International Atomic Energy Agency Scientific Forum

A Decade of Action on Cancer Control and the Way Forward

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How to ensure nuclear security of radioactive sources for medical use: the Senegalese perspective

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ARSN

INTRODUCTION

Solve the problem of the wide range of possible causes that can lead to a loss of control of radioactive sources, including theft, sabotage or other malicious acts, etc.) is a challenge, especially in hospitals and other health facilities.

Why so challenging in medical sector ?

- **Health facilities and meanly hospitals are more difficult to secure than other authorized nuclear sites due to two important factors : constant evolution of the people staying there (patients, visitors, staff) ; Medical staff are generally more concerned by radiation protection than with source security ;**
- **Effective protection of each of the hundreds of thousands of radioactive sources in medical use worldwide from these intentional acts is challenging ;**
- **Medical uses of radiation will continue to grow and mostly in Radiation therapy ;**
- **Cancer remains leading cause of death globally and significant proportion of cancer burden is borne by developing countries.**

HOW TO ENSURE NUCLEAR SECURITY OF RADIOACTIVE SOURCES FOR MEDICAL USE :

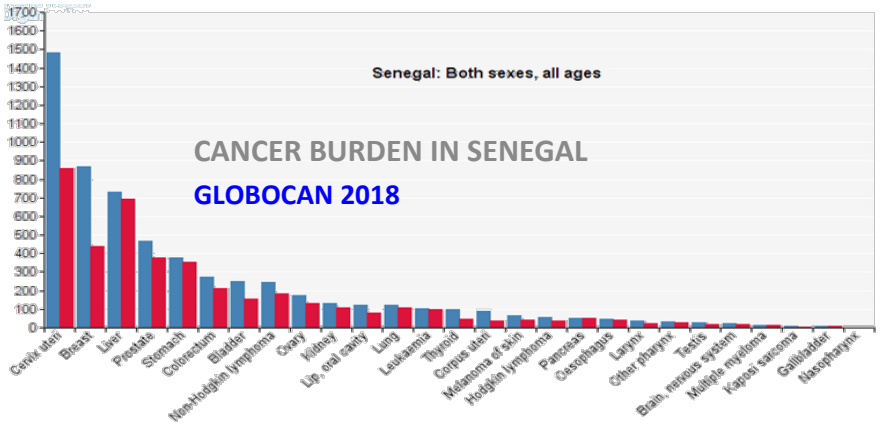
The Senegalese perspective

Radioactive sources were used in medicine in Senegal before the 1950s. Context at this time :

- ✓ **Order n° 8409, I.G.T.L.S.-A.O.F., dated 20/4/1956 of the Governor General of French West Africa- for protection of personnel exposed to X-rays and radiation from radium needles in hospitals, health centers,….., and cancer centers" ;**
- ✓ **Safety and Security were not a major concern; No inventory of Rad S; No Regulatory body.**

Current situation :

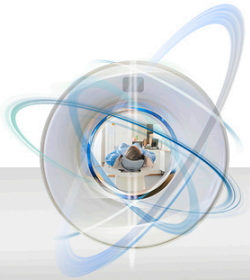
- ✓ **Effective Regulatory body; Finalized draft of a new comprehensive nuclear law (April 2018) on safety, security and safeguards; Penal Code revised by Law No. 2016-29 of 08 November 2016 Title II.: - Criminalization of malicious acts involving radioactive materials or nuclear installations).**



DALAL JAMM HOSPITAL 2 LINACS , 3D Conformal Radiotherapy, HDR Cobalt Brachytherapy , In Vivo Dosimetry

DANTEC HOSPITAL 1 LINAC, 3D Conformal Radiotherapy IMRT, HDR Iridium Brachytherapy

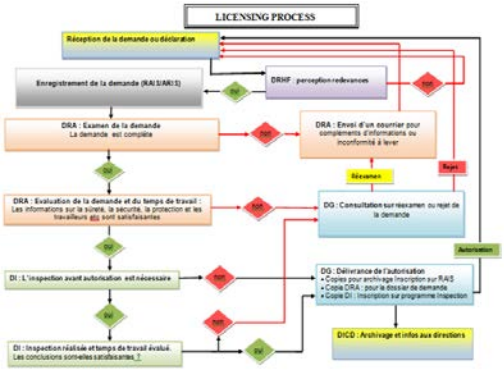
KGO ONCOLOGY CENTER 1 LINAC, VMAT + Stéréotaxy + IG



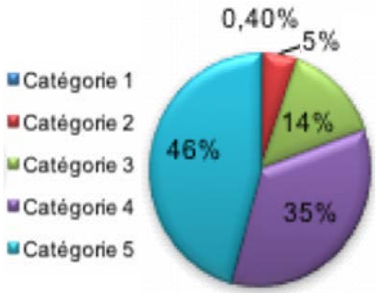
HOW TO ENSURE NUCLEAR SECURITY OF RADIOACTIVE SOURCES FOR MEDICAL USE :

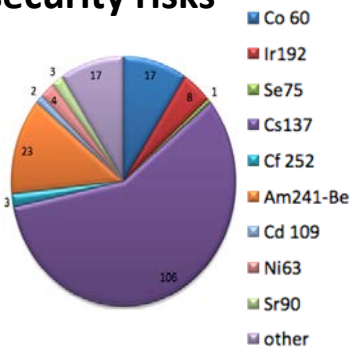
The Senegalese perspective

Inspection and Authorization programs



Identification of radionuclides and source categories : to know which sources pose the greatest security risks





❑What did we do?

- ✓ **Use the graded approach:** direct effort to the practices where the highest contribution to doses and risk may exist and application of nuclear security measures proportional to the potential consequences of a nuclear security event
- ✓ **Request the assistance from the IAEA and other bilateral cooperation;**
- ✓ **Establish coordination mechanisms with all national stakeholders that may have any role or responsibility in nuclear security;**
- ✓ **Communicate with decision makers, stakeholders and public;**

❑How this 3Cs Approach help us to ensure the security of Rad S?

HOW TO ENSURE NUCLEAR SECURITY OF RADIOACTIVE SOURCES FOR MEDICAL USE

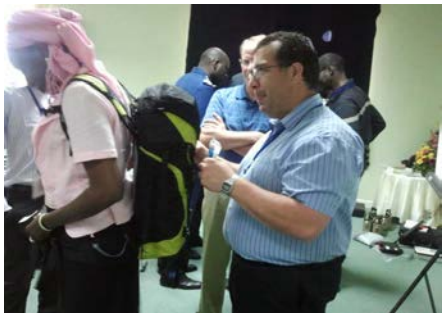
The Senegalese perspective

❑ How did we do it?

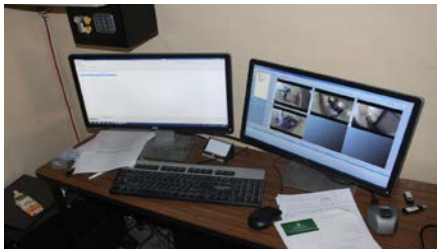
Cooperation with the IAEA and bilateral cooperation with US DOE and US NRC help us :

to **draft new comprehensive law** ; to acquire radiation **detection equipment ;** to **inventory and upgrade security of cat 1 and 2** sources in radiotherapy facility**;** to establish a **national Register of Radiation Sources** based on **Regulatory Authority Information System (RAIS)** and **US RASOD** under the **Radiation Sources Regulatory Partnership (RSRP);** to **train** the ARSN Staff, medical personnel (Radiophysicists, Oncologists and RTT's) and response forces; to adopt an **INSSP Plan** in 2014

US DOE visit to radiotherapy facility)



Training for search of orphan sources



Equipment to upgrade security of cat1 and 2 sources

training of First responders trained through bilateral and multilateral cooperation (US and EU CBRN Center of Excellences)

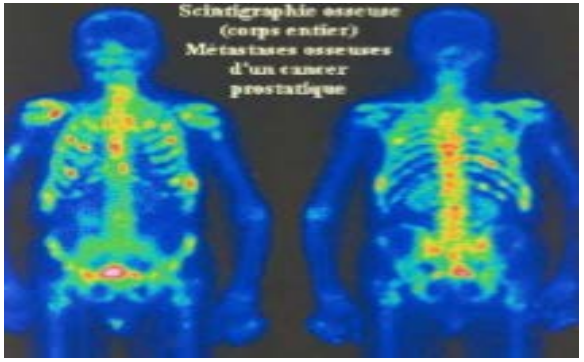
HOW TO ENSURE NUCLEAR SECURITY OF RADIOACTIVE SOURCES FOR MEDICAL USE :

The Senegalese perspective

Inventory of ionizing radiations sources currently in medical use

Brachytherapy HDR with ^{192}Ir

Brachytherapy HDR with ^{60}Co & ^{60}Sr for calibration



Nuclear medicine: ^{99m}Tc, ^{131}I, ^{125}I

Inventory of radioactive sources used in the past and the issue of Legacy sources

Legacy sources are those that predate effective regulatory requirements and may not have been disposed of, or were not disposed of in an appropriate manner. They may be a substantial problem in some cases.

Legacy sources in Senegal : ^{226} Ra needles and ^{90}Sr used before 1950s ➡ **Recovered, Conditioned and stored in 2018**

Radiotherapy with Co 60 from 1989 to 2017 ➡ **Repatriated to Hungary and replaced by LINACs in 2017**

HOW TO ENSURE NUCLEAR SECURITY OF RADIOACTIVE SOURCES FOR MEDICAL USE :

The Senegalese perspective

Cobalt source decommissioning and repatriation (2017)

Decommissioning (28 July – 4th August 2017

Source storage before repatriation

Source shipment

Source arrival in Hungary (24th October 2017)

Source extraction

HOW TO ENSURE NUCLEAR SECURITY OF RADIOACTIVE SOURCES FOR MEDICAL USE :

The Senegalese perspective

Recovering, Conditioning and storage of Radium 226, Sr 90 found in medical facility and Am-Be, Cs-137 in other sites (2018)

- Expert Mission to assess status of contaminated area and radioactive orphan sources conditions (2017)
- Participation in the demonstration of Neutron and Low Activity Gamma sources' conditioning held in Egypt (2017).
- Regional Training Course to Demonstrate Conditioning and Storage Operations for Neutron and Low Activity Sources to be held in Dakar, Senegal (2018)

Building of a temporary storage facility (2018)

HOW TO ENSURE NUCLEAR SECURITY OF RADIOACTIVE SOURCES FOR MEDICAL USE :

The Senegalese perspective

Regional cooperation to better control Rad S movement across borders

- Protocol between ARSN MAURITANIE and ARSN SENEGAL for the control of cross-border movement
- Launching of FASSEN G5 Sahel and Senegal, a Regional Cooperation Forum on Nuclear Safety and Security

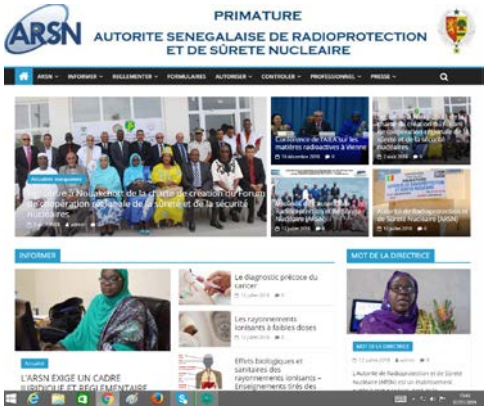
Coordination with all national stakeholders that may have a role or responsibility in nuclear security

- Protocols signed between ARSN and Gendarmerie, Army and Customs.
- Draft Protocols with Police and National Intelligence Agency.

HOW TO ENSURE NUCLEAR SECURITY OF RADIOACTIVE SOURCES FOR MEDICAL USE : The Senegalese perspective

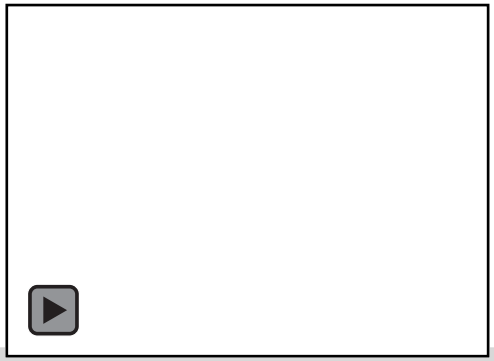
Communication with decision makers, stakeholders and public and sharing information

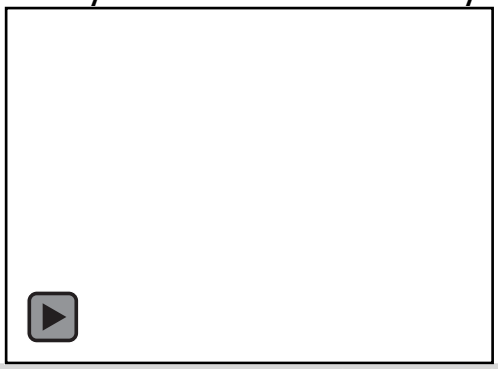
❑ Public information:



web site (www.arsn.sn)

Raising awareness about nuclear security at National Assembly





Video records in French and Ouolof at national TV

❑Participation to sharing information tools and networking ITDB; NUSIMS; Nuclear Security Guidance Committee, NSSCs (Nuclear Security Support Centers) .

CONCLUSION

- The rapidly evolving technology of medical equipment: the phasing out high activity sources in some developing countries is becoming a real concern and we should ensure that it does not compromise security as well as cancer care in low-resource areas;
- Training of medical professionals in security of Rad S issues is a continuing problem;
- Donation of medical equipment with high-level Rad S to developing countries may pose security issues in some cases;
- Nuclear security clearly remains a national responsibility but it is not a matter of exclusively national concern. So to ensure nuclear security of radioactive sources for medical use we hope that this forum will:
  - **Give us the opportunity to work together to improve the security of high risk radiological sources worldwide in medical use.**
  - **Give us an excellent platform for examining the lessons learned from our bilateral and multilateral cooperation .**
  - **Expand collaboration and strengthen national and international co-operation and communication with regard to cross-border traffic of these Rad S**

- ✓ **No country should ignore the security poses by the use of Rad S in medicine**
- ✓ **While international assistance is important, we must all do our part with a long term political commitment from each of our countries to develop a national action plan to keep radioactive sources safe and secure for continuous beneficial medical use.**

Thank you for your kind attention