Status of Medical Physics Collaborations and Projects in Latin America

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SESSION:
DEVELOPMENTS IN INTERNATIONAL MEDICAL PHYSICS COLLABORATIONS IN AFRICA AND LATIN AMERICA

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WHO: Cancer cases in South America are expected to increase by 88% over the next two decades. It is estimated that by 2035 the greatest growth will occur in Ecuador (115% more cases) and Colombia (114% more).

Forecasts are completely discouraging. For the next 20 years, no country will see a drop in the number of incidences and cases leading to mortality. According to the WHO, a total of 430,000 people died in South America as a result of cancer in 2012. By 2035, the regional projection is 883,000. Brazil is the South American country with the largest number of new cases of cancer. Currently, there are 437,000 which will see a 90% increase.

Introduction

Information taken from ONCOMEDICA (Dr. Luis Barriga)

RISK OF CANCER AND AGE IN LA

Risk of Cancer (%)

Men
Women

Age
Introduction

Cancer Management

Objectives
- Local control
- Survival
- Quality of life of patients with cancer

Needs
- Facilities
  - Adequate access to medicine
  - Appropriate technological equipment
  - Qualified professionals

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Introduction

According to recent estimates in Latin America more than 500 medical physicists, only radiotherapy would be required to comply with the recommendations of international scientific and professional organizations. At present, we only have about 500.
License/Degree in Medical Physics

University education in different countries includes training at the university degree level (known in some countries as an undergraduate), leading to a degree (bacharelado in Brazil) in medical physics. These studies have a duration of 4-5 years and their degrees are awarded by institutions of higher education (universities) recognized by the Ministries (or Secretariats) of Education in each country.

Master's and doctorate in Medical Physics

The aim is to train skilled professionals, academics and researchers, including: specialty, Master and PhD. The duration of these studies is as follows: specialty ~ 1-3 years, Master ~ 1 to 2 years, Doctorate ~ 2-5 years.

Training programs

These programs are generally offered by health institutions (hospitals and clinics), called hospital residencies, in addition to academic training, including clinical training for medical physicists, in which they acquire the skills and practical skills.

Number of medical physicists

Argentina

- RD: 20
- NM: 20
- RT: 120
- 74%

License/Degree in Medical Physics

- Favaloro University
- University of General San Martin
- National University of La Plata

Master's and doctorate in Medical Physics

- University of Buenos Aires
- Instituto Balseiro Foundation School and Nuclear Medicine (Bariloche and Mendoza)

Training programs

- Offers 9 seats in radiotherapy and 3 in nuclear medicine annually.

Brazil

- RD: 63
- NM: 31
- RT: 237
- MP: 331

License/Degree in Medical Physics

- Federal University of Uberlândia
- University of Sao Paulo (Ribeirão Preto)
- Pontifical Catholic University of Sao Paulo
- State University of Campinas
- Federal University of Rio de Janeiro
- Federal University of Sergipe

Master's and doctorate in Medical Physics

- University of Sao Paulo
- State University of Rio de Janeiro
- Radiation Protection and Dosimetry Institute

Training programs

- Offers 17 seats in radiotherapy and 6 in imaging per year.
CHILE

Master's in Medical Physics
University of La Frontera (Temuco)
University of Chile
University of Tarapacá
Pontifical Catholic University of Chile

MP: 29
RD: 1
NM: 3
RT: 25

Education and human resources

COLOMBIA

Master's in Medical Physics
National University of Colombia
Pontifical University Javeriana

MP: 69
RD: 14
NM: 5
RT: 50

COSTA RICA

Master's in Medical Physics
University of Costa Rica
National University of Costa Rica

MP: 32
RD: 2
NM: 4
RT: 26

CUBA

Master's in Medical Physics
Higher Institute of Nuclear Sciences and Technologies
Higher Institute of Medical Sciences

MP: 69
RD: 9
NM: 25
RT: 35

ECUADOR

Medical Physicist
11

MEXICO

Master's and doctorate in Medical Physics
National Autonomous University of Mexico
University of the State of Mexico

MP: 149
RD: 0
NM: 2
RT: 9
NICARAGUA
MP: 9
RD: 0
NM: 1
RT: 2

PANAMA
MP: 10
RD: 1
NM: 0
RT: 9

PARAGUAY
MP: 8
RD: 3
NM: 0
RT: 5

PERÚ
MP: 52

National University of Engineering
Offers 2 seats in radiotherapy and 2 in imaging per year

DOMINIC REPUBLIC
MP: 6

VENEZUELA
MP: 67

Central University of Venezuela
Venezuelan Institute for Scientific Research

URUGUAY
MP: 6
The National University of San Martin (UNSAM) as Convenor University, spearheaded the creation in 2012 of the Latin American Network of Medical Physics (RELAFIME).

The integration of Latin America is a basic condition for the full development of its population, and that there is now a wide variety of options in academic training of a medical physicist. The challenge is to accept that the path is to recognize those differences.

The aim is to facilitate communication between universities that will train human resources in the field of medical physics. This approach is intended to discuss which medical physicist profile will be more useful in our region, how we can work together to achieve equal academic policies which could promote the achievement of some medical physicists as well as allow for mutual recognition skills of medical physicists.
The Latin American Association of Medical Physics, founded on July 18, 1984. Its aims are as follows:

- Maintain high academic and scientific level, in the implementation and development of physics in medicine.
- To promote the progress of medical physics and sciences and related disciplines.
- Sponsor conferences, seminars, meetings, symposia, conferences and training and specialization.

That's why we created the news magazine and this year we are launching the Latin American journal of medical physics, in order to encourage the publication of research papers in LA.

Task Group Reports Translated to Spanish

With permission of the AAPM, several task group reports have been translated to Spanish and are planned to be used for training of future Medical Physicists in LA.

The translated documents are intended to facilitate understanding and application of the material in a more effective manner and are not intended to replace the original document(s), a plan to publish the translated version of some of the Task Group Reports in the “Revista ALFIM” is being considered.

Content of academic programs

Training in Medical Physics in Latin America has been without structures because each country has its own requirements; in other words, there is no standardized program.

In curricula require the development of a thesis to grant the title. Deadlines, formal academic load and the time required for the preparation of the thesis does not allow, in addition, the student can acquire a supervised practical training of.

However, some existing Masters include “residencies” inspired by the homes of medical students within their activities academic. Generally, these semi residences covering more than one specialty, precisely seeking to provide a first level, as wide as possible, of training or practical clinical knowledge.

It is recognized that the responsibility for maintaining academic standards in college graduate medical physics programs lies with each university, and is guaranteed through accreditation systems of each country.
Clinical training in Medical Physics

Clinical training sites with formal programs are very limited.

As we observe, clinical training programs are structured around a hospital’s intensive practice, called hospital residences in the region (Brazil and Argentina).

To obtain a hospital residency requires that the applicant have a Bachelor in Physics or Medical Physics, with a background in theoretical courses and hospital practice. Most of the training is for the radiation area and the rest in radiology and/or nuclear medicine.

Accreditation of an academic program

The accreditation of an academic program and/or clinical training is a voluntary process which aims to ensure that the program or institution has reached a defined standard.

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Establish common academic programs in both theoretical aspects and practical education for medical physicists to provide a sustainable basis for quality diagnostics and safe treatments.

There is a proposal to unify the postgraduate academic training and clinical training for the medical physics area within a hospital residency program lasting a minimum of three years.

Whatever the specific method chosen, it must be ensured the minimum content of academic programs and clinical training meet the needs of hospital practice, which should be subject to an accreditation process.

A number of Education & Training Centers (ETC) should be created at each country.

Content of academic programs

Proposals

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Proposals

We currently have the recommendations outlined in a publication of the IAEA, but there needs to be more concrete actions, for it should be a committee of action for:

The review of existing programs in training medical physicists in Latin America help define, address, implement and monitor changes to occur. This can be given with the support of organizations such as:

AAPM, CAMPER WHO, IAEA, ABR, SDAMP

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### Medical Physics Organizations

<table>
<thead>
<tr>
<th>Country</th>
<th>Organization</th>
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<tbody>
<tr>
<td>ARGENTINA</td>
<td>Argentinian Society of Medical Physics (SAFIM)</td>
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<tr>
<td>BRAZIL</td>
<td>Brazilian Association of Medical Physics (ABFM)</td>
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<tr>
<td>CHILE</td>
<td>Medical Physics Society of Chile (SOFWECH)</td>
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<tr>
<td>COLOMBIA</td>
<td>Colombian Association of Medical Physics and Radiation Protection (ACOFIMP)</td>
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<td>COSTA-RICA</td>
<td>Physics Society</td>
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<td>CUBA</td>
<td>Cuban Physics Society Medical Physics Section</td>
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<td>MEXICO</td>
<td>Mexican Federation of Organizations for Medical Physics (FMOMF)</td>
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<tr>
<td>PANAMA</td>
<td>Panamanian Association of Physicists in Medicine</td>
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<td>PARAGUAY</td>
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The Latinoamerican Association of Medical Physics, Its aims are as follows:
- Group Medical physics societies in Latin America and the Caribbean.
- To promote and encourage the training of medical physics societies in Latin America and the Caribbean that do not have adequate training.

### Certification and Legislation

#### RADIOThERAPY

The Nuclear Regulatory Authority extends the permissions to professionals who meet certain requirements to practice in radiotherapy. This permit is like "Specialists in radiotherapy physics."

**REQUIREMENTS**
- Bachelor’s degree in Medical Physics.
- Master in Medical Physics or Physics and Engineering (the latter should be in a theoretical course).
- Over 1000 hours of clinical practice in no less than one year.

For nuclear medicine ARB extends a similar to Radiotherapy permission but "partial" presence is required in the centers of attention. Unfortunately for diagnostic radiology nothing. This depends on the Ministry of Health of the nation and even the presence of specialists is not required by diagnostic centers nor are they recognized professionals.

SAFIM presented a project to the Ministry of Health for not recognizing the profession of medical physics within the framework of the Health Community. These SAFIM described the requirements, scope and specialties of medical physics.
Brazilian Association of Medical Physics (ABFM) performs the recognition of qualifications of medical physicists who work in radiotherapy, diagnostic radiology and nuclear medicine, through an annual exam. Recognition is made through the issuing title of Medical Physics Expert in one of these areas: Radiotherapy, Radiology, and Nuclear Medicine.

The examination for obtaining the Medical Physics Expert Title is held annually and prepared by an exam board composed exclusively for this purpose.

REQUIREMENTS
- To have Bachelor, Master or PhD in Physics or Medical Physics;
- Have experience in Medical Physics in the specific area, with the minimum experience criteria as described below;
- To have had clinical training within the last 2 years..

Radiotherapy: minimum of 3600 hours
Diagnose radiology: minimum of 2850 hours
Nuclear medicine: minimum of 2650 hours

Colombian Association of Medical Physics and Radiation Protection

For the first time in 2006, Colombian legislation recognized the need for medical physicists in radiotherapy. They have allotted four years in order to acquire the number of medical physicists needed who will have received adequate training on an international level. Currently, Colombian law requires that those who work in radiotherapy services to have a graduate degree in medical physics and "If you have equipment PET, PET CT have " professionals with expertise in medical physics." There is no structured certification.

REQUIREMENTS:
- Years of experience,
- Academic status
- Publications
- Passing the exam which will be divided into two sections: an oral and a written part.

Costa Rica has the peculiarity that the practice is regulated by a College of Physicists.

REQUIREMENTS:
- Academic status
- Publications
- Passing the exam which will be divided into two sections: an oral and a written part.

Once submitted and evaluated all these, the applicant may be a Medical Physicist Collegian as an area (RT, RX, MN, RP) or Specialist Medical Physicist area.

Costa Rica is in a phase of analysis to determine the members of an internal committee called COFIMED (Commission of Medical Physics), which will be responsible for start evaluating the skills of these professionals in Medical Physics.

Cuba

RADIOThERAPY AND NUCLEAR MEDICINE

National regulatory authorities (National Center ONBN the Nuclear Safety and Control Center of Drugs, Medical Devices -CECMED ) MiNeRAT.

REQUIREMENTS:

- Specialist in Medical Physics in NM
  - Have the title of Master of Science: Medical Physics and at least six months of supervised work in a Department of NM by an expert and / or possess the Diploma in Nuclear Medicine.

- Specialist in Medical Physics in RT
  - Have the title of Master of Science: Medical Physics and at least six months of work supervised by a licensed expert medical physicist in the Department of Radiology.

Another situation presented radiology services that are subject to the regulations of the Ministry of Public Health (Public Health Ministry ), which owns less control system certification and licensing requirements. These requirements do not require the presence of a medical physicist in services, although there is a growing awareness of its importance for the safe and best practice of radiological techniques.

They are working on the issue of certification.
The operating license granted by the Ministry of Health is the regulatory authority. Professional qualifications to practice as a Medical Physicist is granted under the Ministry of Health Technical Board of Health.

REQUIREMENTS:
Master of Medical Physics and two years of residency in the specialty (Radiotherapy, Diagnosis, Nuclear Medicine, Radiation Protection).

Medical Physics is registered as Specialty Health Sector at the Ministry of Health.

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**PERU**

**INSTITUTE OF NUCLEAR ENERGY (IPEN)**

**TECHNICAL OFFICE OF THE NATIONAL AUTHORITY (OTAN)**

- **RADIOThERAPY (IR.001.01)**
  - Basic training: Professional in Physics or Engineering
  - Specialized training:
    - Postgraduate in Medical Physics of at least two years
    - Course Training in radiation protection 80 hours at least Teletherapy
    - Practical experience of at least 2 years of work supervised by professionals licensed Adoption of the test applied by OTAN/IPEN

- **DIAGNOSTIC RADIOLOGY (IR.003.2013)**
  - Professional graduate of a master's degree in Medical Physics Training or experience of not less than six (06) months Adoption of the test applied by OTAN/IPEN

- **NUCLEAR MEDICINE (IR.003.2013)**
  - Basic Training: Professional Specialized training: graduate master's or doctorate in Medical Physics
  - Practical experience at least 1 year in medical physics tasks in nuclear medicine Adoption of the test applied by OTAN/IPEN

The Ministry of Health (MOH) is working on the process of official recognition of physical and medical health professionals.

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**Summary: Individual professional certification**

There is not standardized program for Training in Medical Physics in Latin America.

MP is not recognized as a health professional.

The presence of a MP is only mandatory in RT.

To obtain this certification, the candidate should meet the following requirements:
- Have a consistent academic training with any of the modalities
- Have obtained the specific supervised clinical training in the area.
- In cases where the country does not have relevant professional bodies, IAEA and/or PAHO could select a group of experts to advise on the certification assessment of the candidate.
There is no plan (short and long term). The lack of a consistent plan, investments have been done in expensive and complex technologies, sometimes not in line with the facility routine and needs before an analysis of what is really necessary to improve the quality and level of health services to deliver to the public:

- There is no awareness of the importance of creating multi-disciplinary workgroups to plan equipment purchasing, and prioritize expenditures across the facility as a whole.
- Purchase of medical equipment out of a plan - in most of cases does not have the participation of experts. Especially in the public sector, the purchase is carried out by the administrative staff without any input.

Proposals
- Gathering reliable information about the equipment.
- Planning your technology needs and allocating sufficient funds for them.
- Purchasing suitable models and installing them effectively.
- Providing sufficient resources for their use.
- Operating them effectively and safely.
- Maintaining and repairing the equipment.
- Decommissioning, disposing, and replacing unsafe and obsolete items.
- Ensuring staff have the right skills to get the best use out of your equipment.

THANK YOU!

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