Session 2.1
Overview of Nuclear Applications in Human Health and Nutrition

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Nuclear Applications in Human Health

Division of Human Health enhances the capabilities of MS to address the needs related to the **prevention, diagnosis and treatment** of health problems through the application of nuclear and related techniques.
Stable Isotope Techniques in Nutrition

• Monitor programmes that:
  – Promote breastfeeding & appropriate healthy foods for infants
  – Increase vitamins & mineral through food fortification and supplements
  – Prevent and treat moderate and severe malnutrition
  – Prevent and treat childhood obesity
Nuclear Medicine and Radiology

Renal Scintigraphy-Tc-99m-MAG3

PET/CT in Use in Neurology

Use in Cardiology

Most Common NM tests:
- Bone scans
- Thyroid scintigraphy
- Lung perfusion and ventilation
- Nuclear cardiology
- Renal scans
- Oncology
- Neurology and Psychiatry
Radiation Therapy

- 50% of cancer patients need radiotherapy for treatment
- Radiotherapy can be curative or palliative, alone or combined with chemotherapy or surgery.

Robotic Body Radiosurgery

Linac External Beam 3-D/IMRT

Brachytherapy
Quality and Dosimetry in Radiation Medicine

Application of radiation in medicine

Safe & effective
- Development and harmonization of guidance on physical & technical aspects of Quality Assurance

Consistent and accurate
- Development and provision of accurate dosimetry through calibration and audit services
Added value of the Nuclear Applications

Table 1: Radiotherapy utilisation rate, mean fractions, and outcome benefits (absolute proportional) for top ten cancers globally by incidence

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Radiotherapy utilisation rate (%)</th>
<th>Mean radiotherapy fractions per course</th>
<th>5-year local control benefit (%)</th>
<th>5-year overall survival benefit (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast</td>
<td>87</td>
<td>16</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>Cervix</td>
<td>71</td>
<td>21</td>
<td>35</td>
<td>29</td>
</tr>
<tr>
<td>Colorectal</td>
<td>19</td>
<td>23</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Haematological</td>
<td>48</td>
<td>8</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Head and neck</td>
<td>74</td>
<td>22</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Liver</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lung</td>
<td>77</td>
<td>16</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Oesophagus</td>
<td>71</td>
<td>15</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>Prostate</td>
<td>58</td>
<td>28</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Stomach</td>
<td>27</td>
<td>19</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>18</td>
<td>10</td>
<td>4</td>
</tr>
</tbody>
</table>

Radiotherapy utilisation rate is the number of patients for whom radiotherapy is the treatment of choice according to guidelines and evidence, divided by the number of new cases in one year. Haematological cancers include leukemia, Hodgkin's lymphoma, non-Hodgkin lymphoma, and multiple myeloma. 5-year biochemical disease-free survival for curative cases only.

Cost and benefits (in US$) of investments to scale up radiotherapy services in low and middle-income countries (2015-2035). The costing models are described in the text and include both operational and capital costs.

http://www.world-nuclear.org

Figure 1: Cost and benefits (in US$) of investments to scale up radiotherapy services in low and middle-income countries (2015-2035). The costing models are described in the text and include both operational and capital costs.


CT Image

PET Image
Steps in the implementation and use of Nuclear Techniques

Implementation of Best Practice and Safety Guidelines

Data bases (DIRAC and NumDab) for imPACT Missions

Calibration service for national Dosimetry standards

Support to end-users in Dosimetry: Verification of clinical beam calibration

Appropriate and safe use

Quality Assurance Team for Radiation Oncology
- Radiation oncologist
- Medical physicist
- RTT
- Safety specialist

IAEA-dosimetry travel kit used for QUARO missions

IAEA-WHO TLD postal service for external beam radiotherapy
- 500 beams per year; Co-60 & X-rays
- Discrepancies are followed up, if necessary by an expert visit

3D heart tissue scaffold

Research

Training of professionals

Assessing Intake of Breastmilk

IAEA-WHO SSDL Network
- 83 SSDL laboratories in 67 countries
- 6 SSDL organizations
- Five collaborating international organizations

Planning and Setting up

Need for new facilities
THANK YOU