Quality in Medical Physics from the Global Perspective

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Outline

1. What is different about LMICs compared to HICs?
   - Disease burden
   - Disparities in physical infrastructure, resources, general awareness, training and education
2. Attributes of quality medical physics practice in LMICs
3. Need for collaboration amongst all stakeholders
4. AAPM role in the global medical physics
5. Vendors responsibilities in the global market

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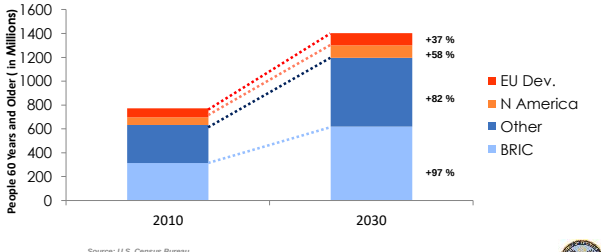
Worldwide demographic shift



Source: U.S. Census Bureau

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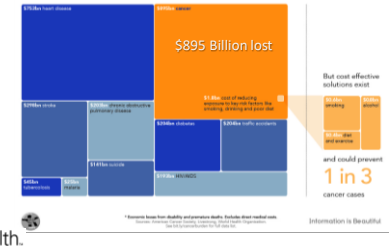
The global healthcare Burden

Cancer is costly…..

The economic cost* of cancer exceeds that of any other disease



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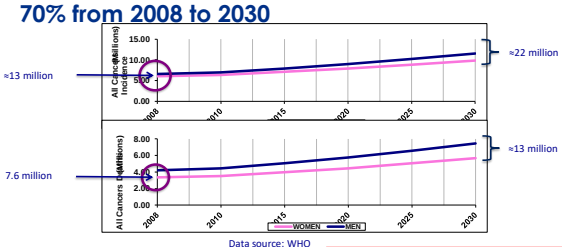
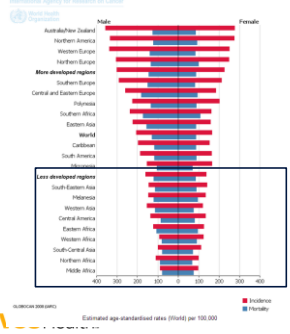
New non-communicable disease cases and number of deaths are expected to grow around 70% from 2008 to 2030



Data source: WHO

Situation is much more dire in LICs



LMICs vs HICs

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

Abysmal situation in global cancer management

- Even though, the median cost per radiation treatment is US$11.02 and US$4.87 for LINAC and Cobalt-60 respectively in LMICs; but

Country	Population (Million)	Income/day (US $)
Sudan	40.2	1.60
N Korea	24	4.60
Afghanistan	29.8	5.20
India	1189	19.70
China	1370	46.50
USA	322	163.00
Liechtenstein	.037	381.00

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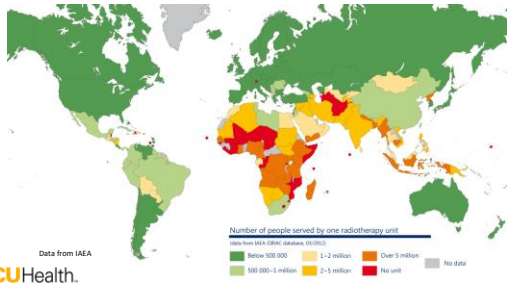
Global radiotherapy coverage map



Data from IAEA

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LMICs 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†	Required by 2020 (n=84 countries) Total needed	% of additional required†
Telethenpy units	1/450 patients	4138/10,735	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%

2014's gap
6,597 units
36,287 personnel

2020'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

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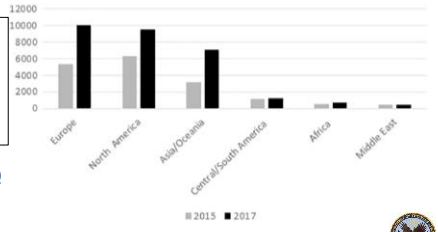
Global Medical Physics Workforce

93 Countries reported 29,179 MPs in 2017 *(8702/20477;W/M)*
- Europe 34%
- NA 33%
- Asia/Oceania 24%



Approximately 59,000 MPs will be required by 2035

Tsapaki et.al. Physica medica , 55 (2018)

Global cancer outlook

- Over 70% of cancer cases will be diagnosed in LMICs by 2030,
- Most developing countries do not have the resources or infrastructure to prevent, diagnose, or treat this growing burden of cancer,
- A higher proportion of cancers in LMICs are detected at an advanced stage, leaving palliative radiotherapy as one of the only options for treatment, even for cancers that, when detected in earlier stages, have curative treatment options.
  - Currently 80% of radiation treatments in LMICs are palliative

The global medical imaging outlook

- The WHO estimates that two-thirds of the world lacks access to basic medical imaging services
  - Need for low cost and effective imaging equipment
  - LMICs often have equipment that sits broken and unused because maintenance contracts are non-existent or too expensive.
- Lack of adequate imaging equipment creates a systematic gap in all of healthcare and that becomes a global healthcare problem
  - The gap propagates out into deficiencies in caring for cancer, delivering babies and undergoing surgery safely
- LMICs face numerous obstacles, notably a lack of sustainability and infrastructure

Question of the day

What are the consequences of such dire disease burden and inadequate healthcare infrastructure on the practice of medical physics in LMICs?

Answer: *"What is good for the goose is **NOT** good for the gander"*

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Attributes of quality medical physics practice in LMICs

- Recognize the challenges and limitations of local environment
  - Resource-adapted treatment guidelines, SOPs, and QA processes
- Recognize that the demand on patient throughput is paramount
  - Strive for simpler, efficient, and effective treatment techniques
- Global collaboration
  - Develop a big brother/sister paradigm
- Adequate training and education

Global need assessment review

(AAPM IAC & IEAC AND ASTRO IES)

Need Assessment

Top Priorities	Stakeholders: Radiation oncology/ Radiology team members, hospitals, government agencies etc.	Specific need assessment (education, technology assessment, training, guidance reports, clinical/technical protocols, etc.).	Prioritize preferred methods of collaboration to fulfill the need? (meetings, webinars, education modules, mentorship, training).	Which individuals/ organizations in your WG region can foster collaboration with AAPM/ASTRO	Outline Desired Outcomes for each priority.	How does this priority relate to AAPM/ASTRO Strategic Plans	Timeline to achieve each priority

Strategies to Improve Collaboration

Top Priorities	Proposed and/or existing strategies for collaboration between AAPM/ASTRO and your Work Group.	List ways that AAPM/ASTRO can help your Work Group in a meaningful and efficient manner (in order of priority).	What metrics can be used to measure success?	Timeline

Summary of need assessment

- Large disparity between "have" and "have not's" globally
- Shortage of experienced medical physicists.
- Hand-on and didactic training in advanced treatment modalities/procedures
- Development of clinical and technical protocols taking local environment into consideration (Resource-stratified guidelines)
- Identify medical physicists who are interested in Global Health and create an electronic forum for them to communicate and collaborate
- Coordination of global projects amongst various organizations such as; AAPM, ASTRO,ESTRO, IAEA, WHO, UICC and numerous NGOs

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Suggested strategies

- Establish distance learning methodologies for clinical medical physics leveraging electronic infrastructures (Cloud-based)
- Expert advice using Web-based tools; "Big brother/sister" concept
  - Training the trainer, fostering mentor and mentee relationships
- Work with the vendors to develop disruptive technologies that address pressing global problems as opposed to tweaking existing solutions.
- Provide in-person networking opportunities at the Annual Meeting for those who are interested in Global Health

What should AAPM be doing for the global community of medical physics?

- 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.

What should vendors do for the global community?

- Be aware of their responsibility for ensuring that the buyer has adequate physical infrastructure and support for the installation, testing and clinical commissioning of equipment.
- Have a responsibility to provide correct information and advice, upon request, from users on resource requirements for the safe implementation of purchased equipment.
- Provide adequate service and maintenance support infrastructure
- Provide timely software upgrades and bug fixes, safety information bulletins, and clear instructions for retesting.

Summary

- Almost all of the growth in medical physics will occur in LMICS over the next decade
- All of us who are fortunate enough to practice medical physics in HICs should make a determined and concerted effort to help and collaborate with our colleagues in LMICs
  - Adopt a clinic in LMIC
- Vendors have a societal responsibility to develop resource-adaptable diagnostic and therapy products

*"What is good for the goose may **NOT** be good for the gander"*

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Thank you……

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