International Medical Physics Symposium Medical Physics Practice in Latin America: The Best of Times, The Worst of Times

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Chair, International Scientific Exchange Program (AAPM).

Introduction:

Our task is to present information on the status of the Medical Physics practice in the different countries in Latin America.

Because of its fundamental value, we would like to focus on the status of

education and

professional medical physics issues

in the different countries.

Sources of information:

- Liaisons and Consultants to LAASC
- ***ALFIM***
- Personal visits and contacts

- Latin America: 26 different countries.

- Different economy status.

- Result: Large diversity in Medical Physics practice.

- However, in many instances the economic deficiencies are somehow compensated by the great creativity of their medical physicists.

Education and Training

- IAEA and IOMP : Extensive work in education and practice of the profession of medical physics in the different countries of Latin America.

- Of note: "***El físico médico: Criterios y recomendaciones para su formación académica, entrenamiento clínico y certificación en América Latina***" (FM2010 [1])

- Published in 2010: Collaborative effort of LA Medical Physicists, IAEA and PAHO. Adopted by all LA countries.

IAEA HUMAN HEALTH REPORTS No. 1
INFORMES SOBRE SALUD HUMANA DEL OIEA Nº 1

El físico médico: Criterios y recomendaciones para su formación académica, entrenamiento clínico y certificación en América Latina

Patrocinado por OIEA y OPS

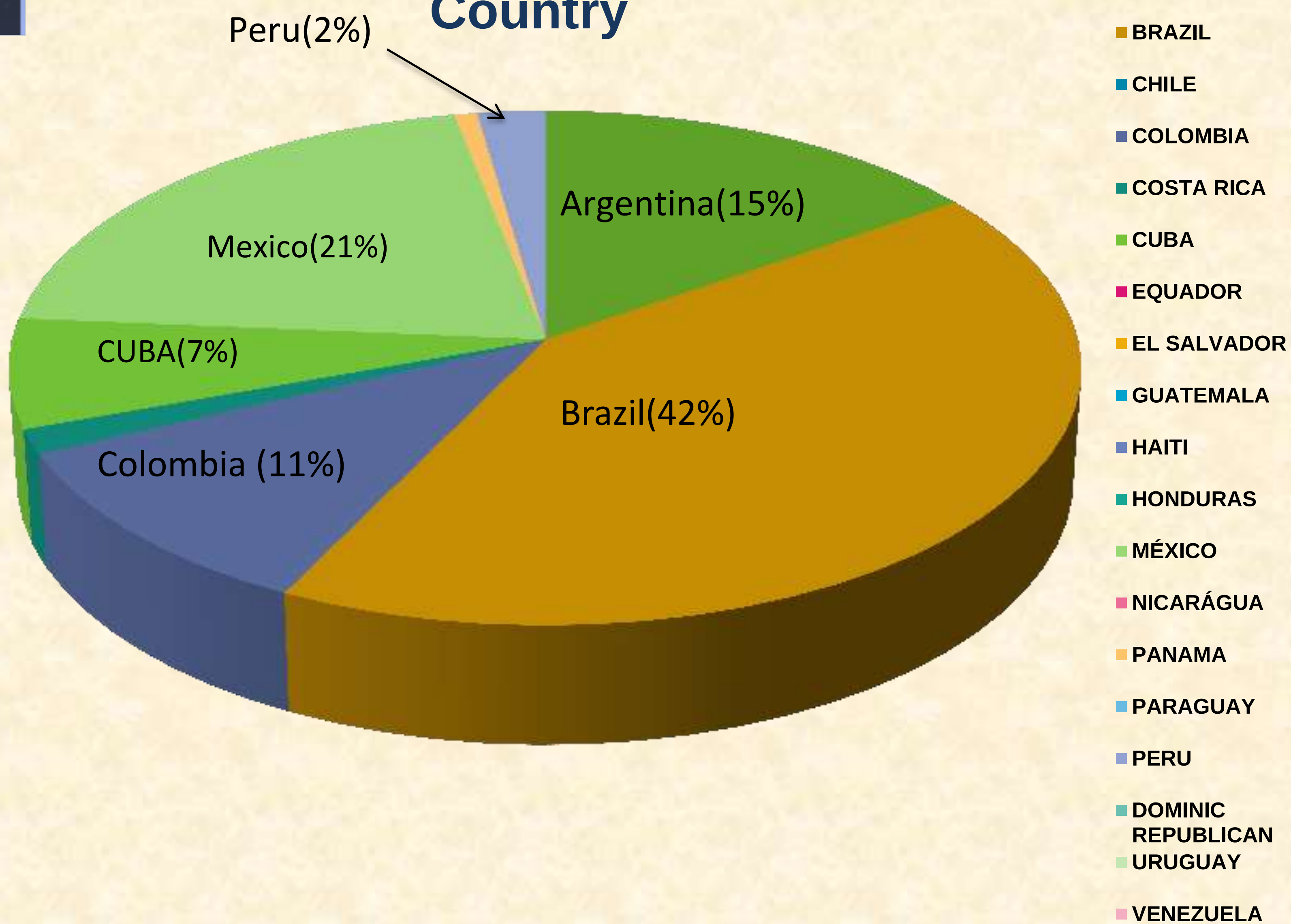
IAEA

IAEA
Organismo Internacional de Energía Atómica

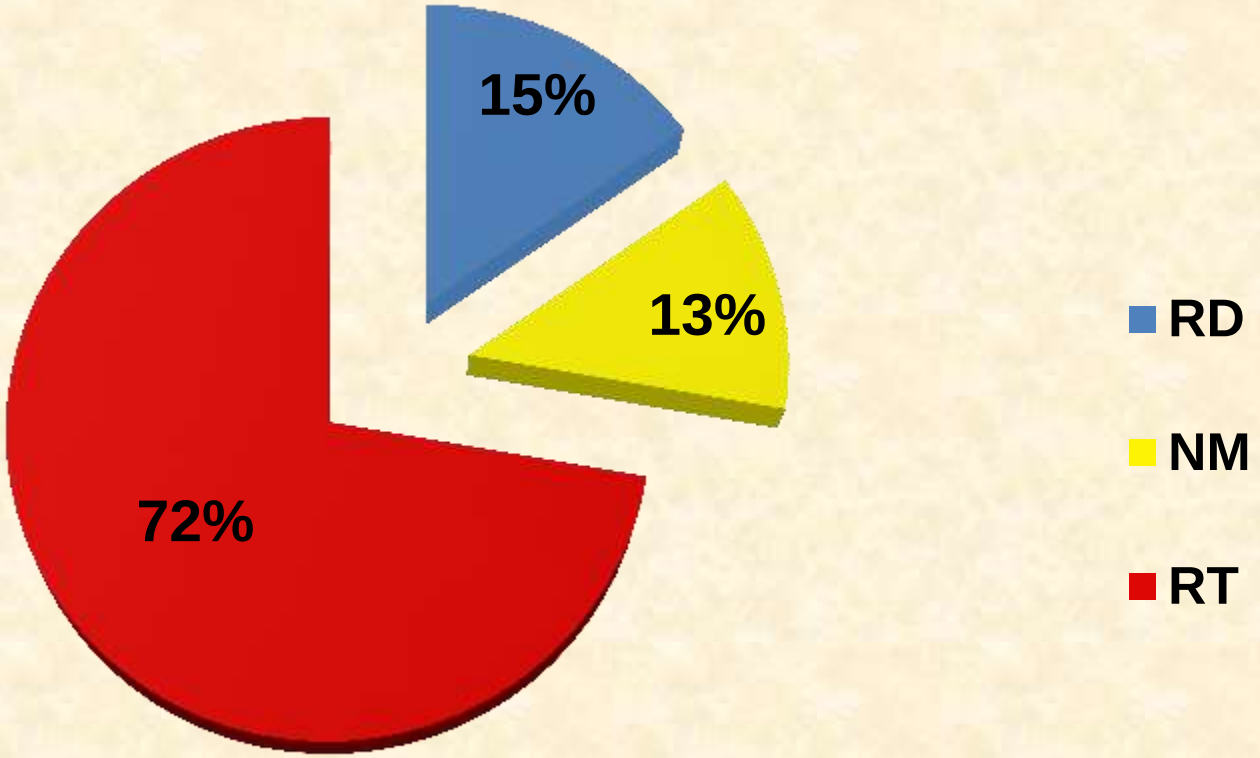
Country	Population Thousands (2010)	Physicians ratio 10,000 hab.	Per capita GDP U$ (2011)
Argentina	40,412	32.1 (2004)	9162
Belize	312	7.0 (2009)	4496
Bolivia	9,93	4.9 (2008)	1978
Brazil	194,946	16.0 (2007)	10716
Chile	17,114	9.3 (2004)	11888
Colombia	46,295	15.0 (2008)	6223
Costa Rica	4,659	18.6 (2009)	7704
Cuba	11,258	66.3 (2008)	5704
Dominican Republic	9,927	13.2 (2008)	5195
Ecuador	14,465	16.2 (2007)	4073
El Salvador	6,193	20.1 (2008)	3426
Guatemala	14,389	9.9 (2008)	2882
Honduras	7,601	3.0 (2008)	2026
Mexico	113,423	14.0 (2006)	9101
Nicaragua	5,788	16.4 (2003)	1132
Panama	3,517	13.4 (2008)	7614
Paraguay	6,455	13.0 (2008)	2771
Peru	29,077	9.2 (2009)	5411
Puerto Rico	3,749	22.0 (2007)	26461
Uruguay	3,369	29.0 (2009)	11952
Venezuela	28,98	13.0 (2007)	13503

Source: PAHO, UN, UNSCEAR 2010

Medical Physicists in LA per Country



Medical Physicists in Latin America



Medical Physicist Education

- Programs are not same in all LA countries: Graduation, Master Degree, PhD, training and residency
- Certification programs exist only in a few countries.
- Clinical residency programs are a lack in many countries.
- Need to increase number of Reference Hospitals.

Education available: Graduation

Country	University	Period (years)
ARGENTINA	Universidad de Buenos Aires	5
BRASIL	Universidade Federal do Rio de Janeiro	4
	Universidade de São Paulo – São Paulo, Ribeirão Preto, Campinas	5
	Centro de Ciências Exatas e Tecnologia da PUC-São Paulo, Rio Grande do Sul	4
	Instituto de Biociências de Botucatu – UNESP (Botucatu/SP)	4
	Fundação Souza Marques (Rio de Janeiro/RJ)	5
	Universidade Federal de Sergipe (Aracaju/SE)	4
	Centro Universitário Franciscano UNIFRA (Santa Maria/RS)	5
CHILE	Universidad La Frontera (Temuco)	5
	Pontificia Universidad Católica de Chile	5
COLOMBIA	Universidad Nacional de Colombia	5
COSTA RICA	Universidad Nacional de Costa Rica	5

Education available: Graduation

Country	University	Period (years)
CUBA	Instituto de Ciencias e Tecnología Nuclear	4
MÉXICO	Universidad Nacional de México	5
	Universidad Autónoma del Estado de México (Toluca)	5
PERÚ	Universidad Nacional de Ingeniería	5
VENEZUELA	Facultad de Ciencias at the Universidad Central de Venezuela	5

Education available: Post Graduation

Country	University	Course
ARGENTINA	Instituto de Tecnología Nuclear DAN BENINSON	Physics in Radiotherapy
	Instituto Balseiro y Fundación Escuela de Medicina Nuclear	M.Sc. Medical Physics
BRAZIL	Instituto de Radioproteção e Dosimetria – CNEN, Rio de Janeiro	M.Sc., PhD in Radiation Protection and Dosimetry
	Instituto de Pesquisas Energéticas e Nucleares - CNEN, São Paulo/SP	M.Sc. , PhD in Nuclear Technology Applications
	Universidade Federal do Rio de Janeiro	MSc., PhD in Physics
	Universidade de São Paulo – São Paulo, Ribeirão Preto	MSc., PhD in Medical Physics and Biology
	Centro de Ciências Exatas e Tecnologia da PUC Rio Grande do Sul	M.Sc., PhD Nuclear Biosciences
	Biociências Nucleares /UERJ - Rio de Janeiro/RJ	M.Sc., PhD Nuclear Biosciences
	Universidade Federal de Sergipe, Aracaju/SE	M.Sc., PhD Nuclear Biosciences
	Centro de Desenvolvimento da Tecnologia Nuclear – CNEN, Belo Horizonte	M.Sc., PhD Nuclear Sciences

Country	University	Course
CHILE	Pontificia Universidad Católica de Chile Universidad de la Frontera	M.Sc. in Medical Physics
	Universidad de Tarapacá (Arica)	M.Sc. in Radiological Science M.Sc. In Radiological Protection and Security
COLOMBIA	Universidad de Colombia	M.Sc. ,PhD in Medical Physics
COSTA RICA	Universidad Nacional de Costa Rica	M.Sc. in Medical Physics
CUBA	INSTITUTO SUPERIOR DE CIENCIAS MÉDICAS	Graduated in Physics of Radiotherapy - Specialist Graduated in Physics of Nuclear Medicine -Specialist

PERIOD: 9 months - 2 years for MSc Degree
4 years for PhD Degree

ARGENTINA

Population (2012): 41,137,524

Present situation: Needs for the clinics (Argentina, D.Sanz)

- Radiation Therapy Physicists: 106→150-200
- RT Dosimetrists (technologists): 57→150-200
- Nuclear Medicine Physicists: 9 → **50-100 !**
- NM technologists: 142 →500

Also, considering the need to:

- Duplicate the number of Linear Accelerators (i.e. $5/10^6$) and PET facilities (i.e. $1/10^6$).
- Improve/upgrade technology and applications.
- Teaching and Research.
- Medical Physicists in radiology.

We roughly need: RT × 4, NM × 10, Radiology +100 or more

⇒ **~500 additional Medical Physicists should be necessary at clinics.**

Argentina: What is the trend?

- The technological gap with developed countries use to be 10-20 years (e.g. 3DRT, HDR, IMRT, PET).
- Now it is 5-10 years (IGRT, PET-CT, Multi Slice CT), greatly due to:
  - Globalization
  - Better economical scenarios
  - Patients are more advised (internet)
- Technology and new methodologies impose more challenges:
  - More QA and specificity.
  - Full time dedication.
  - Optimization to reduce operational costs.

Argentina: What is the trend?

Imaging and therapy are now synergetic: new needs

- More technology.
- More MP involvement in other areas.
- Research enters the clinic: clinical trials, customized tools (image QA, dosimetry procedures).

- The rate of new professionals appears to increase.
- However, it is still very insufficient.

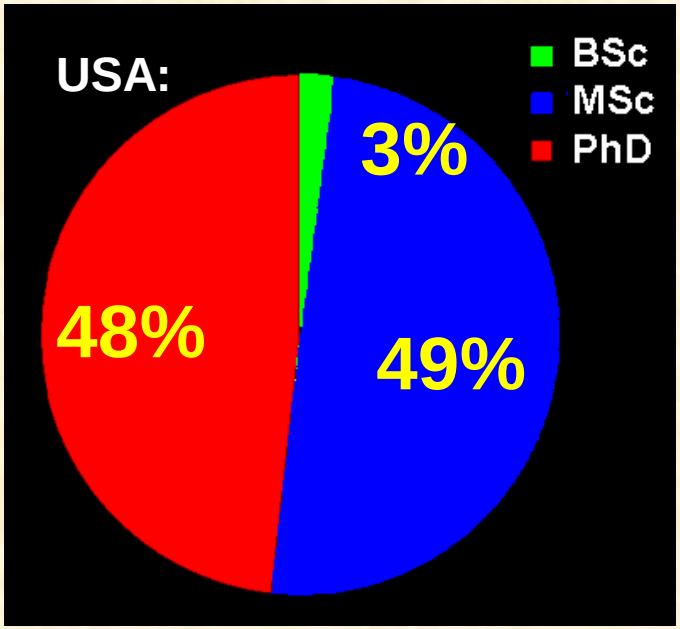
Argentina: Conclusions

- Imperative need to incorporate the medical physicists in radiology-imaging (presently not required).
  - Work with health authorities
- Certification and accreditation:
  - Work with professional associations and universities
- Promote audits and visits:
  - Work with professional associations, IAEA, AAPM
- Promote full time job.

Status of the Research Medical Physicist

What should be the medical physics educational structure?

Argentina:
5% PhD,
25% MSc,
70% Licenciados



Status of the Research Medical Physicist

- No PhD programs for Med. Phys. (Instituto Balseiro)
- Most clinical Med. Phys. teachers or training advisors are not involved in systematic research.
- Delay in technology incorporation expands the gap between the clinic and translational research.

  Physics students that naturally point to a PhD career do not intersect with Med. Phys!

  The low number of new professionals does not create the "critical mass".
- Med. Phys. graduates usually go for the clinics:
  - Intensive clinic throughput and low number of professionals deviates priorities.
  - Clinic is much more profitable than teaching-researching: High differences between salaries and scholarships.

Regulatory Aspects

Careers and courses are recognized by the Nuclear Regulatory Authority (ARN) and are required for professionals to work in the clinic. However:

- The M.P. profession ***is not*** recognized by Health Authorities.
- The Medical Physicist ***is not*** required in radiology (except nuclear medicine).
- The residency formalism (clinical training, as required by law) ***is not*** regulated .
- Authorization is given after (only!) **one year** of clinical training.
- Certification recently established in Argentina (SAFIM). Already in place in Brazil for sometime.

Brazil

Population (2010): 190,732,694

BRAZIL: PRESENT SITUATION OF RADIATION THERAPY: Cecilia Kallil Haddad,Liaison

- About 518,OOO new cancer cases estimated in Brazil in 2012.
- About 60% should be prescribed radiation therapy.
- Not all the patients will have access to the RT procedures.
- As per the Brazilian Society of Radiation Therapy : there are 165 radiation therapy centers, the majority being in the South and Southeast regions.

The goal is to structure 80 new services in the country, until 2015

BRAZIL: Workforce

- At present:

323 specialists:

- 64 Imaging and Diagnostics
- 25 Nuclear Medicine
- 234 Radiation therapy

– Needed: 466 RT medical physicists

– Deficit: 232 RT medical physicists

Practice Residency in Brazil

INSTITUTION	PERIOD (hours)	Annual Ingress
Instituto Nacional do Câncer INCa	3380	6
AC Camargo	3900	3
UNICAMP Hospital de Clínicas	3940	2
USP Hospital de Clínicas	3840	2
Hospital Sírio Libanês	4000	1
UNIFESP Escola Paulista de Medicina	1920	2
Centro de MN do Hospital das Clínicas	1920	1
Hospital do Câncer Barretos	3800	1
Hospital das Clínicas de Ribeirão Preto	3800	3
Liga Paranaense de Tumores Hospital Erasmo Gaertner	6240	1

TOTAL of vacancies for entry : 22 per year

Projected: 80 Linear accelerators

~80 medical physicist in 3 years :

Needed: add 232 RT medical physicists

TOTAL of vacancies for entry : 22 per year

> 2 years for graduation and certification

- Actions:

–Increase the number of slots in the existing residencies.

– Increase the number of training institutions

Certification (Brazil)

- A Certified Medical Physicist must be evaluated by a national or an international professional certification body.
- However, most of LA countries didn't establish a certification process yet.
- Where there is a certification process, different requirements are established to certify or licensee MP.
- Brazil already has certification process. Need to update and improve it to achieve international recommendations.
- The practical training is a concern because there **are not enough accredited hospitals to do residency.**

Mexico

Population (2010): 5,822,000

MEXICO, *Maria Ester Brandan, Liaison*

Two educational programs:

- M Sc (Medical Physics) at the National University of Mexico in Mexico City, about 9 graduates per year.

- M Sc (Medical Physics) at the State University of Mexico in Toluca, about 4 graduates per year.

MEXICO, *Maria Ester Brandan, Liaison*

- The current support to attend the AAPM annual meetings (registration waiver) is an excellent idea.
- AAPM should support the attendance of AAPM members to Mexico's national symposia in Med.Phys. A minimum requirement of " good" organization should be asked.
- An appropriate AAPM med. phys. could attend the event, having a complete work plan (not just give a lecture, but collaborate with local med phys and graduate students).
- ***Brain drainage should be avoided at all cost, visits should be from the US to Latin America (except for attendance to the annual meetings).***

Colombia


Mexico
Cuba
Haiti
Dominican Republic
Puerto Rico
Belize
Guatemala
Honduras
El Salvador
Nicaragua
Costa Rica
Panama
Venezuela
Guyana
Colombia
Ecuador
Peru
Brazil
Bolivia
Paraguay
Argentina
Uruguay
Chile


Caribbean Sea
Panama
Panama City
Venezuela
Pacific Ocean
Bogotá
Brazil
Ecuador
Peru
Colombia
Central Provinces
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COLOMBIA, Raul Gonzales, Liaison

- The Universidad Javeriana of Bogotá Colombia approved a new program of Master in Medical Physics. The person in charge is María Esperanza Castellanos.
- This program is supported by the IAEA.
- The university is going to have an international invited professor each semester.
- First group of students will start August 2013

Uruguay

Population: 3,356,584

URUGUAY, Gabriel González-Sprinberg

- About 100 enrolled students in the Bachelor of Medical Physics. About 12 will graduate next year.
- Medical Physics “visibility” has increased in the academia, in medicine, and in other areas in the country.
- Postgraduate training Physics students : (3!)

  M.S. Degree in Medical Physics at the Instituto Balseiro, Argentina and Universidad de la Frontera, Chile.
- The expanding need for Medical Physicists is now being recognized.

Peru

Population (2010): 29,461,933

PERU, Sandra Guzman, Ph.D.,[1] Fernando Marquez, M.S.,[2] and Dante E. Roa Ph.D.[3]

- ***Regarding recommendations to the AAPM*** - Hands on workshops on new Tx. modalities (VMAT/IMRT QA), implementing an IGRT program, would go a long way.
- Workshop at the Peruvian Radiation Oncology/Medical Physics conference last October (in Trujillo-Peru).
- Head-and-neck, prostate, breast cancer Tx. (IMRT & VMAT) MD (the target contouring portion), Physicist (Tx Planning)
- Workshops of this sort **given in the native language** (very important) can be a significant help since Latin America is experiencing huge improvements in healthcare due to its booming economy.

Venezuela

Population (2010): 27,150,095

VENEZUELA, Jesus E. Davila, MSc, Consultant (serious economical problems)

- The Physics group: 26 medical physicists Radiation Therapy, Diagnostic, Nuclear Medicine and Radiation Protection.
- Many have a MS Degree in Medical Physics, others in the process of obtaining their MS Degree.
- Explore the possibility of making contact with AAPM medical physicists that could be interested in participate in seminars, for the interchange of experiences.
- Collaboration with AAPM MP to deliver via the web, some of the modules of medical physics residency program's to strengthen their students training.
- If it is possible, create an Exchange Program as well as research altogether.


North Atlantic Ocean
Gulf of Mexico
MEXICO
THE BAHAMAS
CUBA
JAMAICA
HAITI
DOMINICAN REPUBLIC
PUERTO RICO
BELIZE
HONDURAS
GUATEMALA
EL SALVADOR
NICARAGUA
COSTA RICA
PANAMA
Caribbean Sea
DOMINICA
ST. LUCIA
BARBADOS
TRINIDAD AND TOBAGO
North Pacific Ocean
VENEZUELA
GUYANA
FRENCH GUIANA
COLOMBIA
ECUADOR
PERU
BRAZIL
BOLIVIA
PARAGUAY
CHILE
ARGENTINA
URUGUAY
South Pacific Ocean
South Atlantic Ocean
FALKLAND ISLANDS

CHILE

Chile, Areli Zuñiga, MSc. Liaison

- Serious problems with medical physics profession.
- New Master in Medical Physics at the Pontificia

Universidad Católica de Chile(PUC), offers option of double degree with the University of Heidelberg.

- Universidad de La Frontera also offer MS in Med.Phys
- ISEP workshop programmed for January 2014 in Chile, in cooperation with PUC.

Accreditation

- There was a thought of looking into obtaining CAMPEP accreditation for medical physics residence programs in Latin America.

- However as all medical physics programs in Latin America follow IAEA protocols, it might be better to have an international organization like ALFIM or IAEA, IOMP to provide an uniform accreditation process to all LA countries. (under discussion)

ALFIM ACTION PLAN(1)

- Medical Physic Database for LA
- Standardize and Specify Requirements
- Standardize Training Syllabus for all countries
- Standardize Certification process for LA
- Achieve International Medical Physics Board Certification – Criteria and Objective
- Increase the number of referral hospitals to achieve training demand
- Establish a Code of Ethics for MP in the region

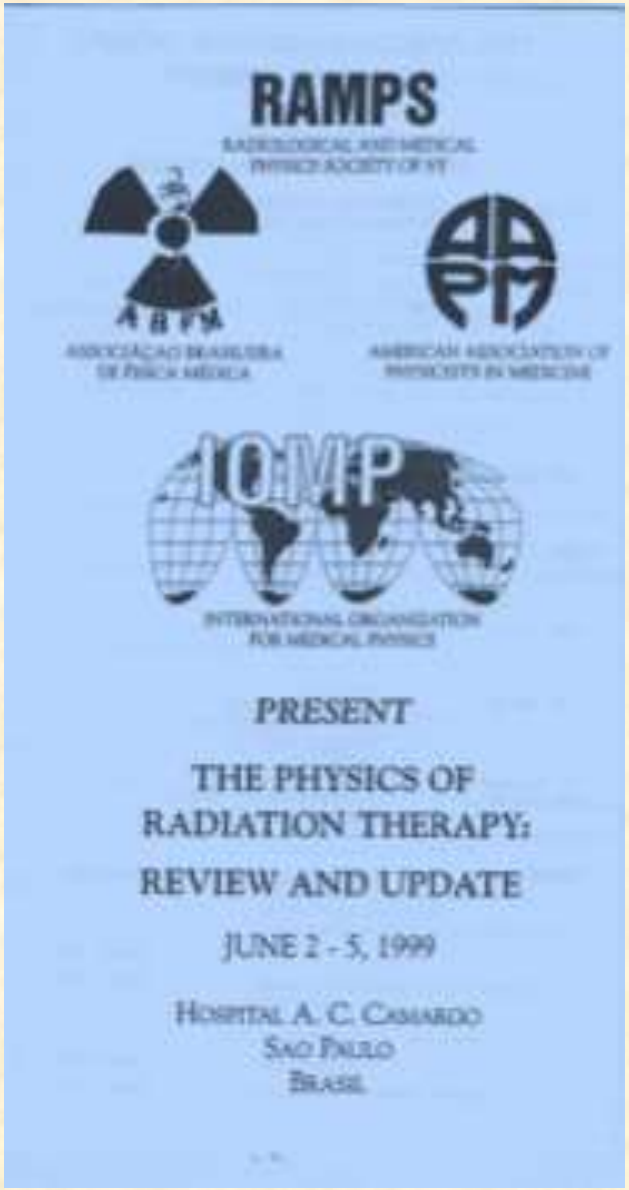
ALFIM ACTION PLAN

Partners

IAEA : Standard Syllabus and Regional Projects

PAHO : Strategic Plan 2008 - 2017 OBJECTIVE 13: Ensure the existence of health personnel available, competent, productive and responsive to the needs, in order to improve health outcomes…..

IOMP: Standards and Certification Process



- **Can we make a difference?**

Jose Carlos da Cruz, Ph.D.
Cecilia Maria K. Haddad,MS.

- **YES, WE CAN!**
- **Next: Chile!**

Conclusions

Through LAASC activities and the realization of ISEP workshops it has been possible :

- To exchange scientific information on the state of the art of the practice of medical physics,

- To divulge AAPM programs available to countries in development.

AAPM PROGRAMS

- International Affairs Committee)
- African Affairs SC [AASC)
  Asian Oceanic Affairs SC AOASC
- European Affairs SC [EASC]
- Equipment Donation Program SC [EDPSC]
- Exchange Scientist Program SC [ESPSC]
- International Library SC [ILSC]
- International Portal Working Group [IPWG]
- Latin American Affairs SC [LAASC]
- Middle East Affairs SC [MEASC]
- Partners in Physics SC [PIPPSC]
- Developing Country Educational Associate (DCEA)"
- International Scientific Exchange Program(ISEP)

Conclusions:

We believe that through cooperation and work together with ALFIM, IOMP and IAEA, the AAPM can contribute to make a sustainable impact to the medical physics profession in Latin American Countries.

- *LAASC has established very good relationship with ALFIM and is looking forward to maximize the work together.*
- ***We want to thank the contribution of Simone Kodlulovich, ALFIM President.***

AAPM – IAC – LAASC

Members - 2013 Roster: There are 17 members

Doracy . Fontenla, PhD,	Subcommittee Chair
J. Francisco Aguirre, MS,	Subcommittee Vice Chair
Steven J. Bartolac,	Consultant - Bolivia (nonvoting)
Maria-Ester Brandan, PhD,	Member - Liaison to Mexico
Jesus E. Davila, MSc, Consultant	Venezuela (nonvoting)
Cesar Della Biancia, PhD, Member	Liaison to Argentina
Jose Luis Dumont, MSc, Member	Consultant to Argentina
Raul Gonzales, Member	Liaison to Colombia
Cecilia Maria K. Haddad, Member	Liaison to Brazil
Amir Huda, PhD Member	Consultant to Chile
Norman Harold M. Ramirez, MSc,	Consultant - Colombia (nonvoting)
Yakov M. Pipman, DSc,Member	Liaison to Cuba and ALFIM
Nicolas Recalde, MS, Member	Liaison to Ecuador
Dante E. Roa, PhD, ,Member	Liaison to Peru
Keli C. Wilson, MS, Member	Consultant to Brazil
Areli A. Zuniga, MS, Member	Liaison to Chile (nonvoting)
Simone K. Dias,	Consultant - to ALFIM (nonvoting)


Thank you