One World Medical Physics: 
Challenges and Opportunities in Cancer Care

Jatinder R Patta PhD, FAAPM, FASTRO, FACR 
Virginia Commonwealth University, and 
Veterans Health Administration

Worldwide Demographic Shift

Source: U.S. Census Bureau

The Global Economic Cancer Burden

Cancer is costly.....

The economic cost of cancer exceeds that of any other disease

$895 Billion lost
New cancer cases and number of deaths are expected to grow around 70% from 2008 to 2030

Cancer in Women
Number 1 cancer incidence per 100,000, age normalized

Cancer in Men
Number 1 cancer incidence per 100,000, age normalized
The Global Needs in Radiation Oncology

Linac Density vs. Total Health Care Spending ($Billions)

LMIC Equipment and Personnel Analysis & Projection

State of Affairs in Global Radiation Oncology

Data from the World Bank, GLOBOCAN 2012, and IAEA (DIRAC) indicate that:

• 57% of the total global cancer burden is in LMICS,
• 50% of cancer patients requiring radiotherapy lack access to treatment,
• 90% of cancer patients in LICs do not have access to radiotherapy,
• there are over 4,200 teletherapy units operating in LMICs,
• LMICs need additional 4,000-5,000 teletherapy units to meet the demand,
• LMICs will need over 43,000 more professionals (Radiation Oncologists: Medical Physicists: Dosimetrists: Therapists: 1.0: 0.5: 0.25: 1.5)

LMIC vs Developed

• Lower incidence rates
• Similar mortality rates
• Later cancer detection

Need Assessment in the Developing World

• The quality of radiotherapy in facilities in the developing world is highly variable, ranging from outstanding to needs improvement – Challenge is to identify and improve substandard practices, as well as move the average towards higher quality and improved patient care.
• Radiation Oncology is a technology driven medical specialty – Challenge is to continue to deploy cutting-edge, effective, and safe technologies that adhere to consensus clinical practice guidelines.
• Guidelines must recognize local environment
• Radiation Oncology is a team-orientated medical specialty – Challenge is to have well-educated, trained, disciplined and attentive healthcare team members.
Challenges Worldwide

• **Safety**
  - Advanced radiotherapy procedures require complex and intricate information flow and handoffs. Poor hardware/software integration, inadequate QA, inadequate training of healthcare professionals, poorly-defined clinical workflow, non-adherence to established clinical practice standards, and ambiguities in decision making process can exacerbate the situation.

• **Paucity of the state-of-the art equipment and trained staff**
  - Economic/Socio pressure to treat as many patients as possible with advanced techniques in a given day creates stressful environment, which is potentially prone to errors.

• **Peer Pressure**
  - Complex treatment techniques have become the standard of care for the treatment of a wide variety of disease sites without systematic collection of high-quality evidence of improved outcomes and effectiveness under local conditions

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**Call to Action for Global Cancer Community**

- Inclusion of detailed plans for RT implementation in national cancer control plans,
- Building cancer system capacity through the establishment of national comprehensive cancer resources in every country,
- Training tens of thousands of RT professionals,
- Creating novel financing solutions to allow countries to make the investment in RT,
- Securing access through the inclusion of RT in universal health coverage plans.

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**Partnering to Address the Global Cancer Care**

- **Focused Government Programs**
  - Population Health Focus
  - Prevention, Diagnosis, Treatment, Survivorship
  - Awareness & Perception of Diagnosis/Treatment Options
  - Infrastructure Investment: Power, Water, IT

- **Global Expert Medical Physicists**
  - Basic Medical Physics Education
  - Training
  - Mentoring
  - Telemedicine

- **Equipment Manufacturers**
  - Patient Safety Highest Priority
  - High-capability Value Based Systems
  - Simple Design & Workflow

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Medical Physicists from HICs can and should impact all three areas
Responsibilities of the Manufacturers

Manufacturers should:

• be aware of their responsibility for ensuring that the buyer has adequate physical infrastructure and support for the installation, testing and clinical commissioning of radiotherapy equipment.
• have a responsibility to provide correct information and advice, upon request, from users on resource requirements for the safe implementation of purchased equipment.
  • Processes to meet these responsibilities should be developed and clearly communicated to the buyer.
• provide adequate service and maintenance support infrastructure
• provide timely software upgrades and bug fixes, safety information bulletins, and clear instructions for retesting.

What is AAPM doing on the Global Scene?*

• Collaborates with IOMP, COMP, ESTRO, EFOMP, MPWB, IAEA, and other National and Regional Societies
• Provides medical physics educational programs and educational resources to medical physicists working outside of the USA and Canada.
• Assess, periodically, the need for international educational activities and the associated activities of the AAPM
• Plan, develop, and direct, as appropriate, the international educational programs and activities of the AAPM, including the International Scientific Exchange Program

* Via International Affairs Committee of the Administrative Council and International Education Activities Committee of the Education Council

What should AAPM do in Global Cancer Care?

• Facilitate rapid interactions, peer reviews, and clinical collaboration amongst HICs and LMICs leveraging electronic infrastructures (cloud-based)
  • Training the trainer, fostering mentor and mentee relationships
• Work with the technology developers and industry to respond to global need through innovations that address pressing global problems as opposed to tweaking existing solutions.
  • Disruptive technologies that lower cost and decrease complexity will be attractive to both developed and developing nations.
  • This will require special consideration of the local environment such as resources, physical and personnel infrastructure