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Alternative technologies to high activity radioactive sources for radiation therapy

WINS 6th Regional Review Meeting

Colombo, Sri Lanka

Michael Sandhu, VP MARKET ACCESS & INTEGRATION

Growing Global Cancer Burden

Lancet Oncology Report 2015 – Calls to Action

THE GLOBAL CANCER BURDEN CONTINUES TO GROW...

NEW CANCER CASES AND DEATHS WORLDWIDE

2025
19.6M new cases
11.5M deaths

2012
14.1M new cases
8.2M deaths

Source: 3 and 4

...AND THE BURDEN IS HIGHEST IN LMICS

LMIC = Low/middle income country

Currently LMICs account for

of the global cancer burden

Source: 3

RADIOTHERAPY (RT) IS "A CRITICAL COMPONENT" OF CANCER TREATMENT AND CARE...

BY 2025,
2M PEOPLE
would derive a clinical benefit
AND
1M PEOPLE
would survive cancer with access to RT

MORE THAN **50%** of patients benefit from radiotherapy treatment
Source: 3

Comprehensive state-of-the-art cancer care requires **MULTIDISCIPLINARY TREATMENT** and palliation (incl. surgery, radiation therapy and chemotherapy)

...BUT LMICs HAVE THE LEAST ACCESS TO RT

LMICS ONLY HAVE...

of global radiotherapy resources

of patients have no access to radiotherapy

THE LANCET ONCOLOGY COMMISSION:

QUANTIFIES
the life-saving and economic advantages of broader access to radiotherapy

AND

RECOMMENDS
next steps for expanding adoption of radiotherapy

5 KEYS TO EXPANDING GLOBAL ACCESS TO RT

1. **PLANNING**
Incorporate RT into the population-based cancer control plans of 80% of countries by 2020

2. **"25 X 25"**
Increase RT treatment capacity 25% by 2025

3. **TRAINING**
Train thousands more RT professionals in LMICs by 2025

4. **FINANCING**
Invest US$46 billion by 2025 to establish RT infrastructure and training in LMICs

5. **AFFORDABILITY**
Include RT services as part of the universal health coverage plans in 80% of LMICs by 2020

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Greatest Incidence and Survival Benefit in LMICs

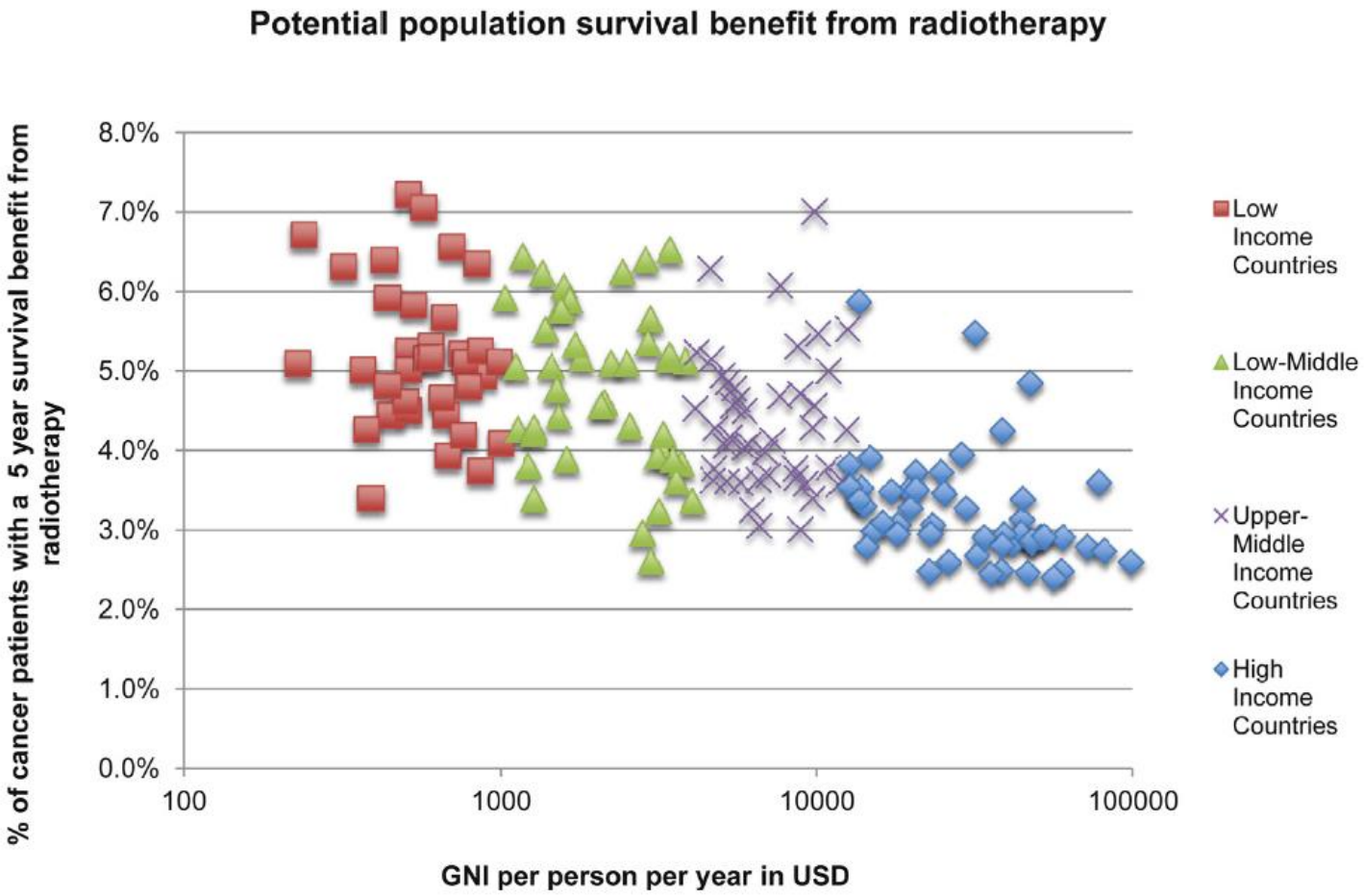

Fig 4. Survival benefit from radiotherapy according to country income classification.

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Overview

The Benefits of Providing External Beam Radiotherapy in Low- and Middle-income Countries

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Diseases treated with Radiation Therapy

50-60% of cancer patients need radiotherapy

Curable Cancers with RT ALONE:

- Prostate Ca
- Head & Neck Ca
- Lung Ca
- Cervical Ca
- Skin Ca

90%

of patients in low income countries have no access

Curable Cancers with RT as part of treatment (adjuvant):

- Breast Ca
- Adv. Lung Ca
- Adv. Cervical Ca
- Adv. Head & Neck Ca
- Brain Tumors
- Rectal Ca
- Endometrial Ca
- Bladder Ca
- Testicular Ca
- Sarcomas
- Pediatric Ca

Metastatic disease: Bone / Brain / Other…

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Global Radiation Therapy Gap

What is Needed	2015	GAP	2035
Radiation Oncology Centers	7,700	3,200	10,900
Linear Accelerators	13,100	21,800*	21,800
Radiation Oncologists	23,200	22,300	45,500
Medical Physicists	10,000	29,300	39,300
Radiation Technologists	33,300	96,900	130,200

KEYS TO CLOSING GAP

AUTOMATION

SIMPLIFICATION

PRODUCTIVITY

Expanding global access to radiotherapy. Lancet Oncol. Vol 16, Sept.2015

*8,700 new machines plus 13,100 replacements = 21,800 additional machines needed

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Current Practices in Radiation Treatment for Cancer

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Evolution of Radiation Therapy Techniques

Improving Precision

Delivery Techniques
- Conventional 2D radiotherapy
- Conformal radiotherapy
  1. 3DRT
  2. IMRT

Localization Techniques
- In-room Guidance:
- US, X-rays, CT, Optical, RF

Dose Evaluation Techniques
- Dose recalculation
- Dose reconstruction

Dose Modification Techniques
- Off-line re-optimization
- On-line re-optimization

Image-Guided Radiotherapy

Dose-Guided Radiotherapy

Adaptive Radiotherapy

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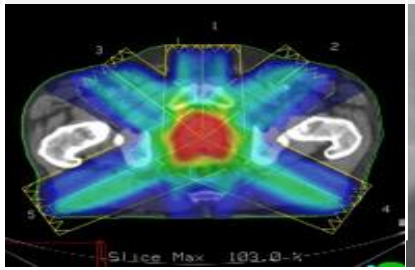
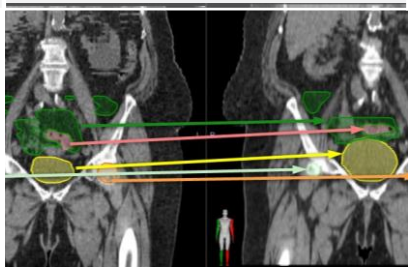
Development of Radiation Therapy Delivery

	1995-2000	2000-2005	2005-2010	2010-2015	2015-Future
	Beam shaping devices MLCs	**In-room image guidance**	**Partially integrated systems**	**End to End Integrated RT Platforms**	**Hypofractionation Adaptive RT**
Technology	• IMRT	• IGRT	• Dedicated devices • Multivendor environment	• SRS • SBRT/SABR • ART	• Need for increased integration and/or interoperability

Clinical Impact	• Head/Neck: improve saliva / swallowing
	• Pelvis: less bowel toxicity
	• Allows safer chemotherapy administration
		• Prostate Cancer: Enable dose escalation: improve cure
		• Reduce traditional set-up errors
			• Increased complexity
			• Decrease throughput
			• Increase safety concerns
				• Lung Ca SBRT: improve cure
				• Frameless CNS radiosurgery
				• Partial breast accelerated irradiation
					• Faster, better, safer treatments
					• Global access:
					  • Simpler set-ups
					  • Education & training

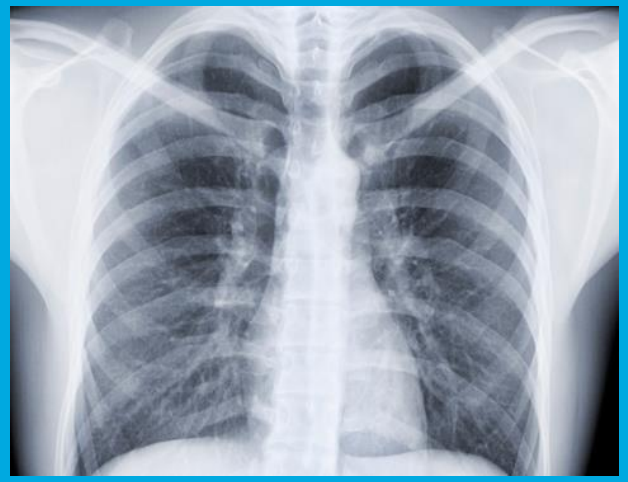
Radiation Therapy Today

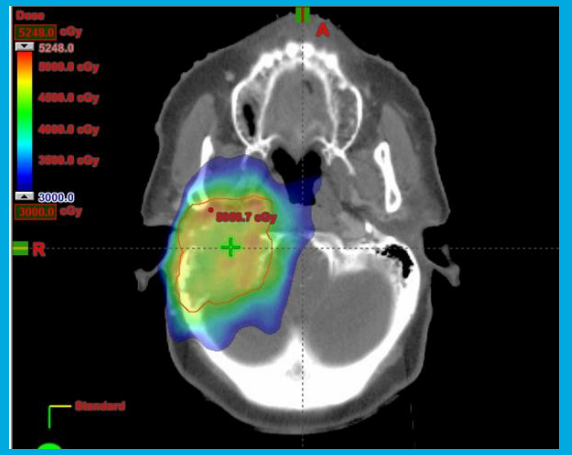
Seeing More Accurately

- Cone-Beam CT
- kV radiographs
- Electromagnetic transponders

Treating More Accurately

- Dynamic Beam Shaping
- Intensity Modulated Radiotherapy (IMRT)
- High dose rate delivery
- Advanced planning and delivery
- Comprehensive software systems





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Development of Linear Accelerators for Radiation Therapy

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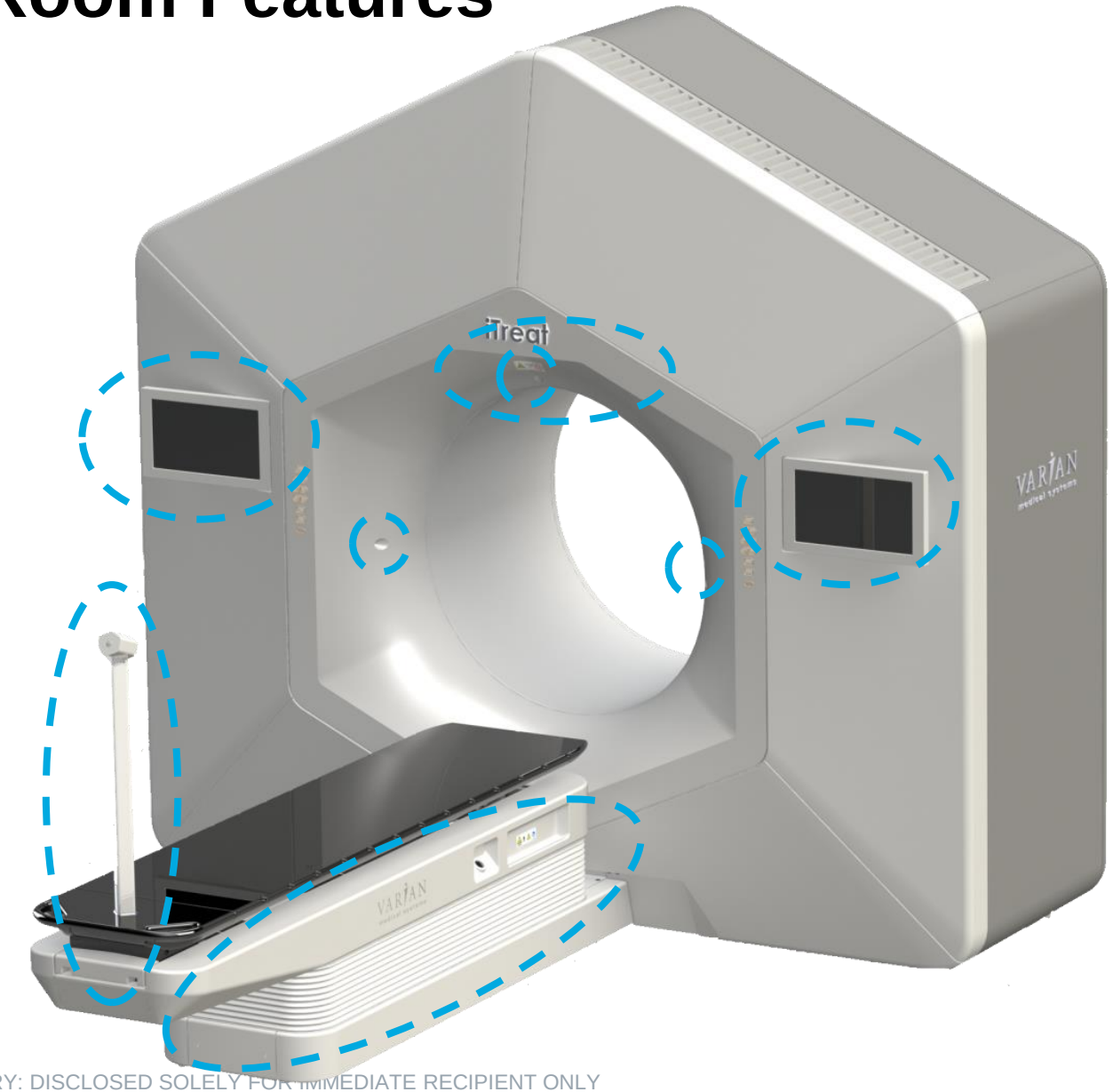
Integrated In-Room Features



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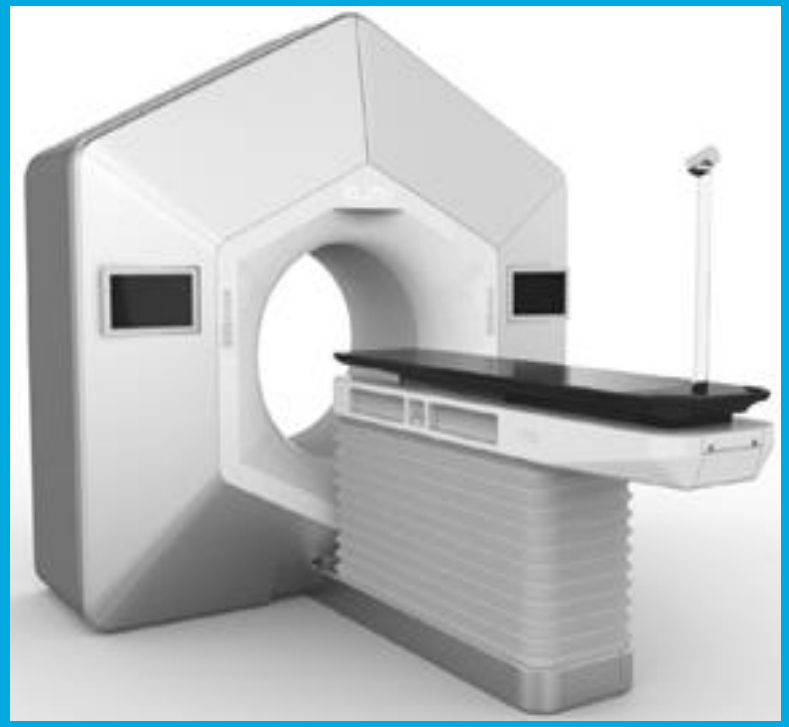
Simplified Operations

Operational Excellence

- Advanced Treatments in fewer Operator steps
  - Minimal key presses to deliver
- In-Built Machine Performance Checks
  - QA checks
  - Self-diagnostics
- High Reliability



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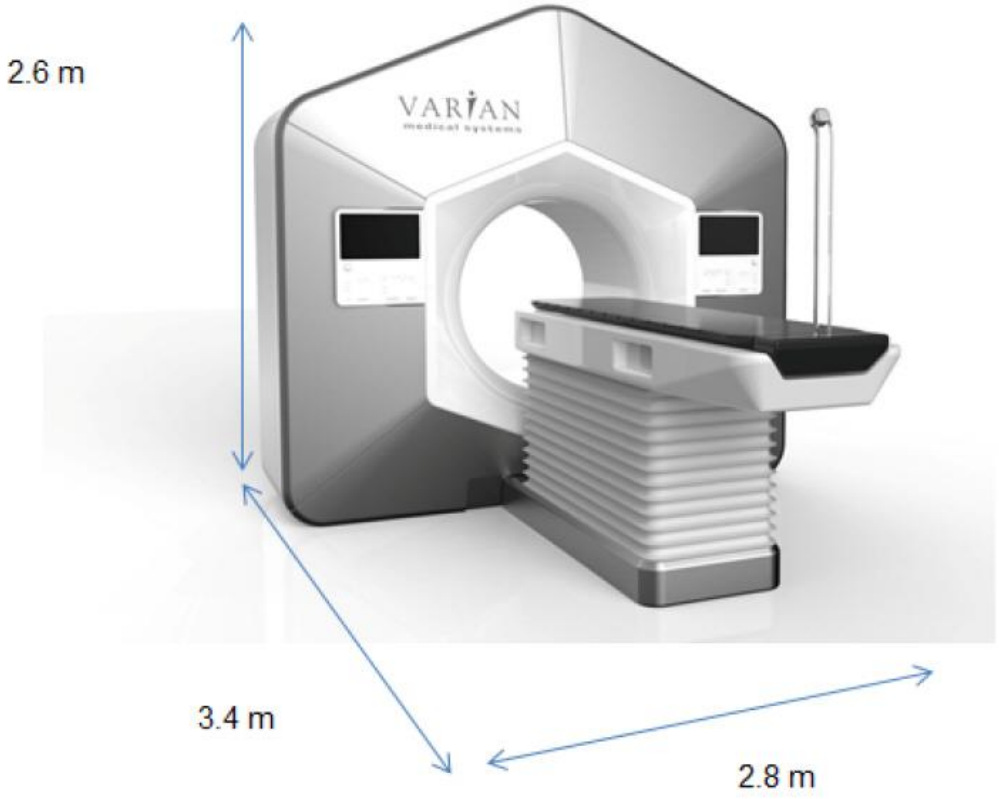
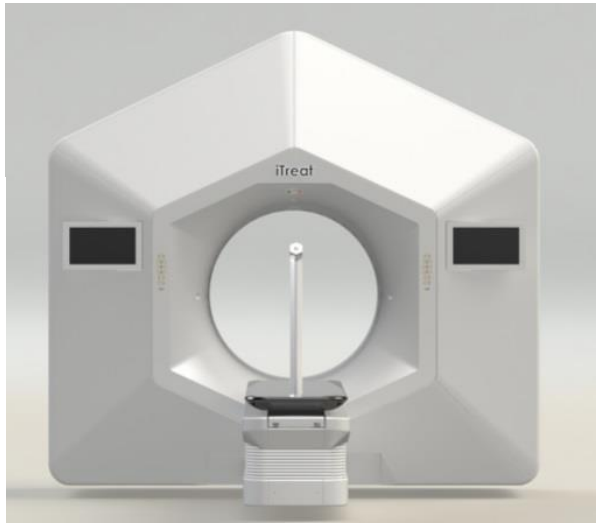
Smaller Footprint – Fast and Simple to Install





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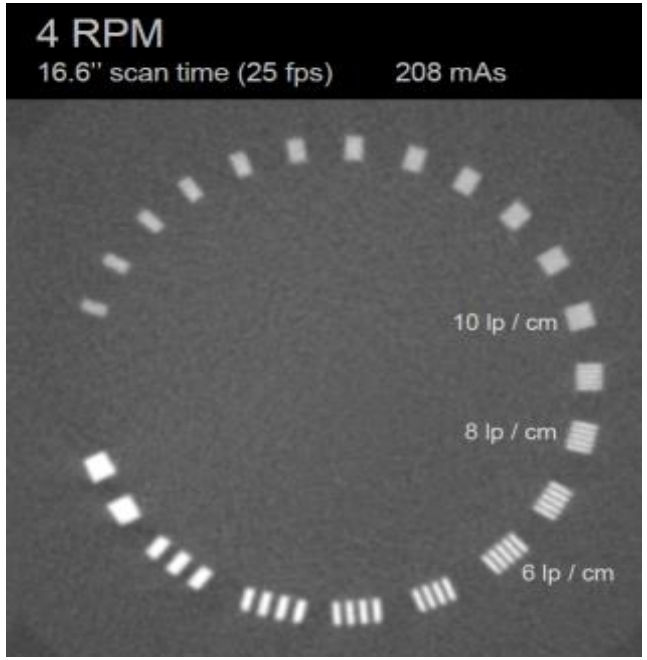
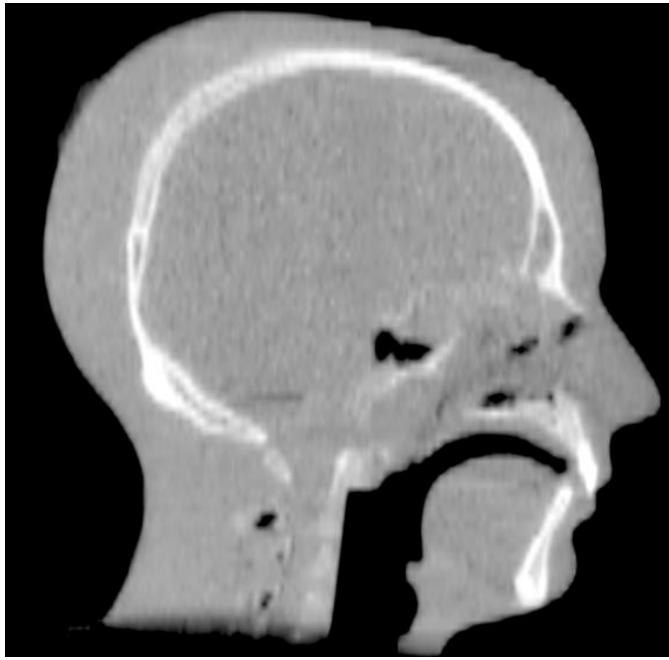
High Quality Care

- Fast and sharp images
- kV and MV CBCT
- Imaging dose taken into account in Treatment Planning

kV CBCT



MV CBCT



Phantom images acquired on prototype system

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Training Needs for Radiation Therapy

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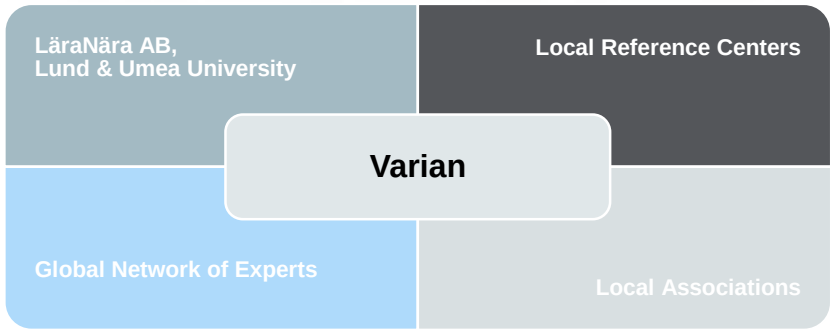
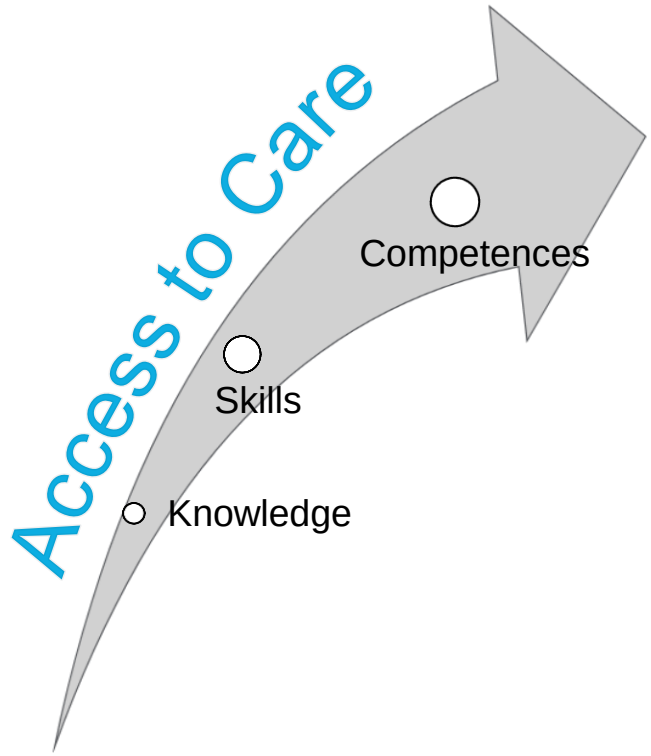
Initiatives to Educate in LMICs

Access to Care Foundation

Adding machines is one part of the solution

Building human capital is the other part of the solution





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From Simple 2D to 3D

Groote Schuur Hospital, Cape Town

- Collaboration between local Universities and Varian
- 3 Weeks at Groote Schuur followed by 10 weeks of follow up by teachers
- Two class rooms
  - First VERT ™ Radiotherapy Simulation System in Africa
  - Cloud based training TPS (14 stations)
- Complete teams are trained from Sub-Saharan Africa
  - 1 Radiographer, 1 Physicist and 1 Oncologist per site
- Aim
  - Empower teams to deliver high quality 3D Conformal Radiotherapy Treatment
  - Development of evidence based clinical protocols at site
  - Implementation of QA/QC protocols at site

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In Conclusion

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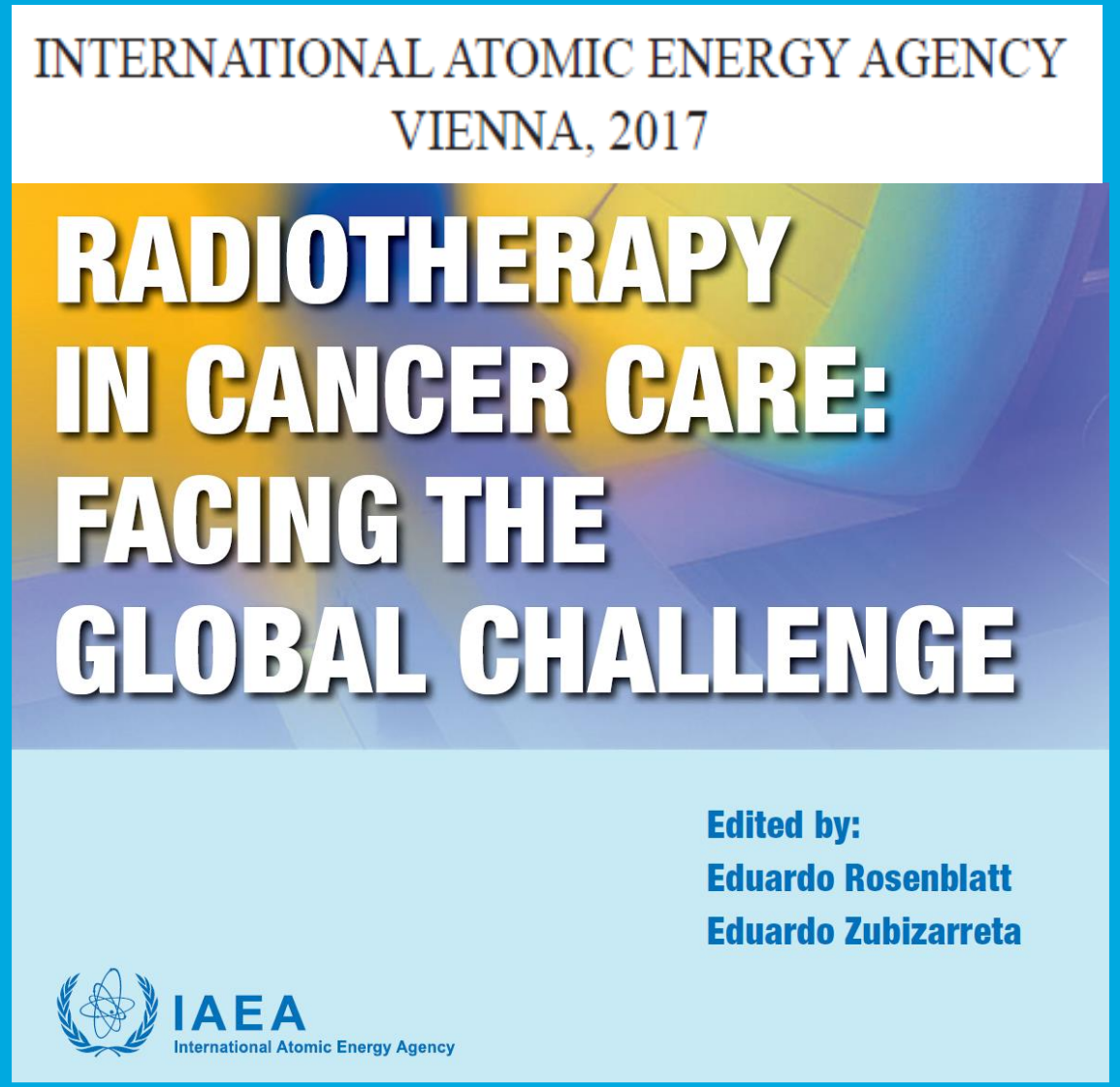
Radiation Therapy is cheap!

the administration of radiotherapy, when evaluated per fraction throughout the lifetime of a machine, is actually a relatively cost effective procedure. Even after factoring in all levels of costs related to the procurement, maintenance and operation of a machine, estimates place the cost per fraction for a ^{60}Co machine at a median of US $4.87 and for linear accelerators (linacs) at a median of US $11.02, which, compared with chemotherapy costs which can reach over US $600 per treatment, are comparatively inexpensive [1.11].

Cobalt-60 teletherapy units have been replaced almost completely by medical linacs in North America, Western Europe [30.13], Australia and Japan. However, in many developing countries, cobalt-60 units still represent the workhorse for the provision of radiotherapy due to their relative sturdiness, and their simpler servicing and maintenance needs. The replacement of a cobalt-60 source, which must ideally be done every five years, has become an insurmountable obstacle for many limited resource centres. Security concerns lead to restrictions on the international transport of radioactive sources, which in turn result in higher costs. In this scenario, many centres opt to replace their old cobalt units with single energy linacs. A decline is foreseen in the use of cobalt-60 teletherapy units in the future as they continue to be replaced by single energy linacs in developing countries.



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Misconceptions on costs are changing

MISCONCEPTIONS
ABOUT RADIOTHERAPY COSTS PERSIST...

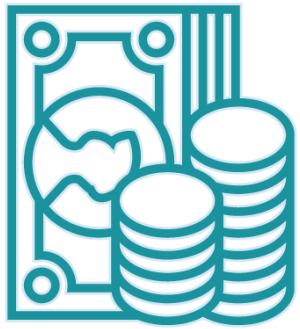
"The continuing geographic disparity in access to radiotherapy is being perpetuated by the **misconception that it is too costly or impractical** to successfully implement in LMICs."

— LANCET ONCOLOGY COMMISSION REPORT

Cost of care is **less expensive in LMICs** compared to global average*

$2000 per course globally vs **$1260** per course in LMIC

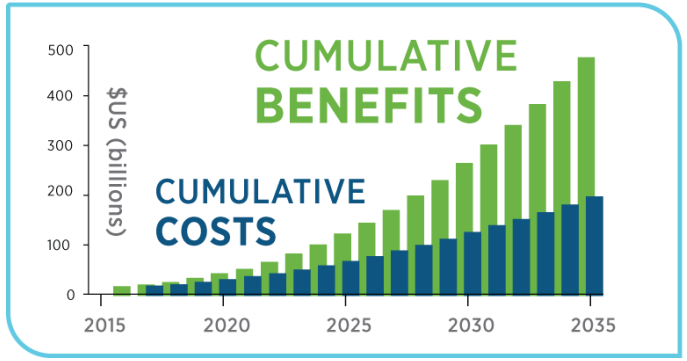
*Average cost per fraction for LMICs and globally — assuming 20 fractions per course of treatment



Source: 3

...YET COST/BENEFIT ANALYSIS REVEALS HIGH RETURNS

Cost of scaling up access by 2035 approx. $184B U.S.



This investment would **save 26.9M life years** with a **net economic benefit of $278.1B**

Models suggest that during normal use these costs are recouped within 10-15 years

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(Thank You)