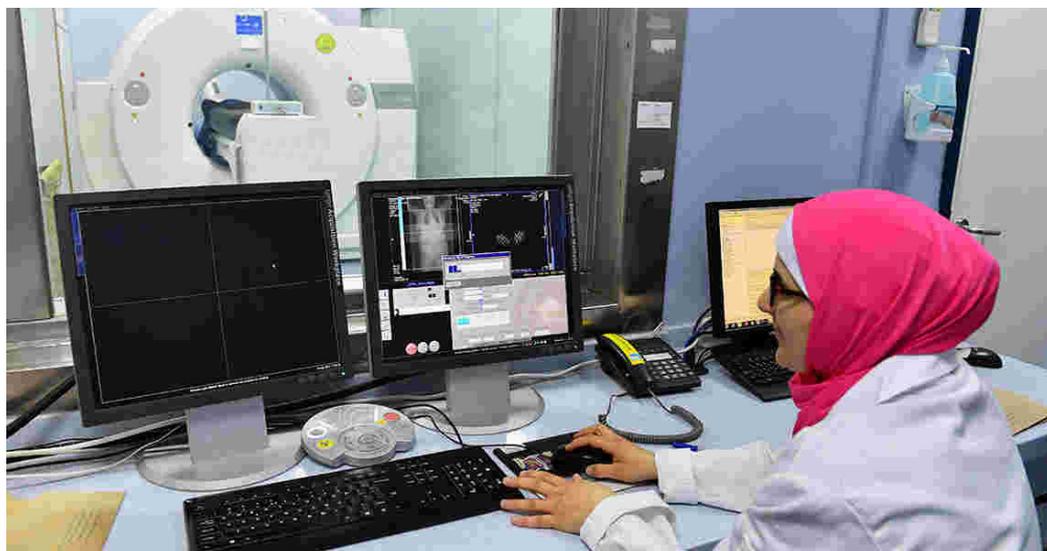


Jordan branches out into theranostics — advanced nanomedicine for cancer management

By Aabha Dixit

A medical worker analyses the PET/CT image of a patient at King Hussein Cancer Center.

(Photo: D. Calma/IAEA)



Three words — You Have Cancer — can dramatically change your life. However, medical advances increasingly allow for early diagnosis and make the disease treatable. At the King Hussein Cancer Center (KHCC) in Amman, Jordan, a wide range of nuclear medicine and advanced technologies are used for diagnosis and treatment.

With 4000–5000 new cancer cases diagnosed and treated each year, KHCC is one of the leading hospitals in the Middle East treating cancer patients from the region. A third of its patients come from abroad.

“At KHCC, the objective is to make sure that procedures involving molecular imaging and theranostics are undertaken with utmost attention and care,” said Akram N. Al-Ibraheem, Chairman of the hospital’s Nuclear Medicine Department. Theranostic technologies are nano-based procedures to improve imaging and therapy for cancer care, and offer cutting-edge biomedical health care products and services. “Benefits are many, but if proper procedures are not followed, there are significant risks to patient safety,” he cautioned.

Techniques and technologies of radiation medicine — which include the disciplines of nuclear medicine, diagnostic radiology

and radiotherapy — offer effective means to combat cancer. They offer unparalleled benefits, enabling insights into physiological function, biological processes and morphology that provide more specific information about organ function and disease.

Theranostic techniques pinpoint cancer cells

Theranostics in particular can change the entire health care programme for cancer treatment. It integrates molecular diagnostic and therapeutic capabilities into a single platform, providing an effective method for detecting and characterizing disease at cellular and molecular levels in order to tailor a targeted therapy. This approach is not only capable of diagnosing the disease, but also predicts drug delivery and can be used to monitor response to therapy.

“In the era of theranostics, we will utilize the molecular signature of the disease by studying the changes at the level of protein and DNA of the patient’s individual diseased cells. This will eventually result in delivering the right therapy for the patients,” Al-Ibraheem said. Molecular signatures are sets of genes, proteins and genetic variants that can be used as markers to assess gene characteristics.

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Theranostics targets a specific cancer tumour or diseased body area. A nanoparticle introduces the therapeutic drug into the body to travel to the specific tumour spot to attack the cancer cells directly. The impact to the surrounding body areas is limited.

The nuclear medicine modality of positron emission tomography combined with computed tomography (PET/CT) is used for molecular imaging and theranostics. The uniqueness of theranostics is that the same nanoparticle or molecule can be used for imaging the tumour or treating it, depending on the particular isotope used for labelling. This eliminates the uncertainties inherent when using different compounds for diagnosis and therapy.

The KHCC introduced theranostics in June 2015, in particular for patients with neuroendocrine tumours, which are abnormal tissue growth that mainly occur in the intestine, pancreas and lungs. Most patients who received this treatment at KHCC have shown significant improvement in their quality of life with prolonged survival. Some have been documented to have partial response to the theranostics treatment as demonstrated by imaging modalities and biomarkers, Dr Al-Ibraheem added.

Spread the word

Raising awareness of how nuclear medicine can help in cancer treatment is not easy in countries where ‘cancer’ remains a taboo word. The KHCC has a public awareness campaign to promote the motto ‘right diagnosis is half way to the right treatment’, Al-Ibraheem said. It hosts workshops and reaches out to local civic bodies as part of its efforts to build public awareness on the importance of early detection and prevention and to raise funds to help support the KHCC.

Tackling cultural and social stereotypes about cancer and encouraging people to get tested go hand-in-hand, he said. Recovering patients and their families also play an influential role in spreading the word on how ‘new technology’ helps to combat cancer, he explained.

Precise training in nuclear medicine and diagnosis

Having advanced medical equipment on its own is not enough: equally important is



A nuclear medicine technician prepares a PET/CT radiopharmaceutical for a patient with a neuroendocrine tumour.

(Photo: King Hussein Cancer Center, Jordan)

providing the necessary training to medical personnel. As part of its efforts to ensure high-quality care, the KHCC has a dedicated training centre that offers education and training on nuclear medicine and diagnosis among other disciplines in cancer care.

The centre offers medical and non-medical courses to both KHCC staff and health care professionals from across the country and the region. It includes a fully comprehensive oncology nursing education programme, which provides detailed guidelines and procedures on the safe use of nuclear medicine and diagnostic equipment. To ensure maximal benefits and minimal risks, it is essential that the nuclear applications in medicine rely on guaranteed attention to all aspects of radiation safety, adequate dosimetry and quality assurance procedures.

IAEA support

Through its technical cooperation programme, the IAEA has helped the KHCC to establish training programmes in nuclear medicine and diagnosis. Training provided to nuclear medicine physicians, radiologists, radiotherapists, and medical physicists has contributed to the establishment of a high calibre staff on-call for cancer care, Al-Ibraheem said. This training has been supported through expertise, fellowships, training courses and an exchange of information such as in radiation oncology and medical physics.