AAPM/IOMP library program
  - AAPM’s International Training and Research Coordination Subcommittee (ITRCS)
  - Other
    - MPWB (www.mpwb.org)
    - MOU with AAPM

Tuesday 12:15-1:45
Hyatt, Mineral Hall A
3rd floor