Accelerating the Future:

Designing a Robust and Affordable

Radiation Therapy TREATMENT SYSTEM

for

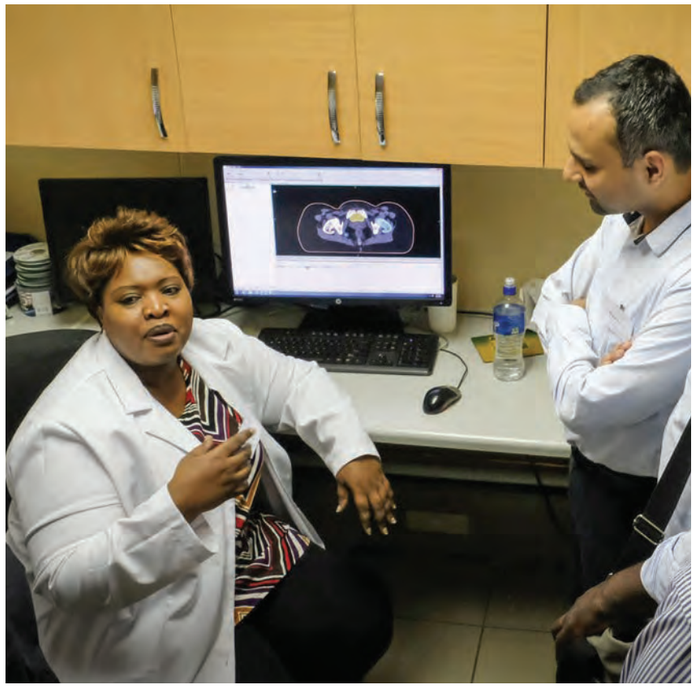
Challenging Environments

The 4th Conference to coordinate efforts to design and develop an affordable and robust yet technically sophisticated linear accelerator-based radiation therapy treatment (RTT) system was held in Gaborone, Botswana on March 20-22, 2019. The conference was sponsored by STFC with funding from the UK Global Challenges Research Fund (GCRF) and supported by CERN and ICEC.

All too often, conferences related to creating a new program or technology to improve the care of patients with cancer or other conditions in LMIC's and underserved regions of UIC countries are held in major world cities; New York, Geneva, London. Convening this conference in Gaborone enabled a significant number (over one half of the attendees) of physicians, physicists and staff from Sub-Sahara Africa and other LMICs to attend, present their reports and interact with the scientists working with them in their own region of the world thereby generating a sense of a global community working toward a common goal. It also allowed participants to visit hospitals, both private and public, in Gaborone to see the conditions under which the robust and modular RTT system will be used. The visiting participants left Gaborone with a much better understanding of the challenges faced by those treating patients with cancer in LMICs and a much stronger commitment to work with their colleagues to develop the new RTT systems that they need.

This workshop, built upon two prior workshops held at CERN in November 2016 and October 2017, and one in Manchester UK in March 2018. LMIC countries with participating representatives included: Botswana, Ghana, Jordan, Kenya, Nepal, Nigeria, Tanzania, Zambia, and Zimbabwe. Expertise included accelerator and medical physicists, engineers, oncologists, and healthcare management representatives.

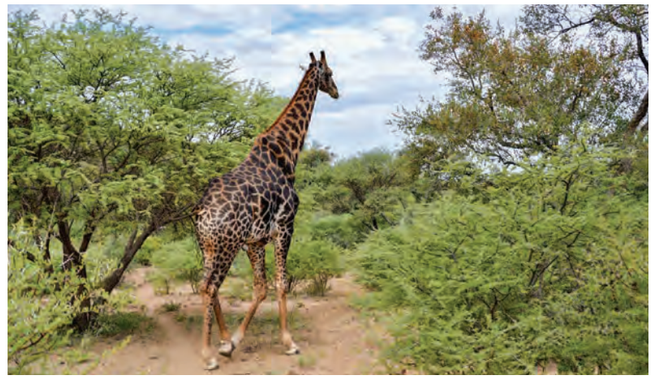
Fourth CERN-ICEC-STFC workshop held in Gaborone, Botswana March 2019.



Linnet Nhari, the radiographer at Life Gaborone Private Hospital

State-of-the art linac facility at Life Gaborone Private Hospital

Medical staff from Botswana



Mokolodi Nature Reserve in Botswana

The meeting was organized with presentations and discussions encompassing five areas:

1. Local LMIC perspective on healthcare, cancer care, and technology challenges

2. Current radiation therapy systems and challenges

3. Project reports on the STFC funded work packages

4. Education, training and technical support needs

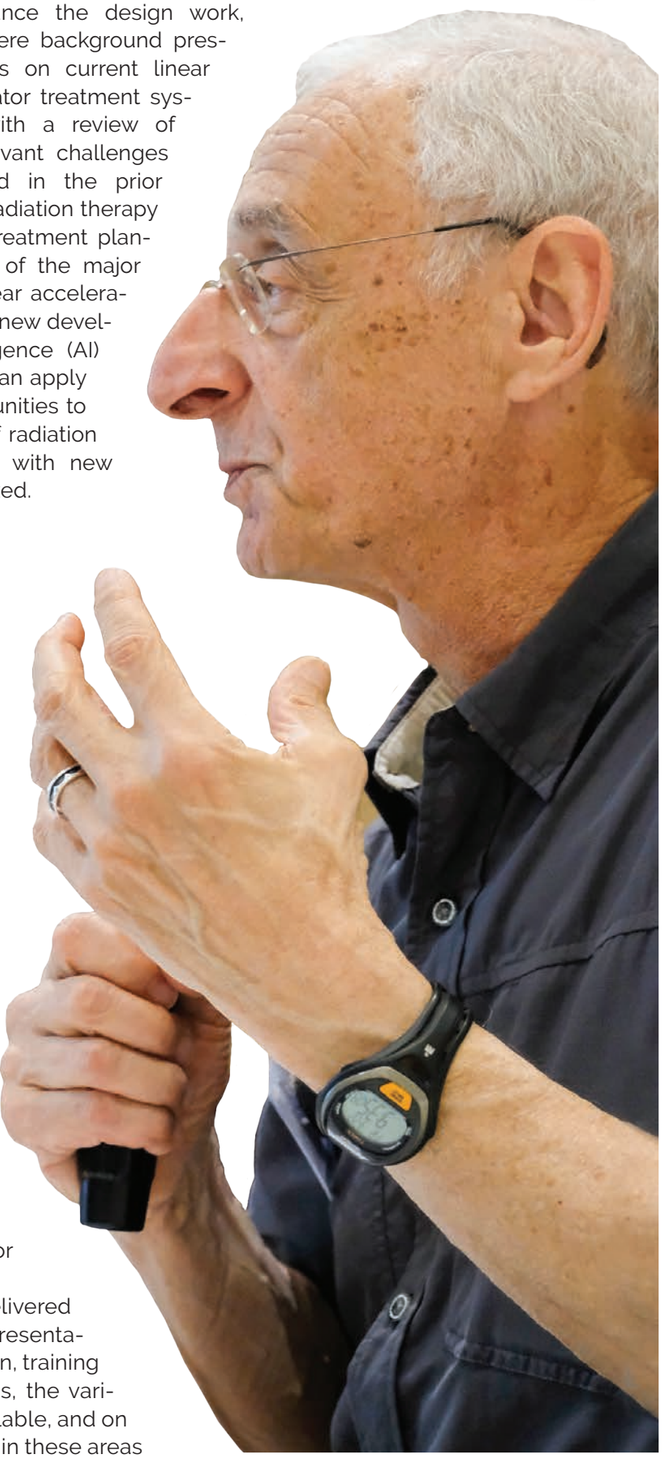
5. Discussion on priorities and next steps

To set the stage for the discussion to advance the design work, there were background presentations on current linear accelerator treatment systems with a review of the relevant challenges identified in the prior workshops; an overview of radiation therapy treatment techniques and treatment planning systems; an overview of the major sub-systems of medical linear accelerators and their shortfalls, and new developments in artificial intelligence (AI) and machine learning as it can apply to radiation therapy. Opportunities to improve the performance of radiation therapy treatment systems with new technologies were summarized.

“The sense of community that this group of world class scientists and oncologists have achieved in pursuit of a technology to improve access to cancer care in challenging environments was inspiring.

Reports were presented on five work packages funded by STFC covering: linear accelerator technology design, accelerator operations and subsystems; power supply options; and cloud technology. Preliminary results from a failure mode study survey for radiation therapy technology experienced in LMICs were also presented. Recommendations were offered on additional areas for R & D.

With radiation therapy delivered within a system of care, presentations were given on education, training and technical support needs, the various programs that were available, and on the continuing unmet needs in these areas with several sessions focusing on medi-



International Cancer Expert Corps

Manjit Dosanjh (CERN), Norman Coleman (ICEC), Charlotte Jamieson (STFC) with Memory Bvochora-Nsingo, radio oncologist in Botswana.

cal physics. Technological solutions to support long-distance mentoring and technical support to compensate for shortages of staff and expertise were discussed.

To learn more about cancer care in Botswana, in addition to meeting with cancer program staff and hospital tours, the group met with the Acting Dean of the Medical School, hospital management, and health ministry representatives and to learn about their priorities, resource commitments and challenges. The WHO Botswana Country Office representative was able to join the group for dinner and talk about WHO's priorities.

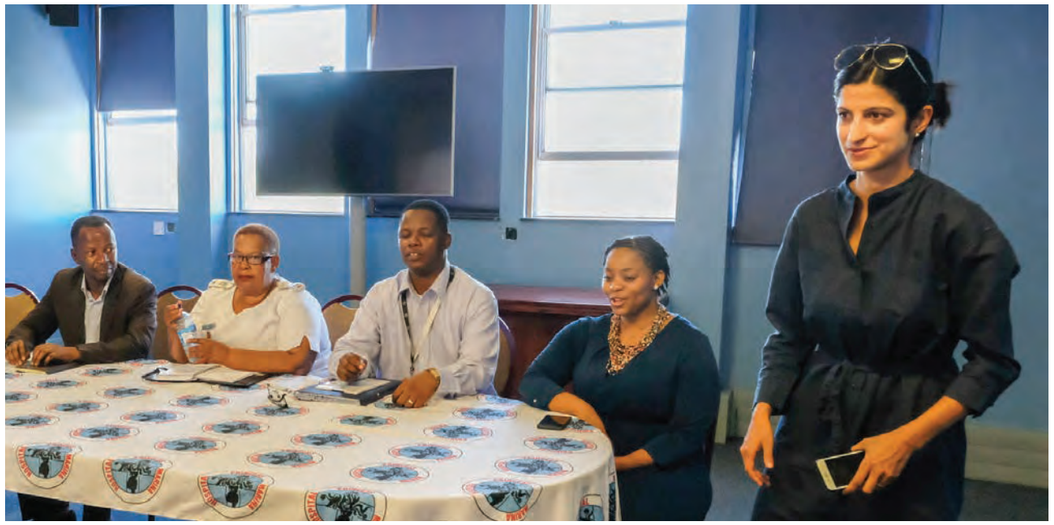
The workshop concluded with a summary of progress, priorities to be addressed, and next steps. The meeting sponsors and participants were most grateful to Princess Marina Hospital, the Life Private Hospital, Sir Ketumile Masire Teaching Hospital and University of Botswana for their time, graciousness, and hospitality.

Donna O'Brien

"Seeing the clinical settings and hearing directly from front line staff on the challenges of providing cancer care was invaluable."

Larry Roth

"The sense of community that this group of world-class scientists and oncologists have achieved in pursuit of a technology to improve access to cancer care in challenging environments was inspiring."



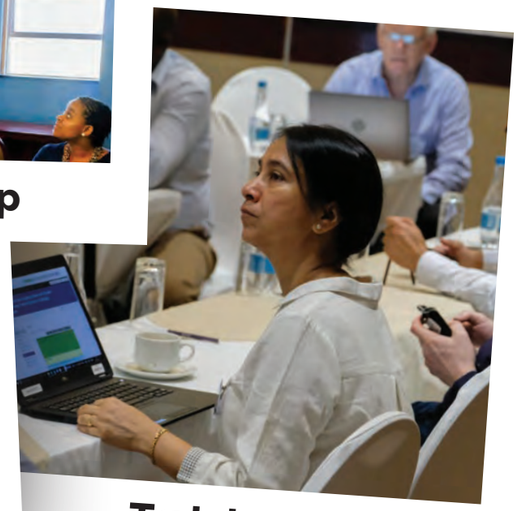
Dr Surbhi Grover at the Princess Marina Public Hospital.

Group photo in front of Avani Gaborone Hotel where the workshop took place.

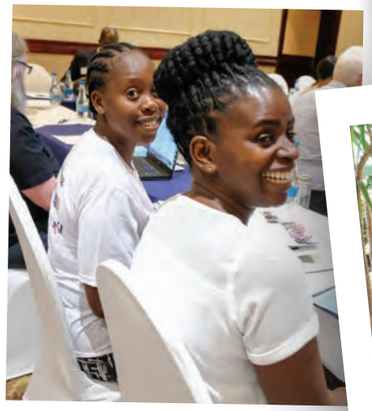
There is need to save many of LMICs from the scourge of cancer which ENLIGHT is promoting.

Platform to exchange ideas

Bridge this gap



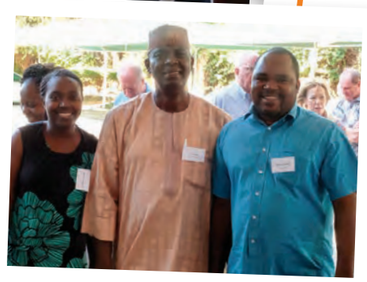
Training the oncologists in Africa



Eye opener

Tackle this global health challenge

The cancer scourge can be "tamed" with concerted commitments and efforts from all the role players and stakeholders.

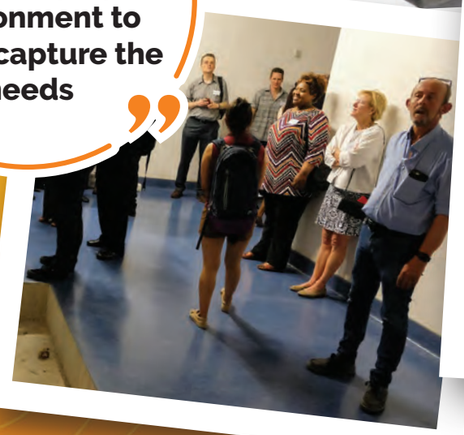


True picture of the need

Universal access to comprehensive cancer care can be made possible through collaborations and scientific innovations

Improve access to radiotherapy

Design concept to the challenging environment to better capture the needs



Heavy patient burden, challenges with shared equipment

URGENCY, COMMITMENT AND PASSION