Breaking down barriers to nuclear medicine in Bangladesh

By Nicole Jawerth

A. Chowdhury came to NINMAS in Dhaka for a diagnostic scan of her kidneys.
(Photo: N. Jawerth/IAEA)

"Cost is extremely important for people in Bangladesh. If we didn't provide subsidized care like we do here at NINMAS, many people would not be able to get the care they need."

— Raihan Hussain, Head, National Institute for Nuclear Medicine and Allied Sciences, Bangladesh

The number of people who can affordably access diagnostic medical care in Bangladesh has increased threefold over the last ten years, as the country has expanded and strengthened its nuclear medical services. Health officials have worked steadily, with the support of the IAEA, to build a nuclear medicine system with well-trained medical staff, advanced imaging tools and a cost-effective source of essential radiopharmaceuticals.

"I came today because this is a very nice facility, but also because it is the most affordable option," said A. Chowdhury following a medical scan of her kidneys at the National Institute for Nuclear Medicine and Allied Sciences (NINMAS) in Dhaka. "Without this kind of public hospital, I don't know how I would have been able to get this help."

NINMAS is one of 15 publicly-funded nuclear medicine centres established around Bangladesh in the last twenty years. It carries out more than 60 000 nuclear medicine procedures (see The Science box) each year in the areas of oncology, cardiology, nephrology and cerebral studies. It also provides therapeutic services for thyroid conditions and eye diseases.

Cost matters

Publicly-funded centres like NINMAS play an important role for Bangladesh's 170 million people, particularly for the quarter of the population who live below the poverty line.

"Cost is extremely important for people in Bangladesh. If we didn't provide subsidized care, many people would not be able to get the care they need," said Raihan Hussain, Head of the Nuclear Cardiology and positron emission tomography (PET)/computed tomography (CT) Division at NINMAS.

A renal scan, like the one Chowdhury received, is a simple procedure in nuclear medicine that allows doctors to evaluate the condition and function of a patient's kidneys, explained Hussain. "In a private practice, this type of procedure costs at least five times as much as it does at NINMAS."

Since its establishment, NINMAS has worked with IAEA experts to procure equipment, receive training and pursue research to further enhance and refine patient care. Its doctors now also teach medical students.

Future plans for NINMAS include the installation of another PET/CT machine and the establishment of a cyclotron facility

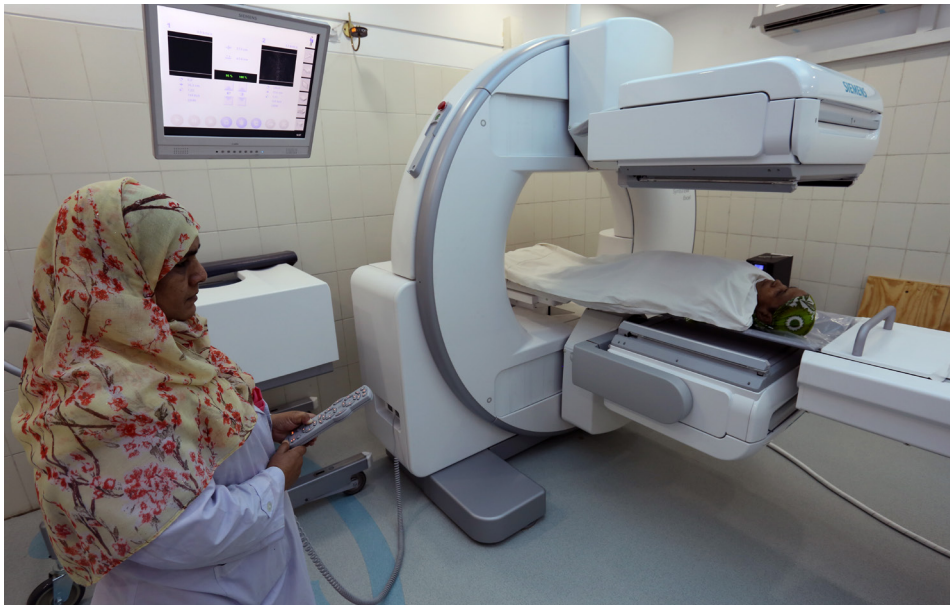
for producing key radiopharmaceuticals — specialized drugs containing small amounts of radioactive material (see The Science box).

"With the new PET/CT machine, we expect to nearly double the number of patients we can serve with our machines each week," said Nasreen Sultana, Associate Professor at NINMAS. "The in-house cyclotron will help us to cost-effectively produce radiopharmaceuticals used for PET scans."

Producing radiopharmaceuticals

The majority of the radiopharmaceuticals used in Bangladesh's nuclear medicine centres now come from the radioisotope production laboratory housed in the Bangladesh Atomic Energy Commission's Institute of Nuclear Science and Technology in Savar, just outside of Dhaka. The laboratory relies on a 3-megawatt (MW) research reactor to develop and supply the radiopharmaceuticals used in the over 500 000 procedures performed at nuclear medicine centres every year.

In addition to iodine-131, which is a radioisotope primarily used to diagnose and treat thyroid conditions, the laboratory produces generators of molybdenum-99 (Mo-99)/technetium-99m (Tc-99m). Tc-99m is a radioisotope used in over 80% of nuclear medicine procedures. Each week between 18 to 20 generators — a device used to extract Tc-99m from Mo-99 for use in medicine — are produced at the laboratory, at significantly lower costs than importing already-completed generators. The facilities were established through IAEA technical cooperation projects.



As the population of Bangladesh grows, more people will need nuclear medicine services like the ones provided at NINMAS.
(Photo: N. Jawerth/IAEA)

Through its collaboration with the IAEA, the laboratory now also has an ISO-certified clean room facility for producing Tc-99m cold kits, which are used for preparing Tc-99m radiopharmaceuticals for use in diagnostic procedures.

"We also have a plan for a new 20 to 30 MW reactor within the next 10 years. Then we can produce the isotopes locally, and then we may be able to supply to other countries," said M. Azizul Haque, Head of the Radioisotope Production Division of the Bangladesh Atomic Energy Commission's Institute of Nuclear Science and Technology.

THE SCIENCE

What is nuclear medicine?

Nuclear medicine techniques are most often used to evaluate the function of any organ or structure in the body. They provide unique information and offer the potential to identify diseases in the early stages.

The majority of nuclear medicine procedures take place inside the body through specialized drugs called radiopharmaceuticals, which contain radionuclides. When these drugs are taken into the body, they interact with certain tissues or organs. A special detector, such as a gamma camera, outside the body can detect the small amounts of radiation emitted from the organ or tissue. The camera is then able to translate the information into images of the specific tissue or organ. By using radiopharmaceuticals, doctors can get accurate information about the organ or tissue as well as the functioning of organs such as heart, kidneys, liver, among others.

Nuclear medicine is also used for treatment of some diseases and health conditions. Doctors choose small quantities of radiopharmaceuticals that certain body parts absorb more significantly and more effectively than other body parts. This allows them to target specific areas during treatment. The small amounts of radiation in the radiopharmaceuticals then kill off the cells causing the health condition, with minimal effect on other cells in the surrounding area and the rest of the body.