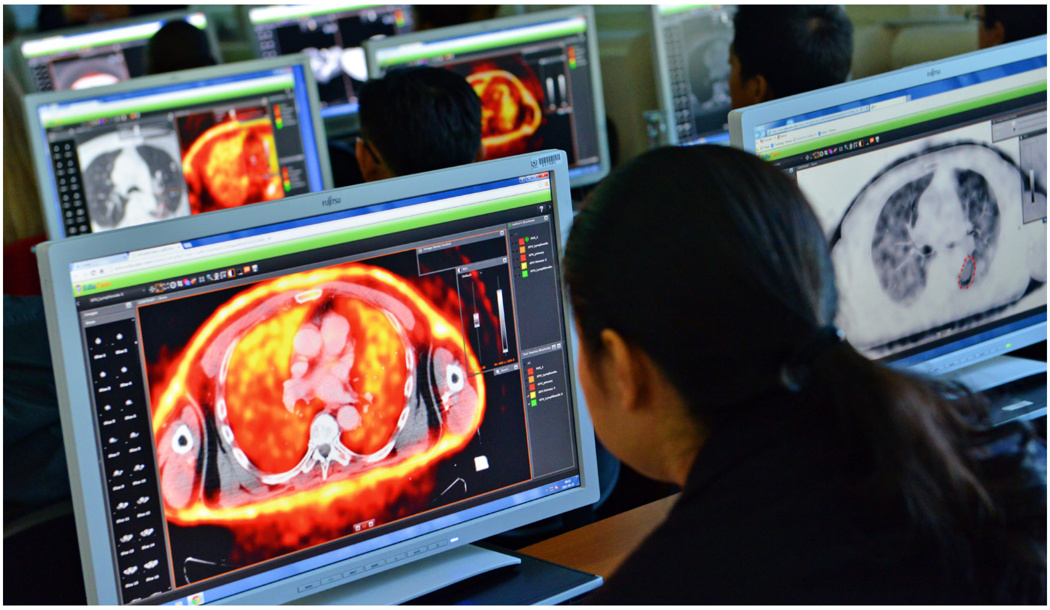
3 GOOD HEALTH AND WELL-BEING

3D radiotherapy increases effectiveness and safety of cancer treatment in Tanzania

By Nicole Jawerth



Radiation oncologists use 3D contouring tools to examine and chart out where tumours lie in the body in order to plan and effectively deliver radiation treatment.

(Photo: D. Calma/IAEA)

> **"Being as accurate as possible when irradiating a tumour is essential. We now have the skills to more fully understand the extent of a tumour and ultimately plan better and more precise treatment for our patients."**
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> *— Mark Mseti, radiation oncologist, Ocean Road Cancer Institute, Tanzania*

Tanzanian doctors are now able to deliver more precise radiation treatment for cancer patients with less damage to healthy tissue. Following training and support from the IAEA in 3D radiotherapy planning, patients will have access to more effective and safer cancer care.

"Being as accurate as possible when irradiating a tumour is essential. We now have the skills to more fully understand the extent of a tumour and ultimately plan better and more precise treatment for our patients," said Mark Mseti, a radiation oncologist at the Ocean Road Cancer Institute in the capital Dar es Salaam, which receives technical support and equipment through the IAEA. He participated in a recent IAEA training on 3D planning for target volume definition and contouring for radiotherapy (see The Science box). This is part of Tanzania's shift from 2D to 3D radiotherapy planning services that will be implemented later this year after the opening of the country's first facility equipped with 3D planning tools.

"The concept of target volume definition and contouring is about making sure that the radiation we use is focusing on the disease and not on healthy tissue," explained Mseti. "If you can obtain accuracy in drawing, or contouring, the tumour, you will have a higher probability of targeting and obtaining the goals of treatment, while sparing as much of the healthy, normal tissues as you can."

Cancer is the uncontrolled division of abnormal cells in the body, and radiation can be used to stop that division. Specific doses of radiation can damage cells beyond repair, causing them to stop dividing and die. This makes radiation effective for managing and treating cancer. However, if the radiation is imprecisely or improperly targeted or delivered at the wrong dose level, the patient's healthy cells can be unnecessarily damaged, or the cancer cells may only be partially eliminated, leaving other cancer cells to continue dividing. This could put the patient at risk of health complications in the short or long term.

The IAEA supports its Member States, like Tanzania, in working to reduce the burden of non-communicable diseases like cancer. To this end, the IAEA offers training, coordinates research, provides equipment and technical expertise and hosts scientific fellows, among other services. Like Tanzania, many low and middle income countries are only beginning or planning to begin using 3D cancer treatment tools.

Expert lecturers at an IAEA training course teach radiation oncologists how to use 3D radiation therapy planning tools.

(Photo: D. Calma/IAEA)

"Radiation oncologists in low and middle income countries are sometimes limited to primarily theoretical training due to economic and resource constraints that make it difficult to access often costly hands-on courses," said Eduardo Zubizarreta, Head of the Applied Radiation Biology and Radiotherapy Section at the IAEA. "Helping doctors get the equipment they need and get expert-led, hands-on experience is essential to improve the quality of treatment."

In Tanzania, radiation oncologists have been using paper and a needle to contour in 2D, which is much less precise than the 3D method. "In my three years of training as a radiation oncologist, I had never actually contoured in 3D," Mseti said. "Everything has been theories, theories, theories. I am now ready to use these new contouring skills on patients."

The new facility, set to open later this year at the Ocean Road Cancer Institute, will be equipped, in part through IAEA support, with new 3D planning equipment, including a computed tomography (CT) machine. The Institute is expected to treat between 100 and 200 patients per day using these new tools.

Quick Facts

Investing in radiotherapy could lead to saving 26.9 million life-years for patients in developing countries and produce a net benefit for the economy of $278.1 billion in 2015–2035.

THE SCIENCE

Target volume definition and contouring for radiotherapy planning

Target volume definition and contouring are key skills used by radiation oncologists to plan how to accurately, precisely and consistently deliver radiation to treat a patient with cancerous tumours.

Using specially-designed contouring computer software, the radiation oncologist reviews 3D images based on medical scans of a patient's body to identify the location and size of cancerous tumours. These scans are taken with nuclear diagnostic imaging tools, like computed tomography (CT) and positron emission tomography (PET) machines.

Once the tumour is identified, the oncologist uses the contouring computer software to define and draw, or contour, an outline of the tumour — the target volume — and then contour the healthy organs in order to precisely and accurately plan where radiation should be delivered, how much radiation is needed based on the size and depth of the tumour and how to minimize exposure to healthy tissues and organs.