The role of the I-NRC in the secure transportation of high-activity radiotherapy sources

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Objective:

This work aims to present a practical case study on the decommissioning and transport of high-activity radioactive sources (Co-60 teletherapy units) from the Radiation and Nuclear Medicine Hospital in Baghdad to the national waste management facility at Twaitha – Bunker B, under the regulatory requirements of the Iraqi National Regulatory Commission (I-NRC). The objective is to highlight the importance of coordination among technical and regulatory bodies in ensuring safe and secure transport, while documenting lessons learned to support national efforts in upgrading radiotherapy services and complying with international standards.

Introduction:

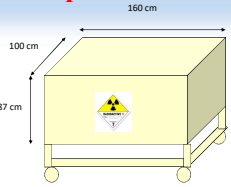
The transport of high-activity radioactive sources is one of the most sensitive stages in the lifecycle of radioactive materials, requiring strict adherence to radiation safety and security standards. This study presents the experience of the Radiation and Nuclear Medicine (RNM) Hospital in Baghdad in decommissioning and transporting three high-activity Co-60 teletherapy units (ISO-1 and ISO-2and Cirus). Hundreds of patients from across all Iraqi governorates seek treatment at the hospital each year. With rising patient numbers, timely access to radiotherapy is critical for preventing disease progression. Modernisation of radiotherapy infrastructure, including the replacement of outdated cobalt units with advanced linear accelerators, has therefore become a priority.The dismantling and packaging were carried out in cooperation with the Ministry of Science and Technology, while the Iraqi National Regulatory body (previously IRSRA - Now I-NRC) supervised the development and approval of a comprehensive transport safety and security plan. The sources were subsequently transferred to the national radioactive waste management facility at Twaitha – Bunker B. This case highlights the importance of institutional and regulatory coordination in handling high-activity sources and demonstrates Iraq's commitment to applying international standards to strengthen radiation safety, security, and protection of society and the environment

The historical sequence of the process of dismantling and transporting radioactive sources and the procedures of the regulatory body

Table 1 : the teletherapy sources in Radiation and Nuclear Medicine

Isotope	Manufacturing activity	Date of manufacturing	Current activity	Gammatron brand	Source category
Co-60	5000 Ci	1/7/1983	103 Ci	ISO-1	2 B
Co-60	8000 Ci	1/11/1988	333 Ci	ISO-2	2 B
Co-60	5995 Ci	1/6/1998	880 Ci	Cirus	1 A

Steel container



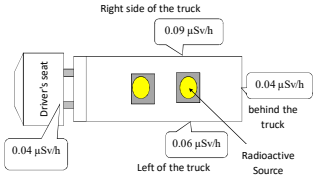
Steel thickness : 2.5 cm (1 inch)

Hospital tries to replace the old therapy sources with new sources, but it fail, and hospitals decide to replace the old radiotherapy unit with a linear accelerator.
First step is to dispose of the (iso-1,iso-2) units by sending them to the disposal and waste management facility (Twaitha-Bunker B).
Hospital contract with ministry of science and technology (MoST) to dismantle the cobalt heads of the two units (iso-1,iso-2).
The job done out of Authority (previously IRSRA - Now I-NRC) supervision, the two heads of cobalt putted inside of two steel boxes and located in a room inside the hospital.
The boxes locally made special to hold the head of cobalt sources.

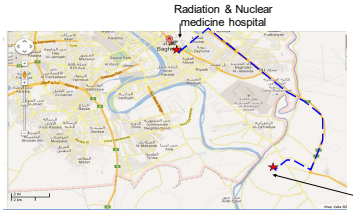
In 25 December 2012, the MoST send a request to regulatory body (previously IRSRA - Now I-NRC) to supervision of transport of these two sources from the hospital to Twaith site. regulatory body (previously IRSRA - Now I-NRC) request transfer safety and security plan for approval before the transfer done. the action of the transfer of the two sources done by MoST and supervision of regulatory body (previously IRSRA - Now I-NRC .
The precedent arrangement was include:(Preparing a special truck with crane to pick-up the two boxes and transfer it to the Bunker. Recall of security forces (Baghdad operations command) to escort the sources while being transfer. Workers with safety uniforms moving the boxes
In the hospital :
regulatory body (previously IRSRA - Now I-NRC) measure the radiation dose around each boxes and associate transfer index and labeling. Verifying of all safety supplyment for workers.

dispose of the (iso-1,iso-2)

Transport truck with security protection force



Radiation dose readings around the truck



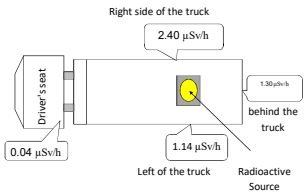
Radioactive source transport path

Twitha site
Bunker B

Regarding the dismantling and transfer of the third cobalt-60 radioactive source from Al-Amal Hospital to the Tuwaitha site in Baghdad for temporary storage purposes, in 2021, the dismantling and transfer operation was carried out by the Ministry of Science and Technology's Directorate of Radioactive Waste Treatment and Management, under the supervision of the Iraqi Authority for the Control of Radioactive Sources. The task was completed in accordance with regulatory requirements and the required preventive and security measures. The path of transporting the radioactive source was the same as the previous transport, with a distance of 20 km.

dispose of the (iso-3)

Transport truck



Radiation dose readings around the truck

Conclusions:

This experience highlights Iraq's progress in regulatory oversight at all stages of handling radioactive sources, particularly the transportation of highly active radioactive sources.
The field plans and procedures implemented were consistent with IAEA requirements, including safe transportation, radiation protection, dose recording, and field surveys before, during, and after transportation.
The experience constitutes an important database to support future policies regarding the dismantling and transportation of radioactive sources and can be adopted as a training and educational model for new cadres in Iraq and the region.