Access to Radiotherapy: Bridging The Gap Through Innovation

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University of California San Francisco

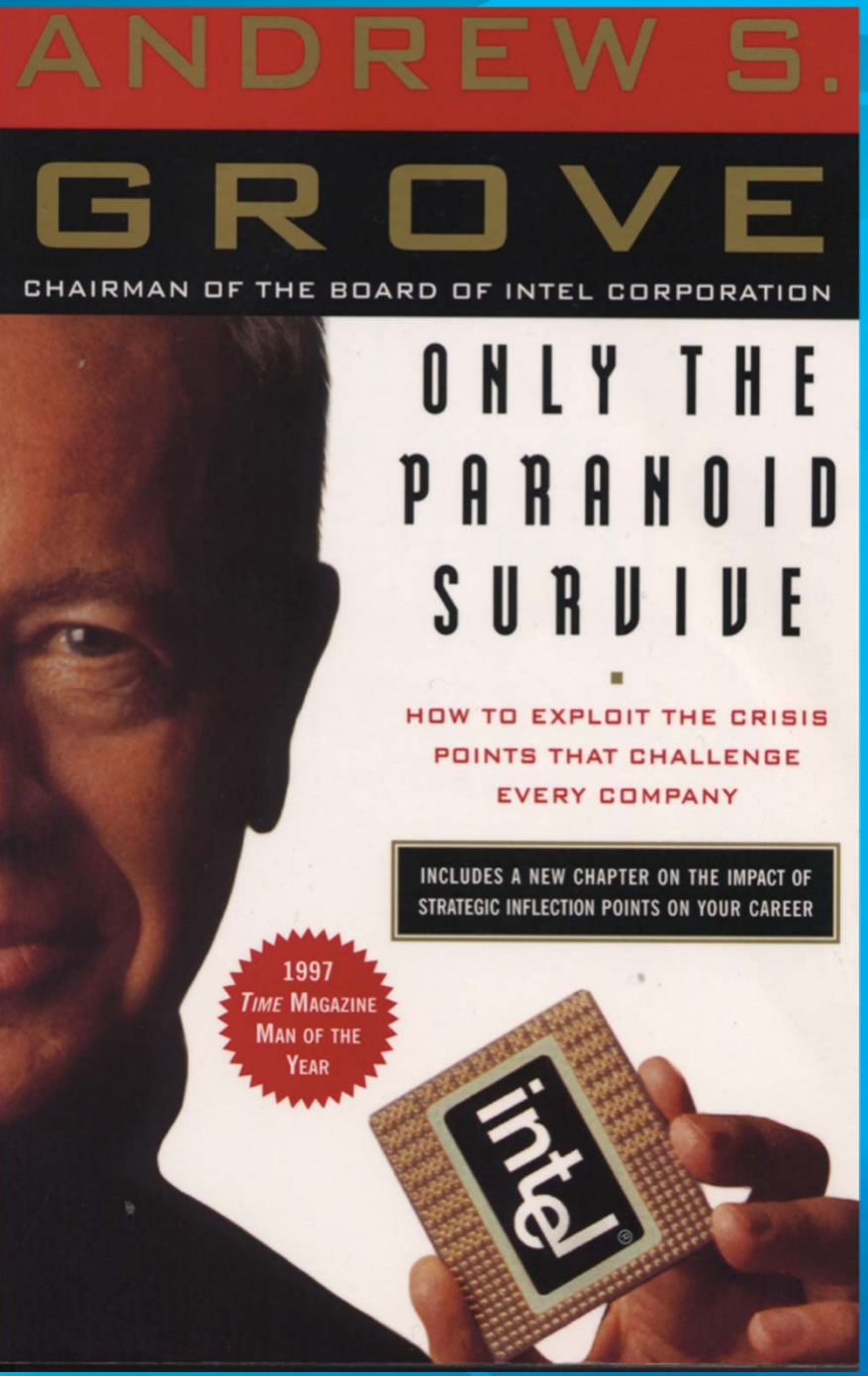
19–20 September 2017

IAEA Scientific Forum

Nuclear Techniques in Human Health

Prevention, Diagnosis, Treatment

UCSF Helen Diller Family Comprehensive Cancer Center



Andy Grove says:

"A fundamental rule in technology says that *whatever can be done* will be done. "

Andrew S. Grove - *Only the Paranoid Survive*

Original Contribution

A REVIEW OF DIGITAL IMAGE NETWORKING TECHNOLOGIES FOR RADIATION ONCOLOGY TREATMENT PLANNING.

SMITH et al. Medical Dosimetry 23: 271-277, 1998

… In the current healthcare marketplace, many radiotherapy facilities operate satellite centers or may be undergoing mergers with other service providers in their community.

As a consequence, the development of network-based radiotherapy image communication may yield a significant impact on the clinical operation …

Digital image networking will become an everyday tool in radiotherapy treatment planning in the near future.

… This article presents a review of the network architecture and transmission standards necessary for understanding and developing a radiotherapy image network.

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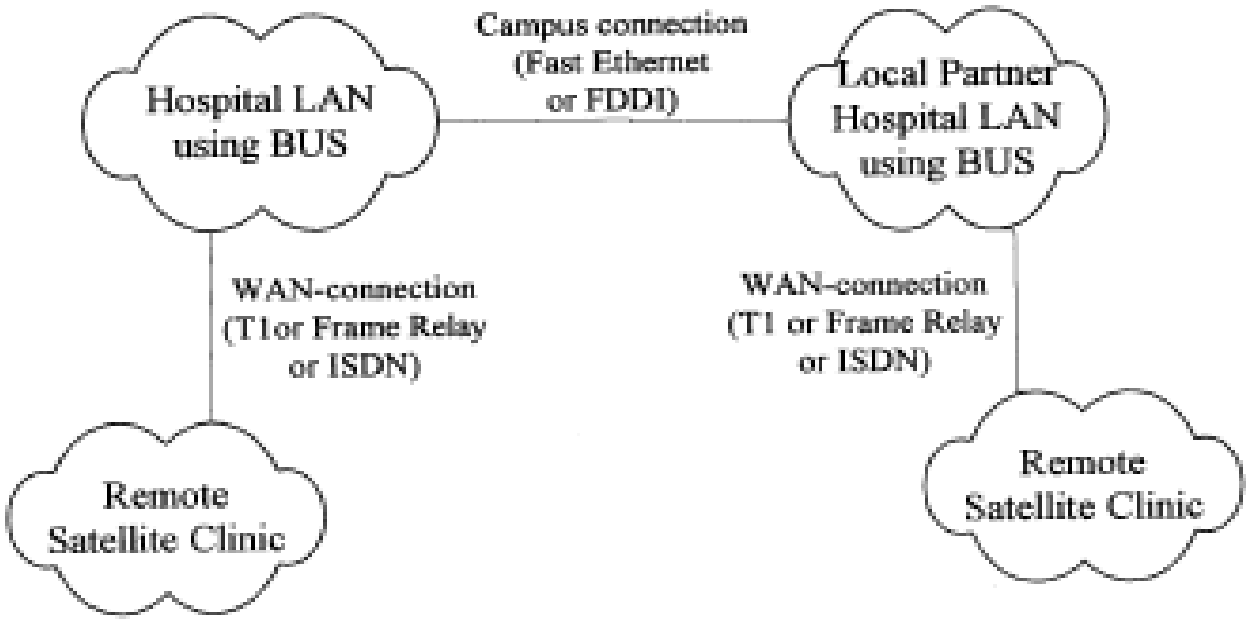


Fig. 2. An example of LAN relationship to Campus and Wide Area Network (WAN) architecture.

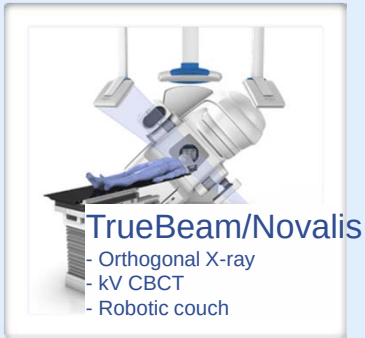
LAN = local area network;

DICOM = Digital Imaging and Communications in Medicine (DICOM)

Networked Technologies at 3 different sites at UCSF Department of Radiation Oncology:

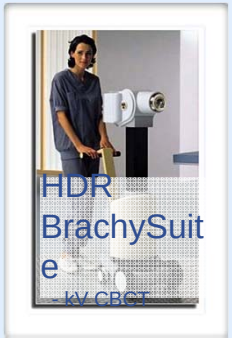
SRS

SBRT



SBRT

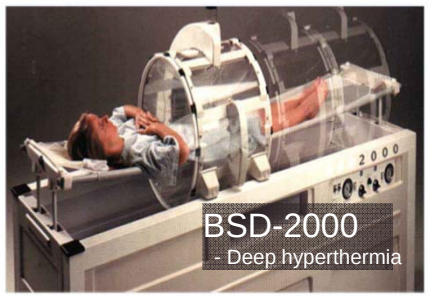
HDR



IMRT/IGRT

IMRT/IGRT

HT



IMRT/IGRT

IORT

Research Article

Training the Trainees in Radiation Oncology with Telemedicine as a Tool in a Developing Country: A Two-Year Audit.

Agrawal et al. Int Journal of Telemedicine and Applications, 2011

Purpose ~ Rad oncologists: ca. pt ratio ~ 1:2000 vs recommended 1:250 … compounded by the poor infrastructure of Rad. oncology departments … suboptimal for teaching, training of resident doctors ...

… To bridge … gap … enhancement of training of residents … telemedicine facility … and a two-year audit of our tele-education activities.

M & Methods. … established telemedicine linkage with … city located 25 kms away … academic sessions … for trainees … shared … remotely.

Results. Regular videoconferencing sessions … of lectures on clinical oncology, medical physics, and radiobiology ...

Feedback … satisfaction with the content of … sessions for … MD training.

Conclusions. Distance education … an important tool for training … residents.

Global Health

A Roadmap and Cost Implications of Establishing Comprehensive Cancer Care Using a Teleradiotherapy Network in a Group of Sub-Saharan African Countries With No Access to Radiation Therapy

Niloy R. Datta, MD,* Michael Heuser, BA,* and Stephan Bodis, MD*,†

International Journal of Radiation Oncology biology • physics

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PURPOSE: … explore the cost implications of establishing a teleradiotherapy network to provide comprehensive cancer care and capacity building in countries without access to radiation therapy (RT).

METHODS AND MATERIALS: Ten low-income sub-Saharan countries with no current radiation therapy facilities were evaluated.

A basic/secondary radiation therapy center (SRTC) with 2 teletherapy, 1 brachytherapy, 1 simulator, and a treatment planning facility was envisaged at a cost of 5 million US dollars (USD 5M).

… networked with 1 to 4 primary radiation therapy centers (PRTC) with 1 teletherapy unit, each costing USD 2M. The numbers of PRTCs and SRTCs for each country … computed on the basis of cancer incidence, assuming that a PRTC and SRTC could respectively treat 450 and 900 pts annually.

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A Roadmap and Cost Implications of Establishing Comprehensive Cancer Care Using a Teleradiotherapy Network in a Group of Sub-Saharan African Countries With No Access to Radiation Therapy. Datta et al. IJROBP 95: 1334-43, 2016

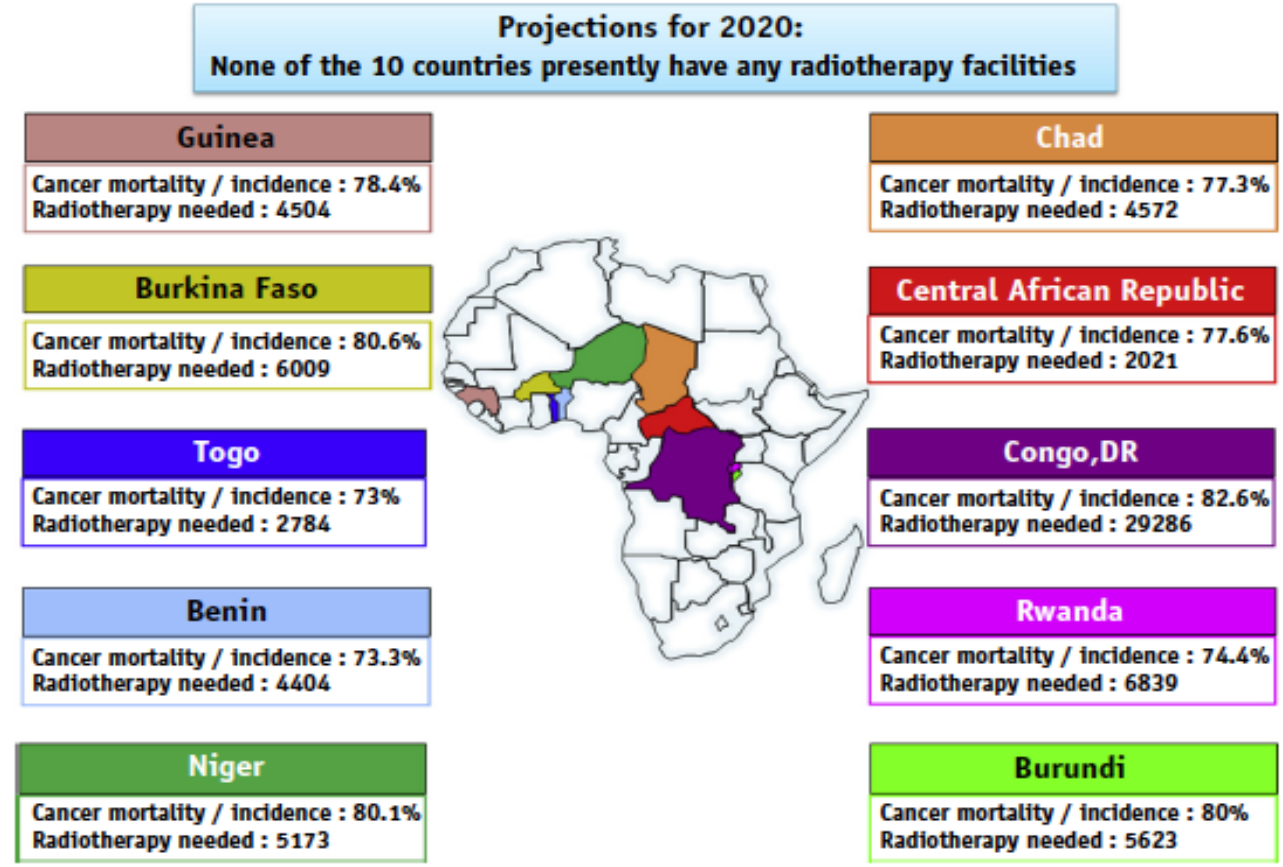

Fig. 1. The 10 sub-Saharan countries with their projections for cancer incidence and mortality for 2020, as per GLOBOCAN 2012 (20).

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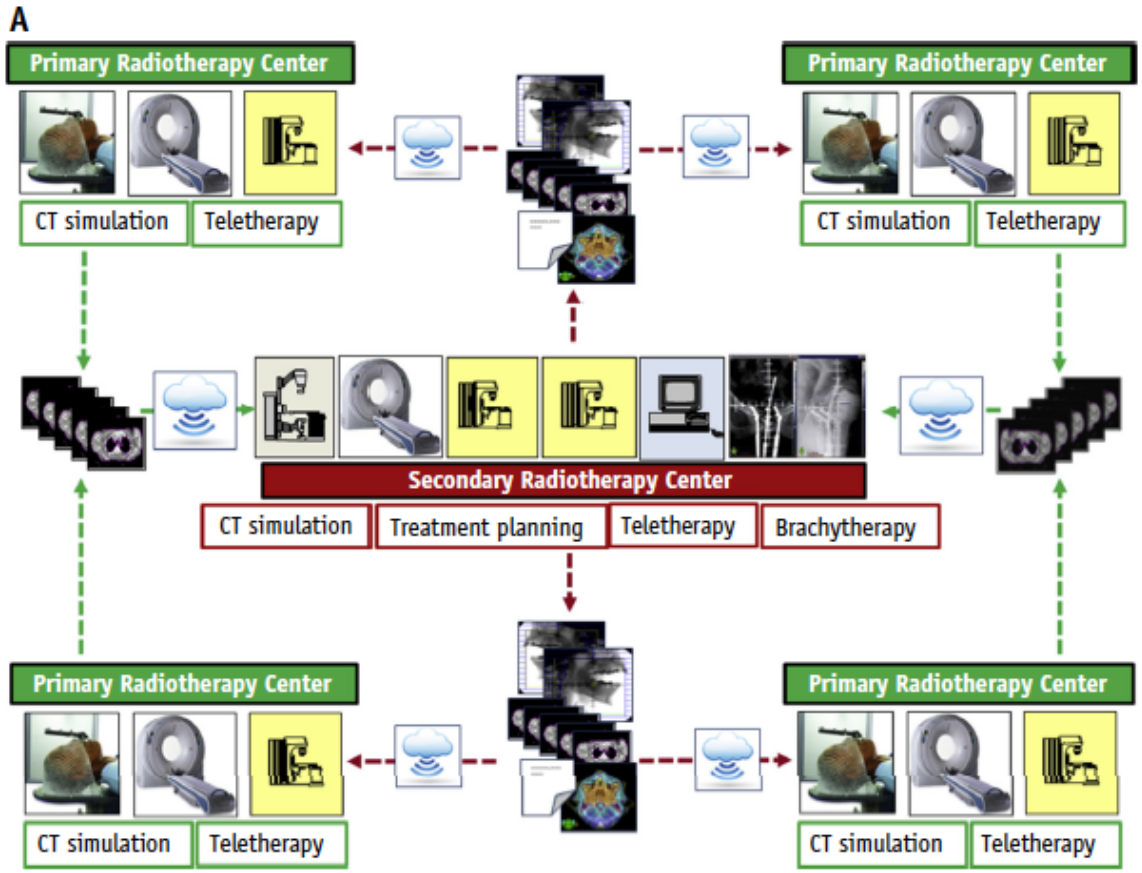

Fig. 3a. Teleradiotherapy network for optimizing the radiotherapy services by integration of primary and secondary radiotherapy centers.

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RESULTS: ~ 71,215 pts … these countries will need Radiotherapy in 2020. … Capacity building could be undertaken through telementoring by networking to … international institutions and professional societies.

… 1.04 million pts could receive RT during the 15-year lifespan of a teletherapy unit for an investment of USD 826.69 per pt.

For the entire pop. of 218.32 million, … ~ to USD 4.11 per inhabitant.

CONCLUSION: A teleradiotherapy network could be a cost-contained innovative health care strategy to provide effective comprehensive cancer care through resource sharing and capacity building.

The proposal calls for active coordination between all national and international organizations backed up by strong geopolitical commitment and action from all stakeholders.

Global Access to Radiotherapy Services: Have We Made Progress During the Past Decade?

Yap, M. L., Zubizarreta, E., Bray, F., Ferlay, J., Barton, M. J Glob Oncol, 2: 207-2015, 2016

PURPOSE: … estimate the global demand/supply of RT megavoltage machines (MVMs) … changes in supply/demand during the decade.

M & M: … incidences for 27 cancers in 184 countries … extracted from the International Agency for Research on Cancer GLOBOCAN database. The Collaboration for Cancer Outcomes Research and Evaluation radiotherapy utilization rate (RTU) model was used to estimate the number of pts … with an indication for RT … RT supply data were accessed from Directory of Radiotherapy Centres database maintained by the IAEA.

RESULTS: RTU varied by country … ~32% in Mongolia to 59% in Comoros. … There remains a deficit of more than 7,000 machines worldwide.

… past decade, the gap between RT demand/supply has widened in low-income countries.

CONCLUSION: … Approximately half of all patients with cancer worldwide should receive radiotherapy; however, more than 2 million people are unable to access it because of a lack of MVMs.

LMICs are particularly disadvantaged by this deficit.

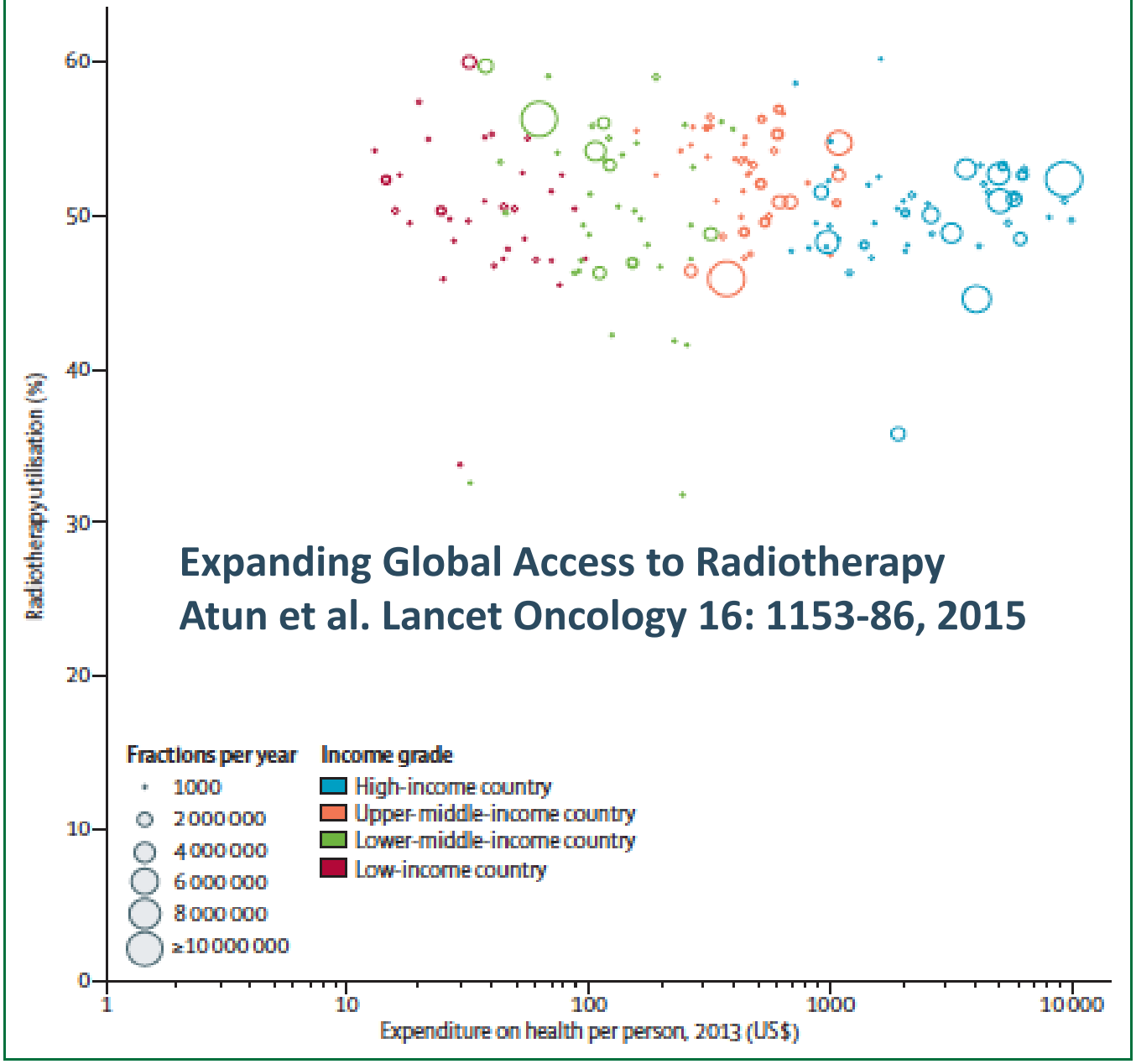

Figure 6: **Radiotherapy utilisation versus health expenditure per person, 2013, by income level**
Each circle represents a distinct country. The diameter of the circle is the actual yearly number of fractions delivered. Evidence-based estimates of appropriate levels of radiotherapy utilisation are independent of a country's health-care expenditure status.

Request for Proposals for Pilot Collaborations with LMICs in Global Cancer Research at NCI-Designated Cancer Centers

Presented to NCAB Subcommittee on Global Health
By National Cancer Institute
Center for Global Health
June 23rd, 2013
Bethesda, MD

Objective of the Request for Proposal (RFP)

- To promote cancer research and to **increase research capacity in LMICs through collaborations or research partnerships between NCI-Designated Cancer Centers and foreign institutions**
- One-year pilot study

Proposal Scope

- Cancer Prevention, Detection, Diagnosis and Treatment
  - Basic, translational or clinical research
  - **Training and capacity building (e.g. RT QC/QA)**
  - Informatics, data managing and sharing
  - Biorepositories establishment and management
  - Retrospective or prospective studies, assay development
  - HIV-associated malignancies; integration of HIV programs that benefit cancer patients

Global Cancer Pilot Award
Project Award Amount: Up to $50,000 in direct costs over 1 yr

Description: … By 2030 … Nearly 70% of cancer-related deaths will occur in LMICs.

UCSF Helen-Diller Family Comprehensive Cancer Center

The purpose of these grants is to support innovative projects that address topics related to prevention, screening, diagnosis, and/or treatment of cancer in LMICs.

These pilot awards are intended to support a wide range of research, including basic science, clinical/translational science, epidemiology, social science, and behavioral science. While applications to develop capacity-building projects are allowable, this mechanism will prioritize the funding of research projects that will lead to future NIH grant proposals or other substantive extramural funding. The project must be a collaboration between a UCSF faculty member and a named investigator at an academic institution in a LMIC. A letter of support from the collaborating LMIC institution is required ...

Who'sEligible:
UCSF Faculty in any series (Ladder Rank, In Residence, Clinical X, Health Science …) at all ranks (Instructors, Assistant, Associate …) may apply ...

Criteria for Review / Evaluation of Applications
***… These priorities include developing or building meaningful collaborations between UCSF and LMIC institutions*. Proposals will be evaluated based on the quality of the proposed scientific investigation, the significance … overall public health impact, and the potential of the proposal to lead to future success …**

Examples of Future Advances Tele-Radiotherapy:

1. Diagnosis – remote expert review of imaging, path.
2. Expert consultation and treatment recommendations.
3. Target volume definitions, dose constraints, margins …
4. Expert evaluation of the quality of treatment plans.
5. Remote monitoring of radiation equipment (e.g. QA, pro-active remote monitoring and maintenance).

… Bridging The Gap Through Innovation:

Conclusions:

- ***Remote consultation … improving rapidly***
- ***Remote treatment planning … capability exist now!***
- ***Access to professionals & patient populations in the field of radiotherapy ... that is why we are here!***