Neuropsychiatry: The Revolution of Molecular Imaging in Alzheimer's Disease

FORGET ME NOT...
IAEA support to MS in neurological disorders

Diana Paez
Head, Nuclear Medicine and Diagnostic Imaging Section
Division of Human Health
Department of Nuclear sciences and Applications
International Atomic Energy Agency
Within the IAEA’s commitment to transferring nuclear technologies for peaceful purposes, our role in the Division of Human Health is to strengthen the capabilities of MS to address the needs related to the prevention, diagnosis and treatment of health problems through the application of nuclear techniques.
WHO defines Health as

“a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity"

1948
**NEUROLOGICAL DISORDERS**

*Public Health Challenges*

---

**in this chapter**

<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>3.1</td>
<td>Dementia</td>
</tr>
<tr>
<td>56</td>
<td>3.2</td>
<td>Epilepsy</td>
</tr>
<tr>
<td>70</td>
<td>3.3</td>
<td>Headache disorders</td>
</tr>
<tr>
<td>85</td>
<td>3.4</td>
<td>Multiple sclerosis</td>
</tr>
<tr>
<td>95</td>
<td>3.5</td>
<td>Neuroinfections</td>
</tr>
<tr>
<td>111</td>
<td>3.6</td>
<td>Neurological disorders associated with malnutrition</td>
</tr>
<tr>
<td>127</td>
<td>3.7</td>
<td>Pain associated with neurological disorders</td>
</tr>
<tr>
<td>140</td>
<td>3.8</td>
<td>Parkinson's disease</td>
</tr>
<tr>
<td>151</td>
<td>3.9</td>
<td>Stroke</td>
</tr>
<tr>
<td>164</td>
<td>3.10</td>
<td>Traumatic brain injuries</td>
</tr>
</tbody>
</table>

This chapter consists of 10 sections that focus on the public health aspects of the common neurological disorders as outlined in the box. Although notable differences exist between relevant public health issues for each neurological disorder, most sections cover the following topics: diagnosis and classification; etiology and risk factors; course and outcome; magnitude (prevalence, incidence, distribution); disability and mortality; burden of treatment, management and rehabilitation; and other services; policies; research;
**Medical Imaging for Disease Management**

- **Prognostic Value**
- **Personalized medicine**
  - x-rays, high frequency sound waves, magnetic fields, and radioactivity
- **Selection of appropriate therapy**
- **LOOKING BEYOND THE VISIBLE**
  - **Early Diagnosis**
  - **Differential Diagnosis**
  - **Cost effective**
- **Therapy response and follow-up**
- **PET**
  - Support MS improve capabilities diagnosis neuropsychiatric disorders
- **fMRI**
- **SPECT**
  - Disease location and spread
Nuclear Applications in Nutrition

Body composition by deuterium dilution and dual energy absorptiometry

Breastfeeding patterns by deuterium dilution

Energy expenditure using stable isotopes

Micronutrient bioavailability using stable isotopes of iron and zinc
Areas of support

Services

Education

Research

Quality
Human Health Campus

- **240,000** regular users
- **Visitors from 205 MS**
- **5,000** visitors monthly
- **Over one million pages viewed since 2010**

Goal: To support the MS with information for strengthening and improving the quality of practices through the use of CME Materials
E-Learning in Neurology

http://humanhealth.iaea.org

Teaching cases

IAEA Training courses

Lectures

Guidelines and literature

Interpretation and reporting
Quality Management and Clinical Audits

Develop a basic understanding of Quality Management and Clinical Audits in NM

56 QUANUM audits in 39 countries
Coordinated Research Projects in Neurology

Generating Evidence and Covering Knowledge Gaps

Research Contracts System

CRP Summary Report: E13043 (Active)

Title: Enhancing Capacity of Neuroimaging and Biomarkers: Application in Early-stage Alzheimer's Disease with Comorbidities

Division: NAHU
Primary Officer: NUNEZ MILLER Rodolfo
Secondary Officer: PAEZ Diana

Duration: 3 Years
Status: Active

<table>
<thead>
<tr>
<th>Dates</th>
<th>Approval</th>
<th>Begin</th>
<th>Expected End</th>
<th>Last Review</th>
<th>Next Review</th>
<th>Completion</th>
<th>Evaluation</th>
<th>Closing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approval</td>
<td>2015-05-12</td>
<td>2015-12-15</td>
<td>2018-12-14</td>
<td>2017-12-15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Countries expected:

Summary:

1. Dementia poses significant healthcare challenges in the Member States. Early detection of the disease is a diagnostic challenge. Comorbidities associated with Alzheimer's disease are major confounders for accurate diagnosis and management of the patients. Such comorbidities are often more prevalent in developing countries. However, there is limited knowledge concerning effects of comorbidities on PET imaging biomarker expression and its diagnostic accuracy. Limited experience and access to standardized quantitative image interpretation in developing countries severely constrain the value of imaging diagnosis. Accurate diagnosis of dementia in the first step towards decreasing burden of the disease in the world. Due to all these circumstances, there is a need to investigate the value of neuroimaging with modern techniques such as PET/CT to properly diagnose patients which have Mild Cognitive Impairment (MCI) and determine what extend--if any--the presence of comorbidities such as HIV, cerebrovascular disease (CVD), and traumatic brain injury (TBI), can impact on the accurate diagnosis in comparison to patients without comorbidities. Currently, there is limited scientific evidence in this subset of patients, and therefore gaining information could be of great benefit to many Member States.

Enhancing Capacity of Neuroimaging and Biomarkers: Application in Early-stage Alzheimer’s Disease with Comorbidities

14 research centres solve problems of common interest
Technical Cooperation
It’s All in the Brain: IAEA Successfully Concludes its First CME-Accredited Workshop on Brain Imaging Under the IAEA Curricula for Nuclear Medicine Professionals

JUN 14 2016

Participants at the CME-accredited workshop on Brain Imaging under the IAEA Curricula for Nuclear Medicine Professionals.

Related Stories

IAEA Curricula for Nuclear Medicine Professionals, Improving Nuclear Medicine Worldwide

Related Resources

% Technical cooperation programme
Dear Diana,

It is a great joy to report that the Neuroimaging Course in Brasilia was a great success. The support of IAEA was fundamental for it to occur and I believe it will help each professional individually and also in the development of Nuclear Medicine Neuroimaging. Thank you for your attention and support.

Sincerely,

Karina Mosci
IAEA Human Health Programme
May Abdel-Wahab

Four Sub Programmes

- Nutrition & Health Related Environmental Studies
  Cornelia Loechl

- Nuclear Medicine & Diagnostic Imaging
  Diana Paez

- Applied Radiobiology & Radiation Therapy
  Eduardo Zubizarreta

- Dosimetry & Medical Radiation Physics
  Harry Delis
On September 25th 2015, countries adopted a set of goals to end poverty, protect the planet, and ensure prosperity for all as part of a new sustainable development agenda.
End hunger, achieve food security and improved nutrition and promote sustainable agriculture

2.2 By 2030 end all forms of malnutrition, including achieving by 2025 the internationally agreed targets on stunting and wasting in children under five years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women, and older persons.

Ensuring healthy lives and promote well-being for all at all ages

3.4 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being.
DO YOU REMEMBER...