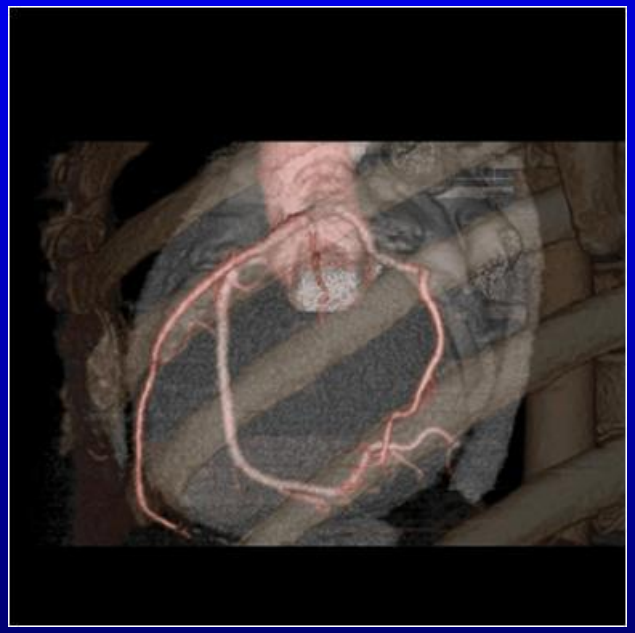
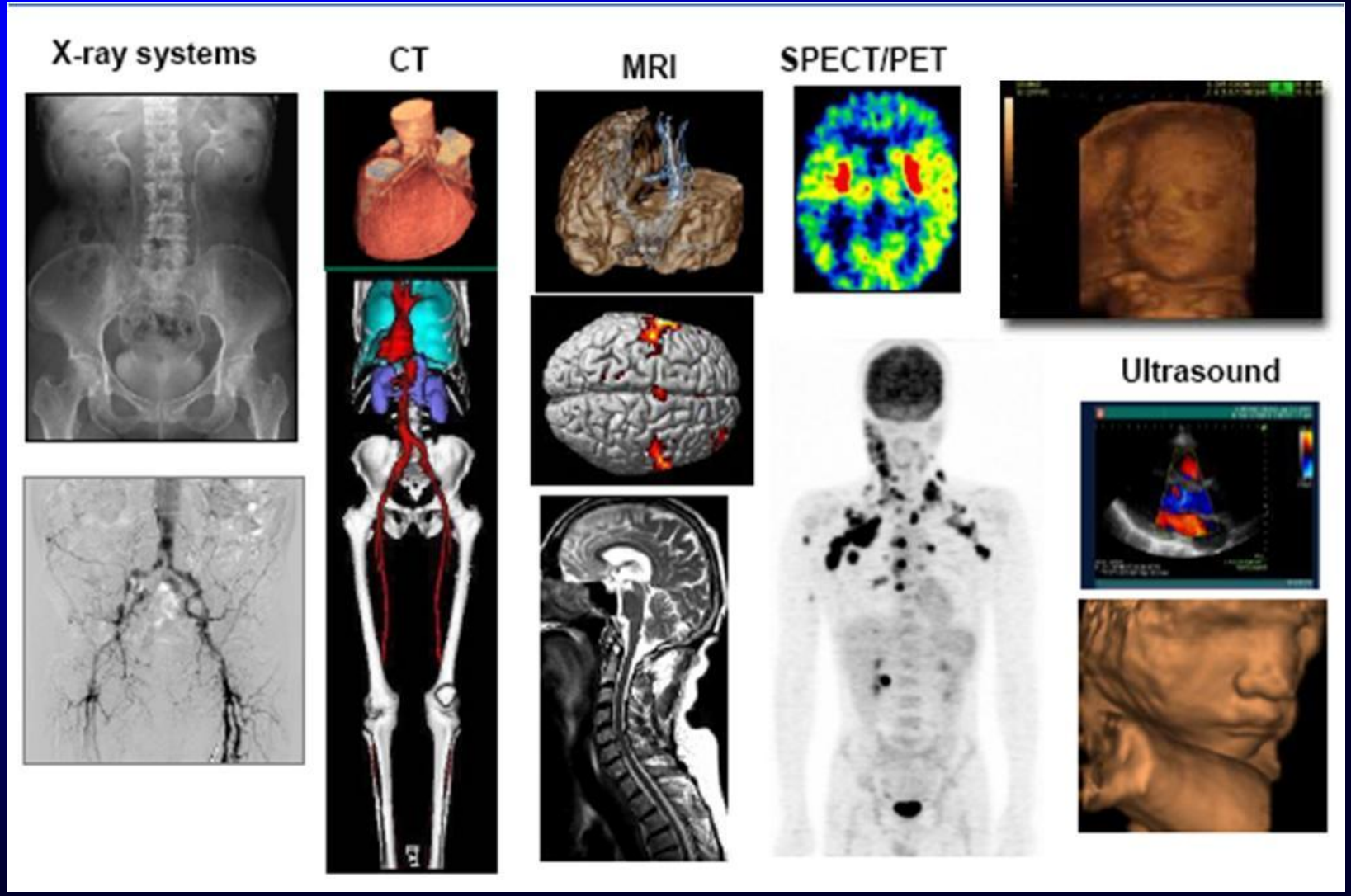
Quality and Safety in Radiology. State of Medical Physicists in Latin America



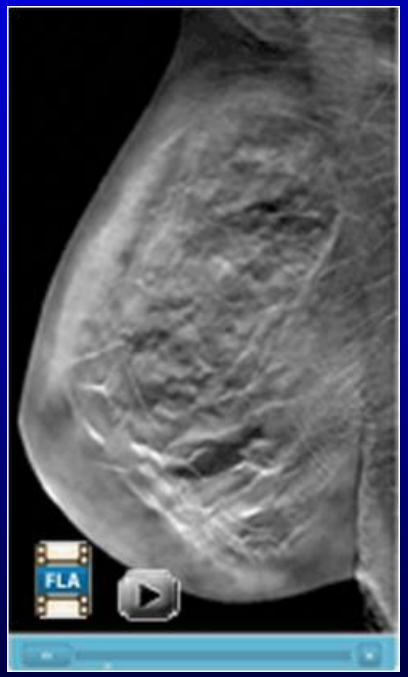
Simone Kodlulovich Renha
National Commission of Nuclear Energy, Brazil
President of the Latin American Association of Medical Physicists (ALFIM)
Contribution: ALFIM BOARD and Dr Lidia Vasconcellos de Sá

Introduction:
Diversity of Image Modalities



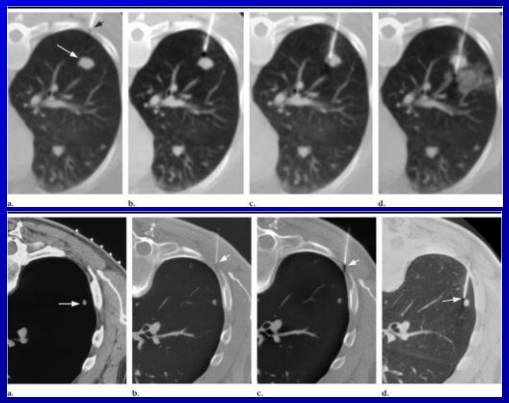
Advances in Digital Radiology and new Technologies

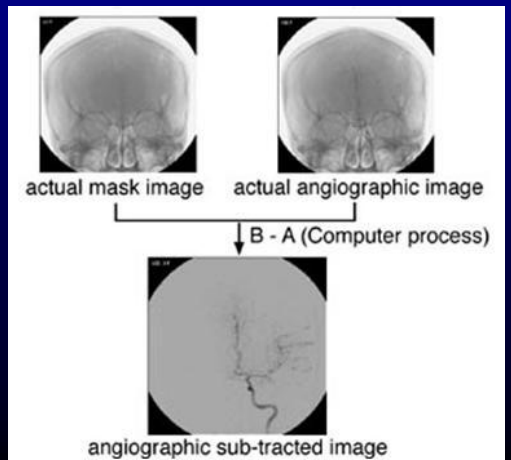
Csl Flat Panel



Fluoroscopy and Interventional Radiology

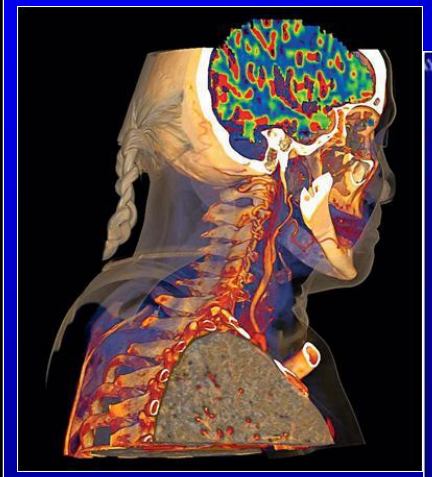
CTF

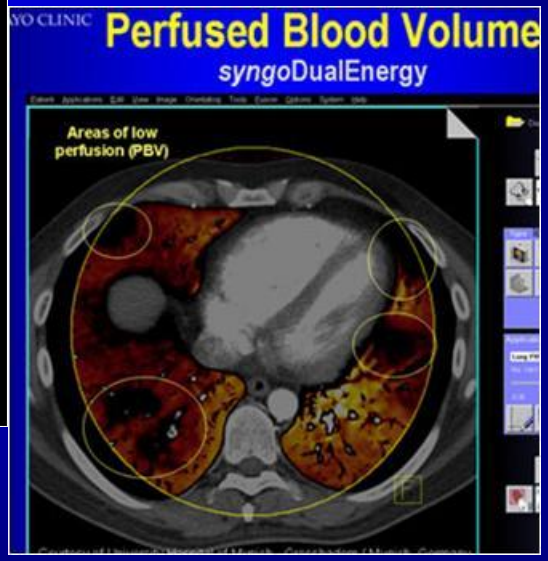


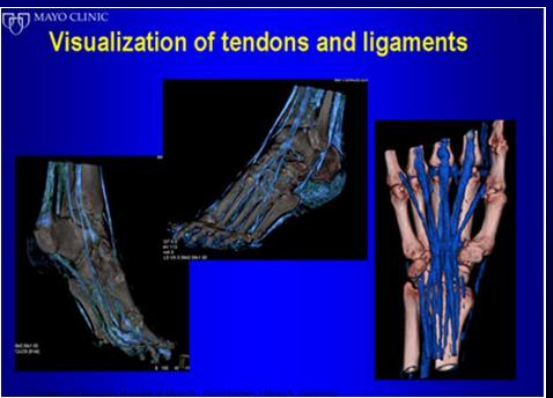


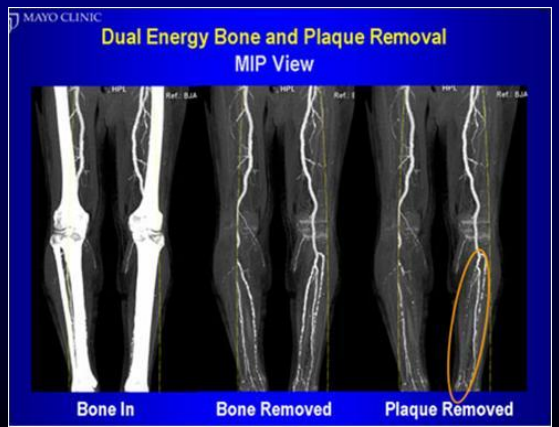
DSA

CT: New Possibilities

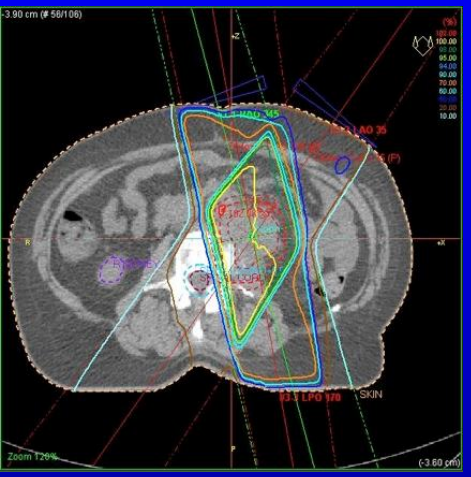


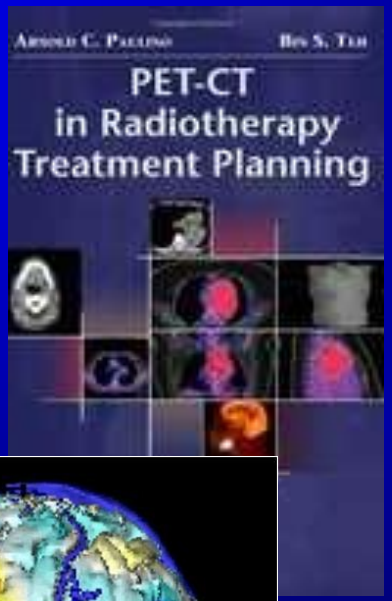






Hybrid Systems: PET-CT, PET-MRI and application of CT in RT planning

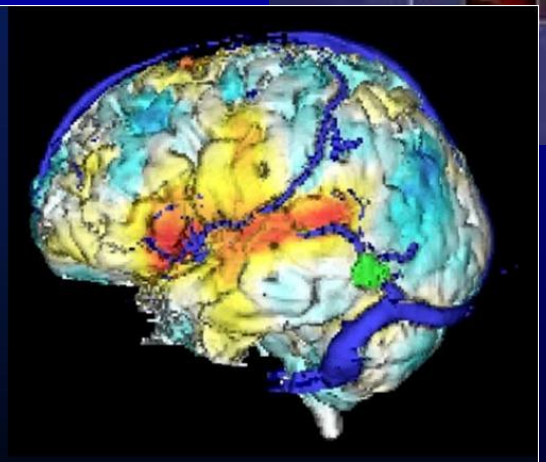




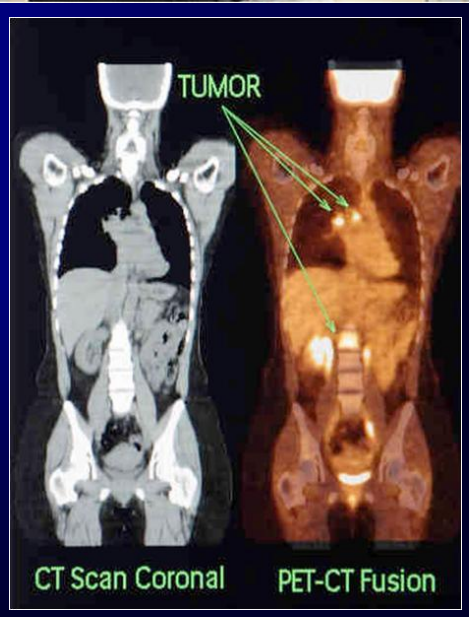
Multi modality

PET + MRI

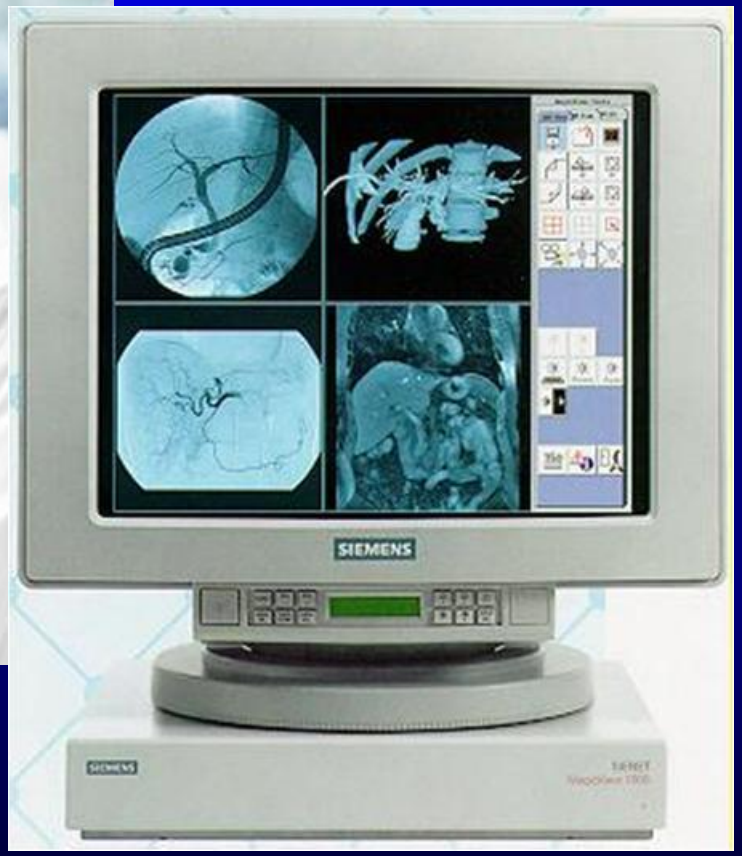
Blood flow changes under speech activation (red)
Tumor (green)

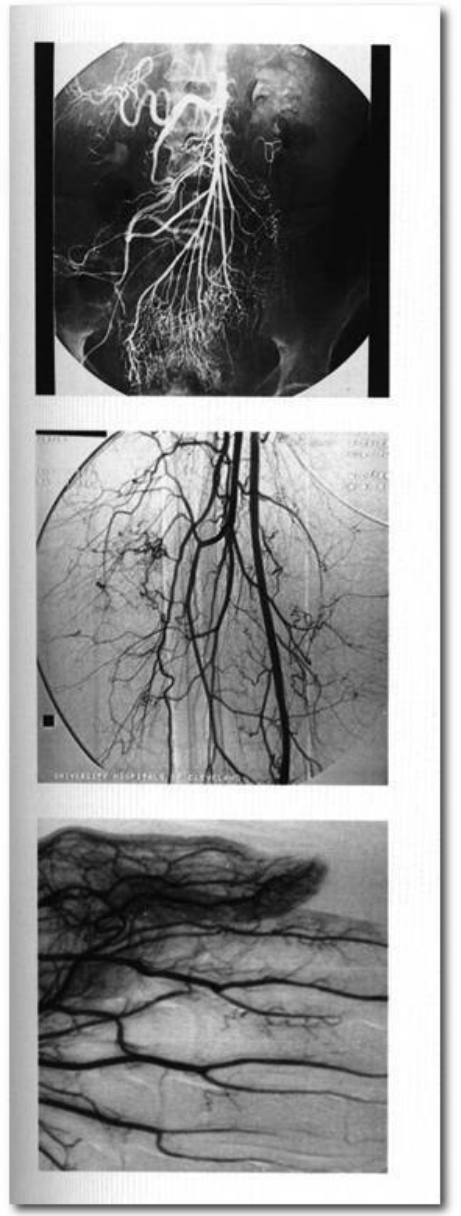


From: Klaus Wienhard
MPI für Neurologische Forschung, Köln



Changing Concepts...and Routine





Special Care

Radiation exposure from CT scans in childhood and subsequent risk of leukaemia and brain tumours: a retrospective cohort study

Mark S Pearce, Jane A Salotti, Mark P Little, Kieran McHugh, Choonsik Lee, Kwang Pyo Kim, Nicola L Howe, Cecilia M Ronckers, Preetha Rajaraman, Sir Alan W Craft, Louise Parker, Amy Berrington de González

Summary

Background Although CT scans are very useful clinically, potential cancer risks exist from associated ionising radiation, in particular for children who are more radiosensitive than adults. We aimed to assess the excess risk of leukaemia and brain tumours after CT scans in a cohort of children and young adults.

Methods In our retrospective cohort study, we included patients without previous cancer diagnoses who were first examined with CT in National Health Service (NHS) centres in England, Wales, or Scotland (Great Britain) between 1985 and 2002, when they were younger than 22 years of age. We obtained data for cancer incidence, mortality, and loss to follow-up from the NHS Central Registry from Jan 1, 1985, to Dec 31, 2008. We estimated absorbed brain and red bone marrow doses per CT scan in mGy and assessed excess incidence of leukaemia and brain tumours cancer with Poisson relative risk models. To avoid inclusion of CT scans related to cancer diagnosis, follow-up for leukaemia began 2 years after the first CT and for brain tumours 5 years after the first CT.

Findings During follow-up, 74 of 178 604 patients were diagnosed with leukaemia and 135 of 176 587 patients were diagnosed with brain tumours. We noted a positive association between radiation dose from CT scans and leukaemia (excess relative risk [ERR] per mGy 0·036, 95% CI 0·005–0·120; p=0·0097) and brain tumours (0·023, 0·010–0·049; p<0·0001). Compared with patients who received a dose of less than 5 mGy, the relative risk of leukaemia for patients who received a cumulative dose of at least 30 mGy (mean dose 51·13 mGy) was 3·18 (95% CI 1·46–6·94) and the relative risk of brain cancer for patients who received a cumulative dose of 50–74 mGy (mean dose 60·42 mGy) was 2·82 (1·33–6·03).

Interpretation Use of CT scans in children to deliver cumulative doses of about 50 mGy might almost triple the risk of leukaemia and doses of about 60 mGy might triple the risk of brain cancer. Because these cancers are relatively rare, the cumulative absolute risks are small: in the 10 years after the first scan for patients younger than 10 years, one excess case of leukaemia and one excess case of brain tumour per 10 000 head CT scans is estimated to occur. Nevertheless, although clinical benefits should outweigh the small absolute risks, radiation doses from CT scans ought to be kept as low as possible and alternative procedures, which do not involve ionising radiation, should be considered if appropriate.

Funding US National Cancer Institute and UK Department of Health.

Introduction

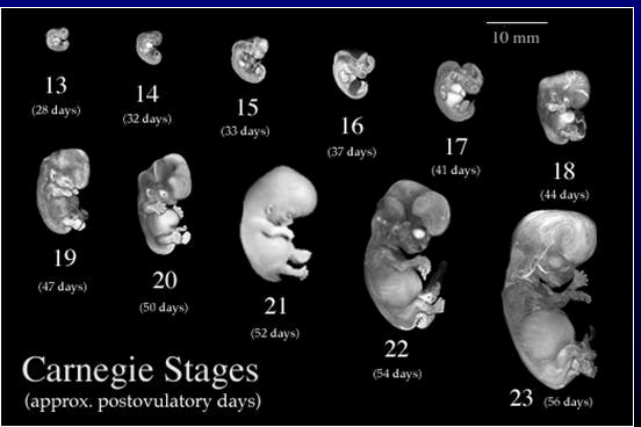
CT imaging is a valuable diagnostic technique, and new clinical applications continue to be identified. As a result, the rates of CT use have increased rapidly in the USA and elsewhere, particularly in the past 10 years.[1] Although the immediate benefit to the individual patient can be substantial, the relatively high radiation doses associated with CT compared with conventional radiography have raised health concerns.[2–4] Potential increases in future cancer risk, attributable to the rapid expansion in CT use have been estimated with risk projection models, which are derived mainly from studies of survivors of the atomic bombs in Japan.[5,6] These studies have been criticised because of concerns about how applicable the findings from this group are to the relatively low doses of radiation exposure from CT scans and to non-Japanese populations. Some investigators claim that there are no risks, or even beneficial effects, associated with low-dose radiation.[7] No direct studies of cancer risk in patients who have undergone CT scans have been undertaken to date.

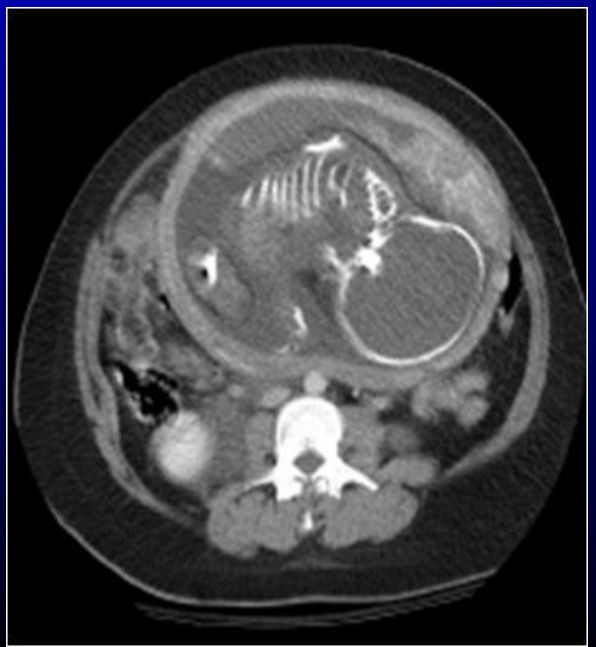
We did a study to directly assess the question of whether cancer risks are increased after CT scans in childhood and young adulthood. Here we assess the risks of leukaemia and brain tumours because they are the endpoints of greatest concern as the red bone marrow and brain are highly radiosensitive tissues, especially in childhood.[8] Furthermore, these tissues are also some of the most highly exposed from childhood CT scans,[9] and leukaemias and brain tumours are the most common childhood cancers.

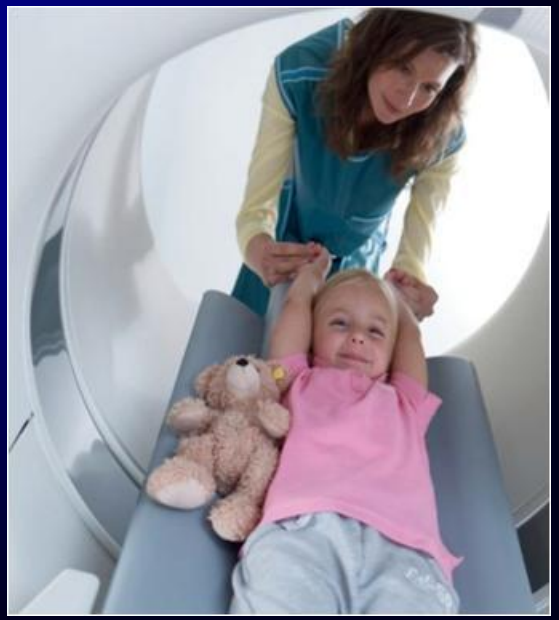
Methods

Patients and study design

In our observational retrospective cohort study, we included patients without previous malignant disease who were first examined with CT between 1985 and







World Health Organization (WHO)

Radiation in Health Care

The use of radiation in health care is by far the largest contributor to the exposure of the general population from artificial sources

Annually worldwide

3,600 million X-ray exams (> 300 million in children)

37 million nuclear medicine procedures

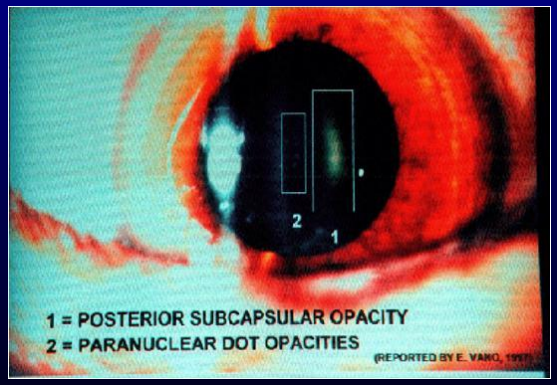
7.5 million radiation oncology treatments

[UNSCEAR Report 2008]

Deterministic Effects: Patient and Occupational

USA Today
November 20
2000

Jury awarded $1 million to 57-year-old man who sustained serious skin injury after two coronary artery angioplasties that occurred 5 months apart and sued (L Berlin 2001)



Searching for solutions

- Justification
- Optimization
- Reference levels
- Multidisciplinary staff – importance of the medical physicist in the service....
- To raise awareness of MP role in the radiology departments…..
- But, are we already prepared?

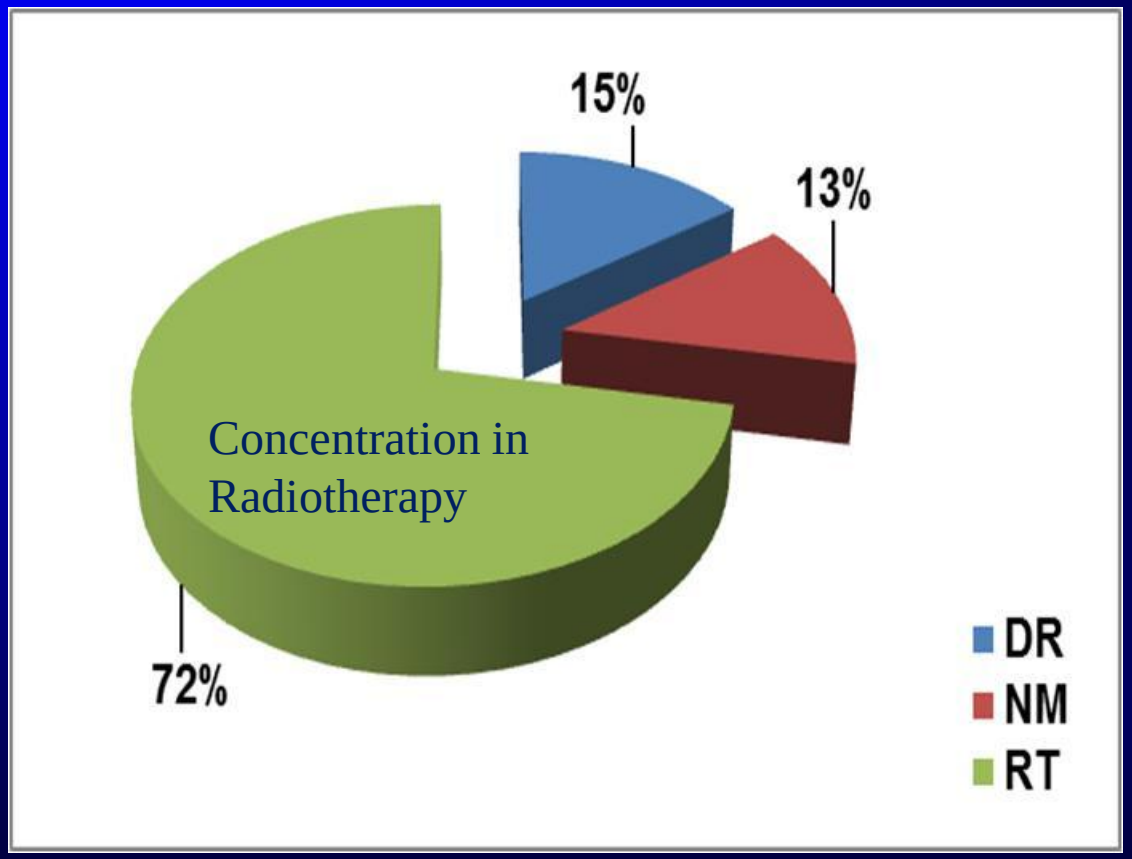
Medical Physicist

Classified by the International Labor Organization as a profession in the International Standard Classification of Occupations-08 (ICSO-08)

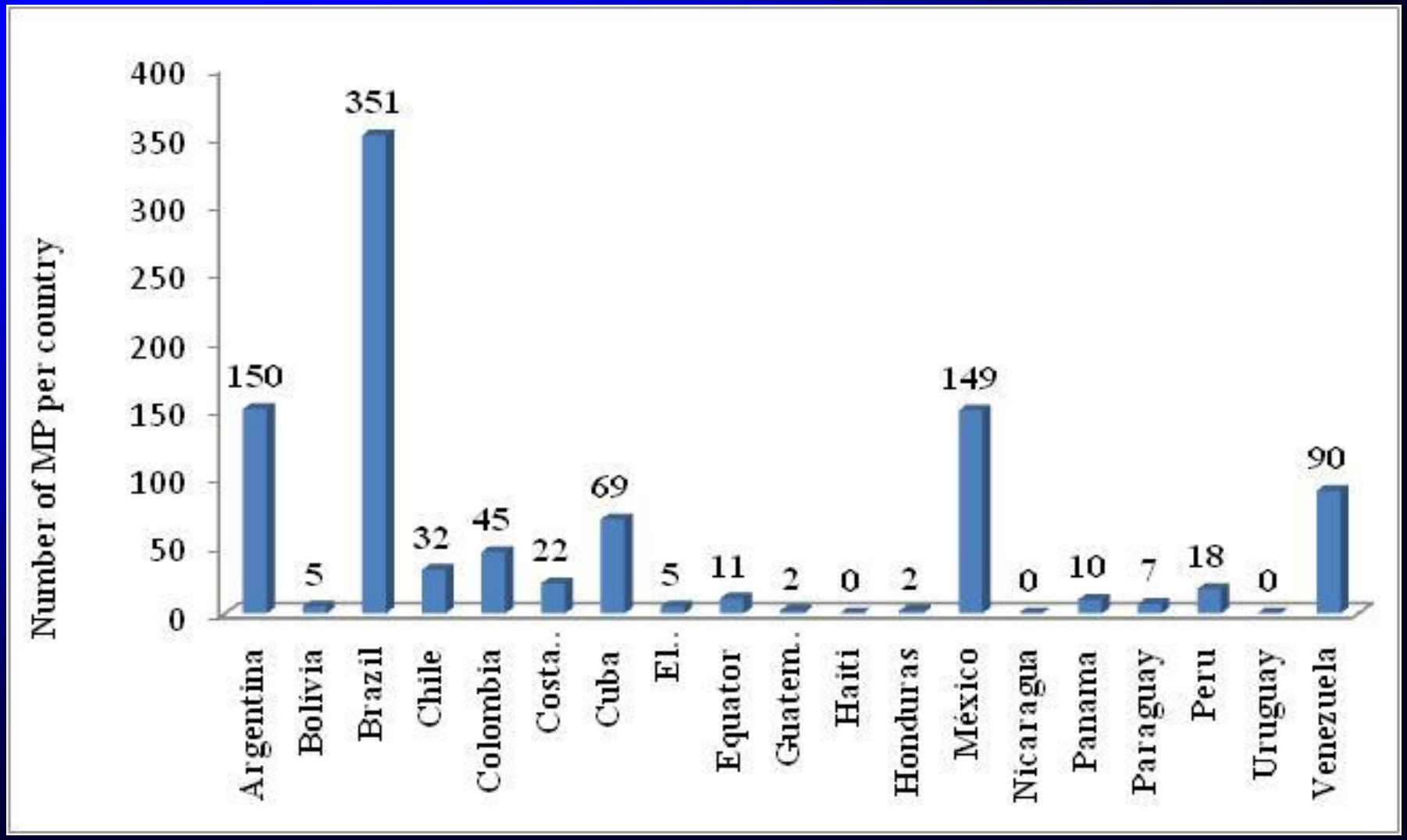
A *health professional*, with specialist education and training in the concepts and techniques of applying physics in medicine, and competent to practise independently in one or more of the subfields (specialties*) of medical physics.

***(e.g. diagnostic radiology, radiation therapy, nuclear medicine)**

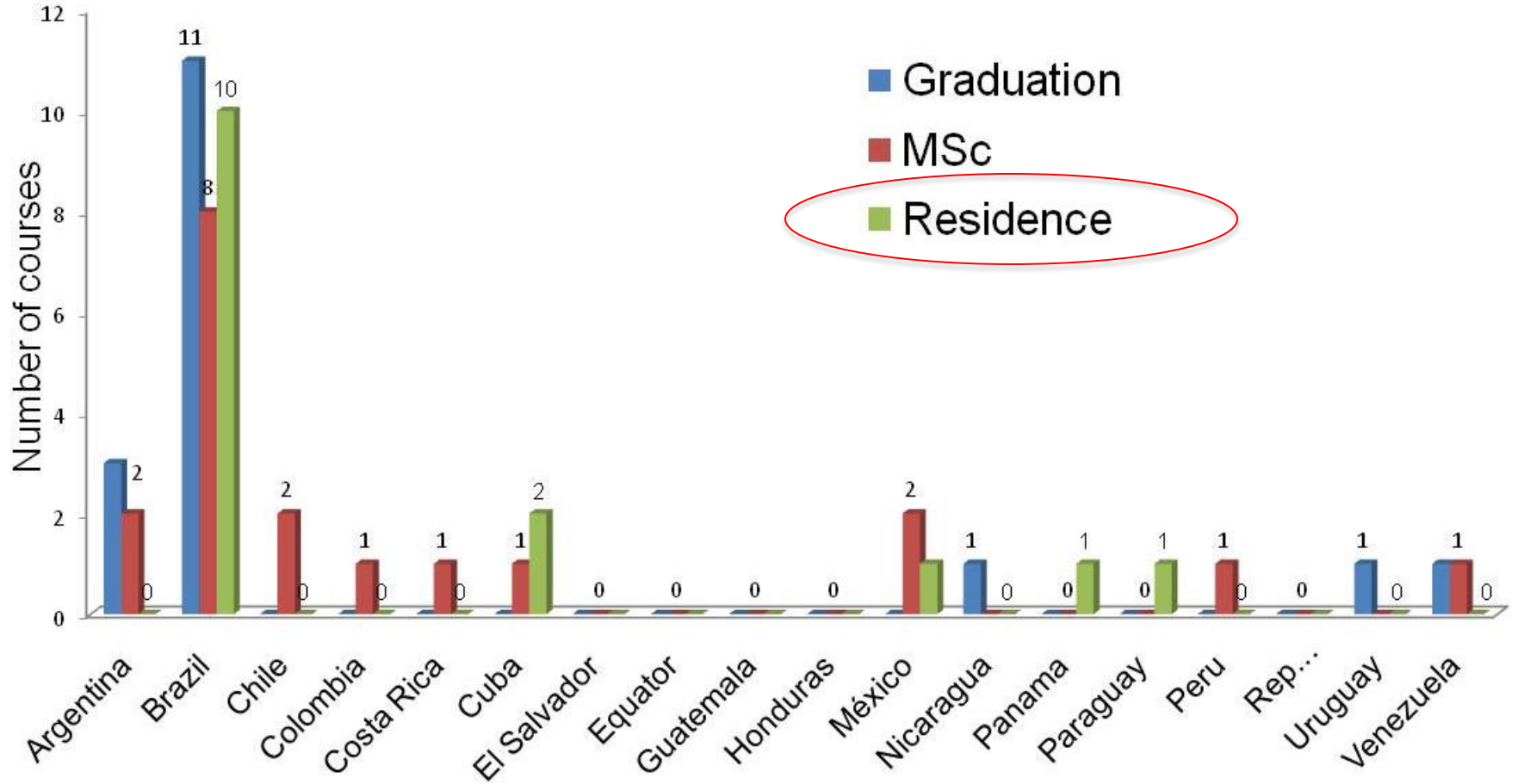
Distribution of MP/Clinical Area



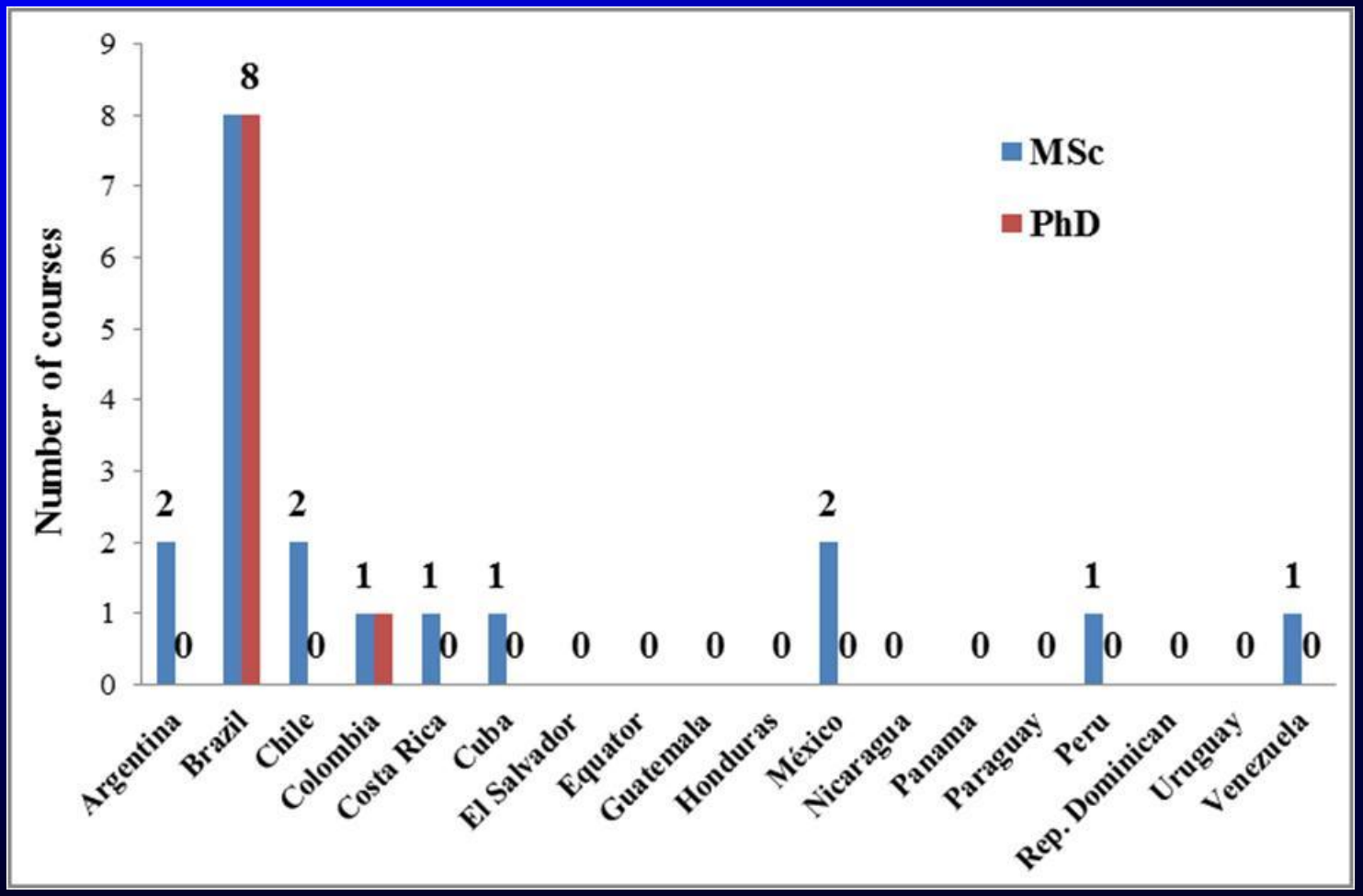
Number of MP/country



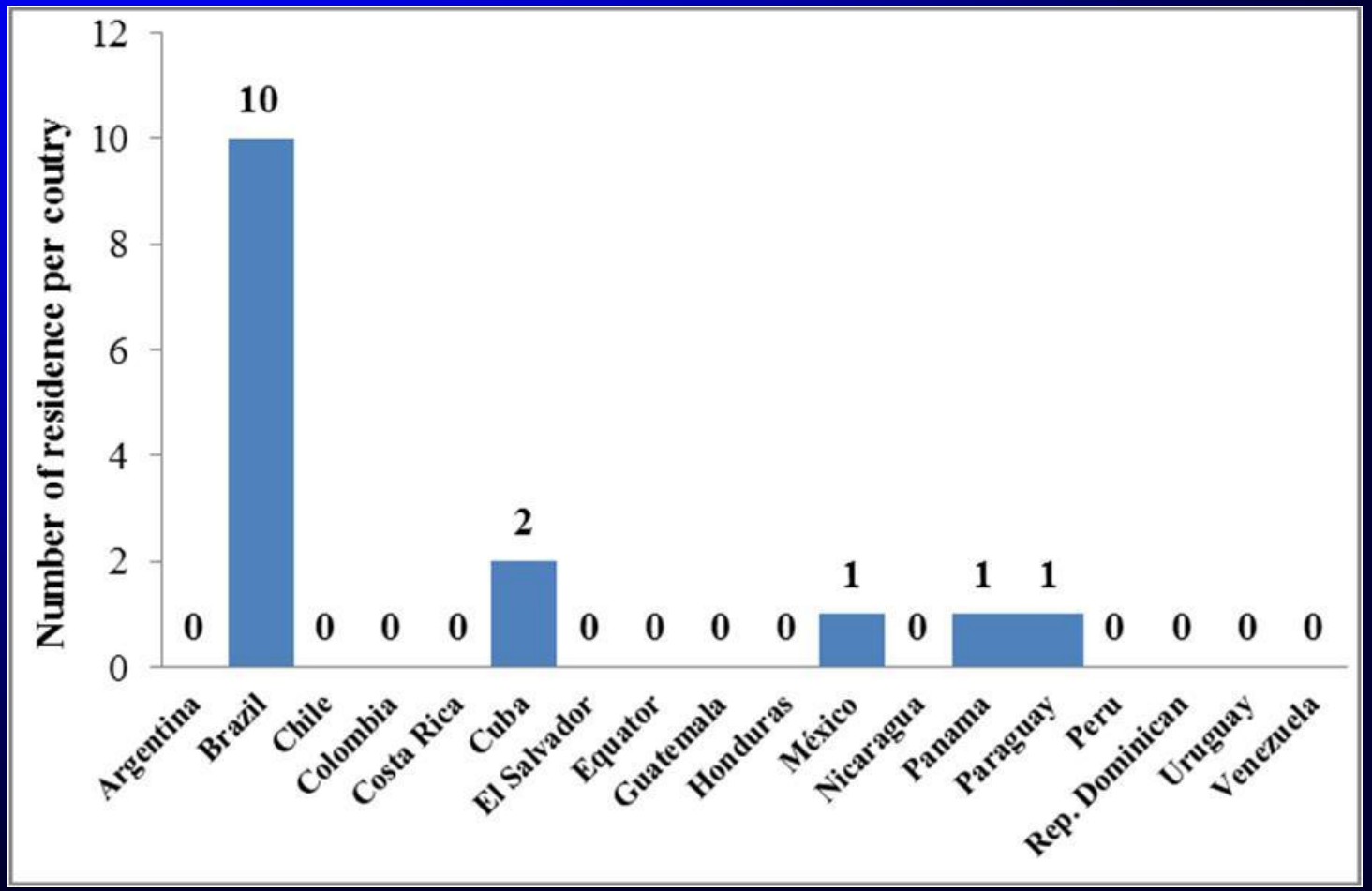
MP courses/country
Number of residence is too low!



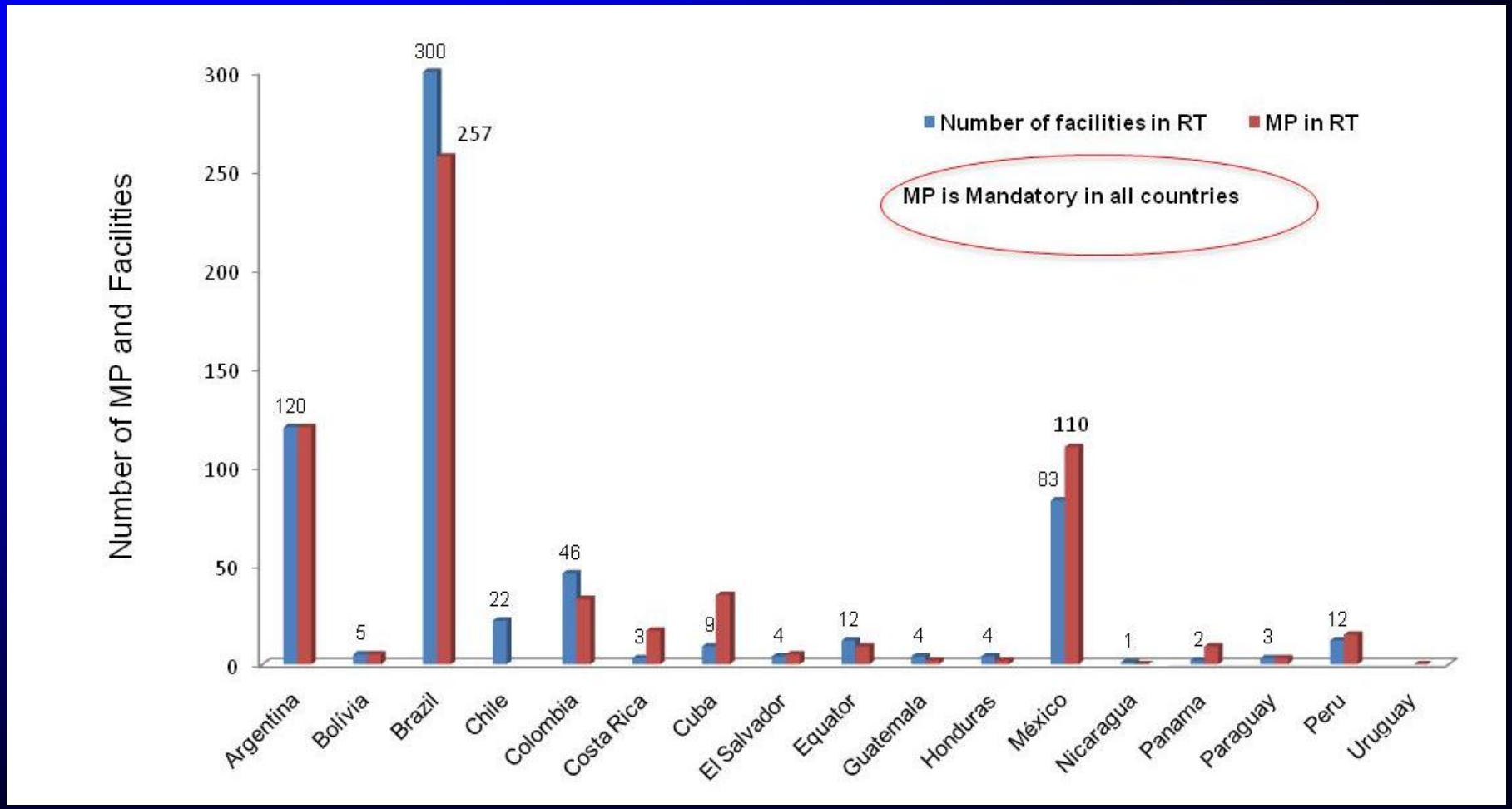
MP Postgraduate course/country



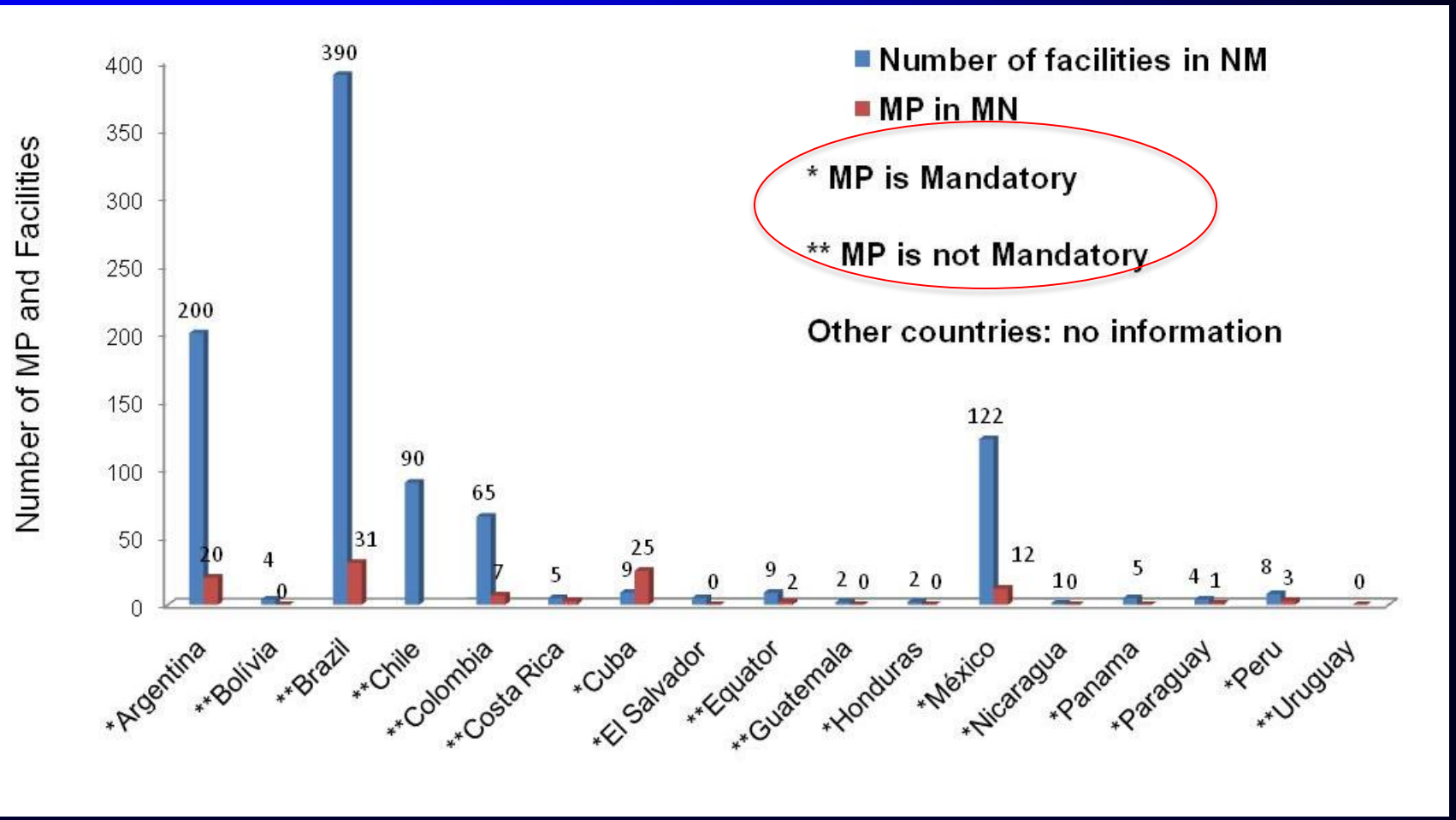
Hospitals and clinics that provide practical clinical training in MP



MP and facilities in RT/country.



MP and facilities in NM/country.



RX equipment and MP/country

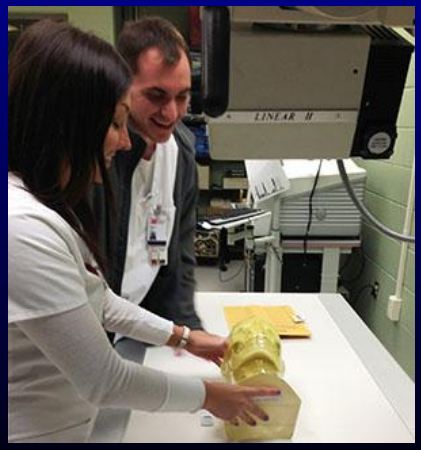
Country	Number of equipment in DR	MP in DR
Argentina	No data	10
Brazil	160000	63
Chile	10000	0
Colombia	20000	5
Costa Rica	No data	2
Cuba	1200	9
El Salvador	170	0
Equator	3000	0
Guatemala	12	0
Honduras	12	0
México	16000	27
Nicaragua	120	0
Panama	-	1
Paraguay	1309	3
Peru	-	0
Uruguay		0

No databank updated, realistic and reliable information

Conclusion

- In order to maximize the benefits of the new technologies in imaging diagnostic and intervention it is essential to have a multidisciplinary staff which work together to improve the health care.

- Strengthening the collaboration and sharing knowledge and experience with a multidisciplinary staff can make positive difference for patients, public and professionals.



Conclusion

- MP are highly qualified health professionals that work to ensure the quality of the procedures while minimizing risks associated with radiation. Raising awareness of Medical Physics profession is of great importance to society in general. (IOMP, 2013)
- The technologies is changing, we also have to change and be prepared…

For all Radiologist…….

- **You all received a precious gift, one special perception and ability …**
  - *The possibility to identify and to classify an information (even hidden) in a clinical image which make the difference in patients lives*
  - *And you share with us in your routine, providing for us our diagnostic and treatment*
  - *The knowledge and the experience we all now that is fundamental, however is your work carried out deeply with the heart and the soul that make you all very special for us…..*
  - *Thank you so much*