One World Medical Physics:
Challenges and Opportunities in Cancer Care

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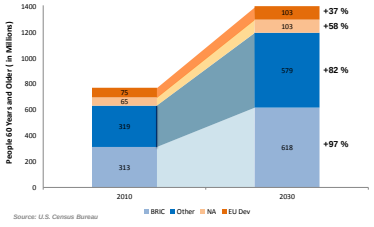
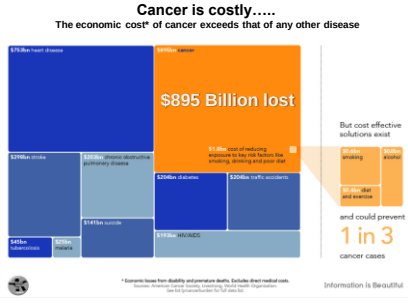
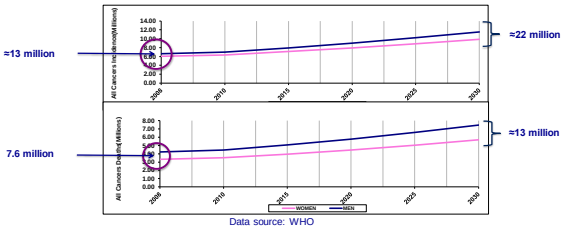
Worldwide Demographic Shift



The Global Economic Cancer Burden



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



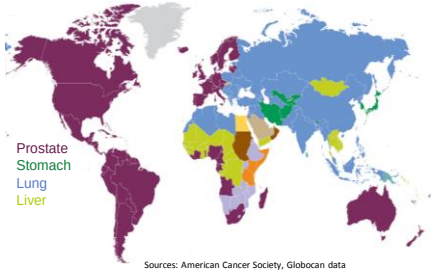
Cancer in Women

Number 1 cancer incidence per 100,000, age normalized

Sources: American Cancer Society, Globocan data

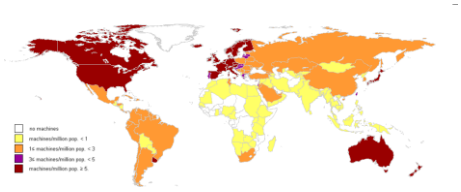
Cancer in Men

Number 1 cancer incidence per 100,000, age normalized



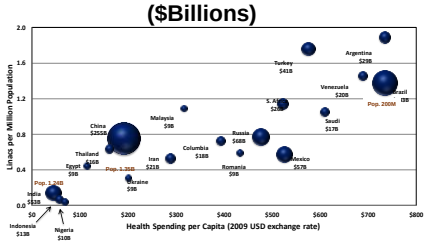
Sources: American Cancer Society, Globocan data

The Global Needs in Radiation Oncology



Courtesy of IAEA Directory of Radiotherapy Centers (DIRAC)

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



Data from WHO *World Health Statistics 2012* and IAEA DIRAC database

LMIC Equipment and Personnel Analysis & Projection

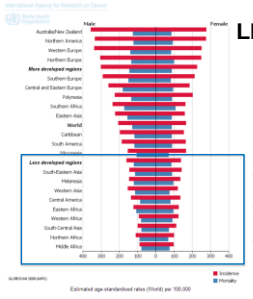
Infrastructure and personnel	No. of units or personnel/no. of patients used in this analysis	Present status (n=84 countries) Existing/required	% of present deficit[1]	Required by 2020 (n=84 countries) Total needed	% of additional required[1]
Teletherapy units	1/450 patients	413/10,735	61.4%	13,307	+221.6%
Radiation oncologists	1/250 patients	11,803/19,323	38.9%	23,952	+102.9%
Medical physicists	1/450 patients	3392/10,735	68.4%	13,307	+292.3%
Radiotherapy technologists	1/150 patients	10,780/32,204	66.5%	39,920	+270.3%
		Today's gap 6,597 units 36,287 personnel		**Tomorrow's chasm 13,307 units 77,179 personnel**	

"Radiation Therapy Infrastructure and Human Resources in Low- and Middle-Income Countries: Present Status and Projections for 2020", Niloy R. Datta, MD, Massoud Samiei, PhD, and Stephan Bodis, MD International Journal of Radiation Oncology, June 2014

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- ,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**

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.

***Atun, R., et al., Expanding global access to radiotherapy. Lancet Oncol, 2015. 16(10): p. 1153-86**

Partnering to Address the Global Cancer Care

Focused Government Programs	Global Expert Medical Physicists	Equipment Manufacturers
• Population Health Focus • Prevention, Diagnosis Treatment, Survivorship • Awareness & Perception of Diagnosis/Treatment Options • Infrastructure Investment: Power, Water, IT	• Basic Medical Physics Education • Training • Mentoring • Telemedicine	• Patient Safety Highest Priority • High-capability Value Based Systems • Simple Design & Workflow

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