### Redesigning IMRT for Low- and Middle-Income Countries

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Disclosures

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### Outline

- Cancer: global burden of disease
- Radiotherapy: benefit and access
- Technology for low-middle income countries (LMIC)

# IMRT (Intensity Modulated Radiation \_\_\_\_\_\_ Therapy)



• IMRT allows for greatly enhanced organ sparing

### Radiotherapy in Cancer Management

#### **Advantages**

- Non-invasive
- Allows organ preservation
- Low risk of morbidities
- Costs are low

### Radiotherapy in Cancer Management

Cancer type	Recommended optimal utilization rate of RT (%)
Head & Neck	78
Lung	76
Esophageal	80
Breast	83
Central Nervous System	92

Delaney G, Jacob S, Featherstone C, Barton M. The role of radiotherapy in cancer treatment: estimating optimal utilization from a review of evidence-based clinical guidelines. Cancer. 2005;104(6):1129-37

#### **Global Access to Radiation Therapy**



US: 18 times as many clinics per M people as in India

#### **Global Access to Radiation Therapy**





Tsapaki et al, Medical Physics workforce: a global perspective, Physicia Medica, 55, 33-39, (2018)



# Impact of Reliability



McCarroll et al. J Glob Onc, 3(5), 563- 571 (2017)

- Reliability
- Simplicity
- Efficiency
- Reduced staffing requirements

NCI Affordable Cancer Technology Program





### Novel Ring-based Compensator IMRT





Plastic shell 3D printed

Fill plastic shell with Tungsten

Treat each field through unique compensator



- Compensator vs. MLC IMRT
  - Upfront costs
  - Continuing maintenance
  - Power
  - QA, physics time & expertise
- Enables IMRT with <sup>60</sup>Co, efficient use of dose



#### Van Schelt, J. et al. Med Phys, 2018





Van Schelt, J. et al. Med Phys, 2018







### Compensator Resolution (H&N plans)



# Monte Carlo Simulations (Geant4)







Reliability





Complex radiation therapy workflow

Ford et al. Int J Radiat Oncol Biol Phys, (2009)

- Reliability
- Simplicity ocess

Wholency

Reduced staffing requirements





### Summary

- Acute need to radiation therapy in underserved areas of the globe
- Current methods have evolved organically
- Complex, time-consuming, error-prone
- Shift toward simplicity, efficiency

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