Radiation Doses in Over 50 Developing Countries of Asia, Africa, Eastern European and Latin America

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We are all interested in making a difference in developing countries

Assumption

Feeling of lack of
- Persons with dosimetry skills (Medical Physicist)
- Dosimetry tools

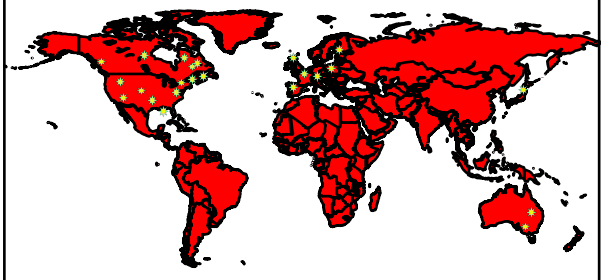
- **Equipment having dose display??**
- **Professionals perhaps not knowing what dose quantities mean**
- **Doses to patients might be several times higher?**

How to meet these challenges?

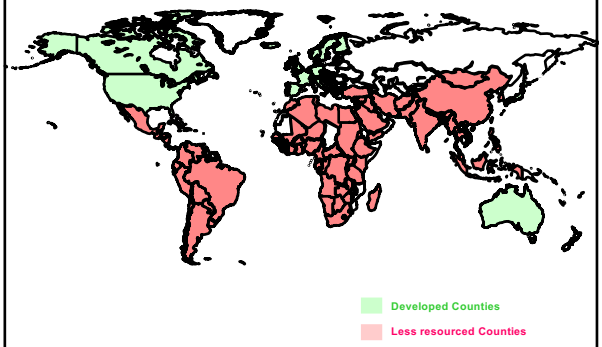
How to meet these challenges?

- **Training**
- **After several training events, do I know the situation better?**
- **Have I made a difference in patient safety?**
- **Was the money spent on training worth?**
- **Experts/trainers: Lose contact or at the most have contact with person for his/her visit**

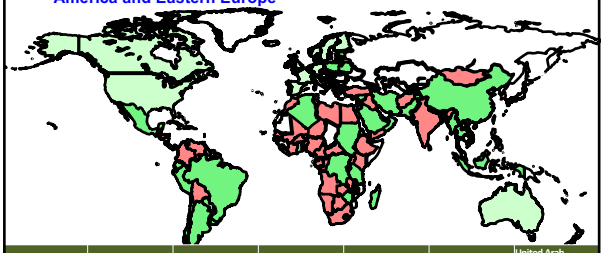
2001 Situation of patient doses & optimization in radiological imaging



Arbitrary indicative map



Now: Published data from 52 less resourced countries, on patient doses in radiologic examinations in Asia, Africa, Latin America and Eastern Europe



Algeria	China	FYR Macedonia	Madagascar	Oman	Singapore	United Arab Emirates
Argentina	Costa Rica	Ghana	Malaysia	Pakistan	Slovakia	Uruguay
Armenia	Croatia	Indonesia	Malta	Paraguay	Slovenia	Zimbabwe
Belarus	Cuba	Iran	Mexico	Peru	Sri Lanka	
Bosnia and Herzegovina	Czech Republic	Israel	Moldova	Poland	Sudan	
Brazil	Dem. Rep. of Congo	Kuwait	Montenegro	Qatar	Syria	
Bulgaria	Ecuador	Lebanon	Myanmar	Saudi Arabia	Tanzania	
Chile	Estonia	Lithuania	Nicaragua	Serbia	Thailand	

AJR FOCUS ON:

IAEA Survey of Pediatric CT Practice in 40 Countries in Asia, Europe, Latin America, and Africa: Part 1, Frequency and Appropriateness

Jenia Vassileva[1]
Madan M. Rehani[2]
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OBJECTIVE. The purpose of this study was to assess the frequency of pediatric CT in 40 less-resourced countries and to determine the level of appropriateness in CT use.
MATERIALS AND METHODS. Data on the increase in the number of CT examinations during 2007 and 2009 and appropriate use of CT examinations were collected, using standard forms, from 146 CT facilities at 126 hospitals.

Eur Radiol
DOI 10.1007/s00330-012-2639-3

First time ever

COMPUTED TOMOGRAPHY

IAEA survey of paediatric computed tomography practice in 40 countries in Asia, Europe, Latin America and Africa: procedures and protocols

Largest International survey of practice of pediatric CT

Jenia Vassileva · Madan M. Rehani · Kimberly Applegate · Nada A. Ahmed · Humoud Al-Dhuhli · Huda M. Al-Naemi

40 countries that have participated

Algeria, Armenia, Belarus, Bosnia & Herz. Brazil, Bulgaria, China, Costa Rica, Croatia, Czech Republic, Estonia, Indonesia,	Iran, Israel, Kuwait, Lebanon, Lithuania, Malaysia, Malta, Mexico, Montenegro, Moldova, Myanmar,	Oman, Pakistan, Paraguay, Peru, Poland, Qatar, Serbia, Singapore, Slovakia, Slovenia, Sri Lanka	Sudan, Syria, Tanzania, Thailand, The Former Yugoslavia Republic (FYR) of Macedonia, United Arab Emirates UAE .

Less resourced countries

Full list of Authors

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Tadeusz Bieganski[11]
Simone Dias[12]
Leila El-Nachef[13]
Dario Faj[14]
Mirtha E. Gamarra-Sánchez[15]
Juan Garcia-Aguilar[16]
Ľubka Gbelcová[17]
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Eduard Gershkevitsh[19]
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Mohammad Hassan Kharita[24]
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Nadia Khelassi-Toutaoui[26]
Hamid Reza Khosravi[27]
Helen Khoury[28]
Desislava Kostova-Lefterova[1]
Ivana Kralik[29]
Lantao Liu[30]
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Radiation Protection Dosimetry Advance Access published February 11, 2010

Radiation Protection Dosimetry (2010), pp. 1–10 doi:10.1093/rpd/ncq015

PAEDIATRIC CT EXAMINATIONS IN 19 DEVELOPING COUNTRIES: FREQUENCY AND RADIATION DOSE

W. E. Muhogora[1], N. A. Ahmed[2], J. S. AlSuwaidi[3], A. Beganovic[4], O. Ciraj-Bjelac[5], V. Gershan[6], E. Gershkevitsh[7], E. Grupetta[8], M. H. Kharita[9], N. Manatrakul[10], B. Maroufi[11], M. Milakovic[12], K. Ohno[13], L. Ben Omrane[14], J. Ptacek[15], C. Schandorf[16], M. S. Shaaban[17], N. Toutaoui[18], D. Sakkas[19], J. S. Wambani[20] and M. M. Rehani[21,*]
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Outcomes

- **Imparting dosimetry skills**
- **Awareness about international system of patient dosimetry**
- **Exposing colleagues to publishing in indexed journals**

Will ball keep rolling?

Radiat Prot Dosimetry. 2015 Jul;165(1-4):91-4. doi: 10.1093/rpd/ncv109. Epub 2015 Apr 1.

Establishment of diagnostic reference levels in computed tomography for paediatric patients in Sudan: a pilot study.

Suliman A[1].

Author information

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Author information

[1]Faculté des Sciences, Université Mohammed V-Agdal, Rabat, Morocco.

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Patient doses using multidetector computed tomography scanners in Kenya.

Korir GK[1], Wambani JS, Korir IK.

Author information

[1]Department of Physics and Applied Physics, University of Massachusetts Lowell, One University Ave., Lowell, MA 01854 chumo2009@gmail.com

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Radiation dose and radiation protection principle awareness: a survey among Nigerian paediatricians.

Famurewa OC[1], Obiajunwa PO, Elusiyan JB, Ibitoye BO.

Author information

[1]Department of Radiology, College of Health Sciences, Obafemi Awolowo University, Ile- Ife Nigeria.

Computed tomography dose index for head CT in northern Nigeria.

Garba I[1], Engel-Hills P[2], Davidson F[2], Tabari AM[3].

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Examination frequency and population dose from medical X-ray examinations in Sudan in 2010.

Suliman II[1], Ibraheem SB[2], Youssif BE[2], Abdelgabar MI[3], Gafar R[2], Elshiekh E[2], Ahmed NA[2], Suleiman A[4].

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[4]Radiology and Medical Imaging Department, College of Applied Medical Sciences, Prince Sattam bin Abdulaziz University, PO Box 422, Alkharj 11943, Saudi Arabia.

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Ofori EK[1], Antwi WK, Scutt DN, Ward M.

Author information

[1]Department of Radiography, School of Allied Health Sciences, College of Health Sciences, University of Ghana, Korle-Bu-Accra, Ghana. erikof2001@yahoo.co.uk

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Entrance surface dose measurement in pediatric patients undergoing common diagnostic x-ray examinations in black lion and Yekatit 12 Hospital Addis Ababa, Ethiopia.

Teferi S[1], Admassie D, Abate T, Rao AD.

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[1]Addis Ababa University, Faculty of Medicine, Department of Radiology, Seife Teferi. seifeteferi@yahoo.com

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Moifo B[1], Kamgnie MN[2], Fointama NF[2], Tambe J[2], Tebere H[2], Fotsin JG[1].

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National diagnostic reference level initiative for computed tomography examinations in Kenya.

Korir GK[1], Wambani JS[2], Korir IK[3], Tries MA[4], Boen PK[2].

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[1]New York City Department of Health and Mental Hygiene, Office of Radiological Health, 42-09 28th Street, Long Island City, N chumo2009@gmail.com.
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[4]Department of Physics and Applied Physics, University of Massachusetts Lowell, One University Avenue, Lowell, MA, USA.

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Radiation doses from some common paediatric X-ray examinations in Sudan.

Suliman II[1], Elshiekh EH.

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[1]Radiation Safety Institute, Sudan Atomic Energy Commission, Khartoum, Sudan. i.i.suliman@gmail.com

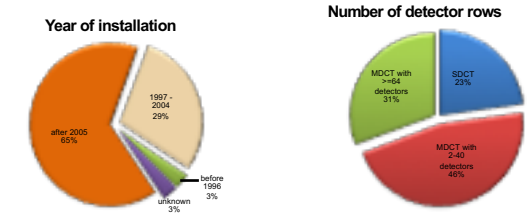
- **There are many more countries and many more publications**
- **Most publications after 2010**
- **Hundreds of presentation of results in conferences**

Glimpse of Results on Pediatric CT

- **About 20 Tables**
- **3 Figures**
- **Supplementary data with 6 Tables**

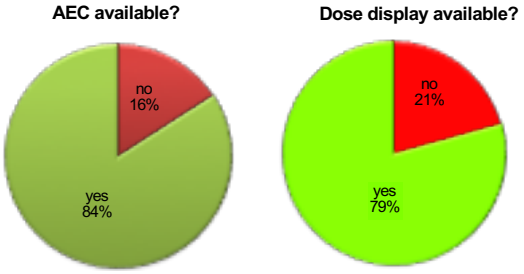
IAEA Survey in 40 countries

CT equipment



IAEA Survey in 40 countries

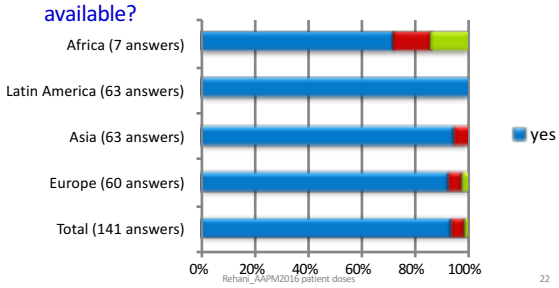
- CT equipment



IAEA Survey in 40 countries

- **141 radiolographers/ technologists answered**

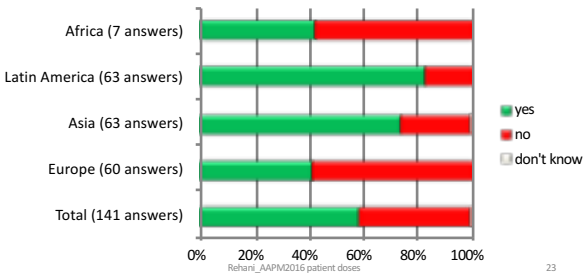
Dedicated scanning protocols for pediatric examinations available?



IAEA Survey in 40 countries

- **141 radiolographers/ technologists answered**

Indication based protocols available?

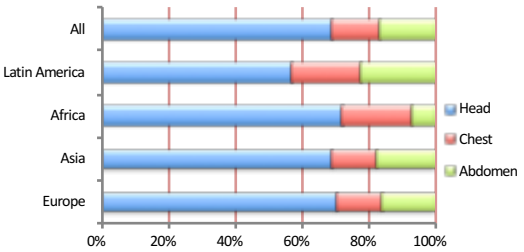


Message

1. **Technology in use is largely modern at least in main centers**

Frequency of pediatric CT exams

Large variation in Frequency (% of pediatric CTs vs total)



Frequency of pediatric CT exams

95 CT facilities in 28 countries

Region	Number of CT facilities	Frequency of pediatric examinations in 2007 (%)		Frequency of pediatric examinations in 2009 (%)	
		mean	range	mean	range
Europe	30	4.6	0.1 – 18.2	4.3	0.2 – 26.8
Asia	57	9.4	0.1 – 29.0	12.2	0.1 – 49.4
Latin America	1	-	-	-	-
Africa	7	9.6	4.2 – 19.7	7.8	2.2 – 18.2
All countries	95	7.5	0.1 – 29.0	9.0	0.1 – 49.4

Message

1. Technology in use is largely modern
2. Trend of increasing CT in children in less resourced countries. As compared to E Europe, frequency in Asia & Africa is higher (2-3 times)

Finding on CTDI values

The **ratio of maximum to minimum CT dose** ($CTDI_{vol}$) values varied between

- 15 for abdomen CT in the age group 5–10 years
- **up to 100** for chest CT in the age group <1 year
- You know only when you do it
- Feedback provided

Typical exposure parameters

- In 8.2% of the scanners CTDI values for pediatric patients were higher than for adults in at least one age group and one examination.
- In 40% facilities the scanning protocols were not adapted to the body size.
- In 13% of them the same protocol was used for all age groups.

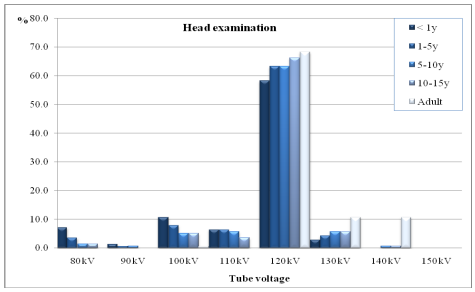
Quick snapshot of findings

- **Modern MDCT available in 77%**
- **Dedicated CT protocols in 94%**
- **Protocols for some age groups not available 50%**
- **Indication based protocols used in 57%**
- **$CTDI_{vol}$ for head, chest in some facilities 2-5 times adults**
- **Up to 100 times variation in radiation dose**

IAEA Survey in 40 countries

Most commonly used kVp=**120**

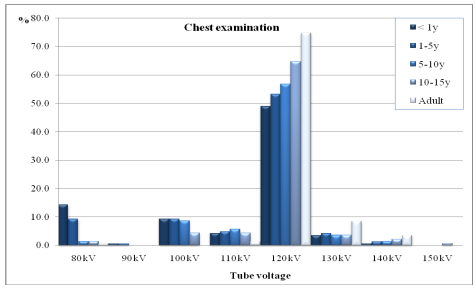
- Head CT



IAEA Survey in 40 countries

Most commonly used kVp=120

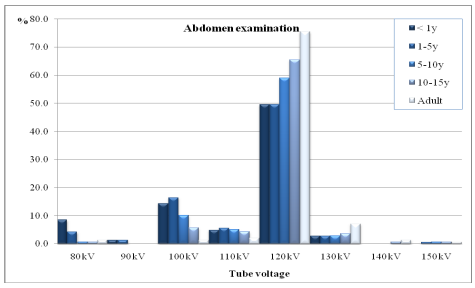
Chest CT



IAEA Survey in 40 countries

Most commonly used kVp=120

Abdomen CT



RESULTS: Typical exposure parameters

$CTDI_{vol}$ – Head examination

		< 1y	1-5y	5-10y	10-15y	Adult
CTDIvol (mGy)	min	2.3	2.7	5.0	14.5	4.5
	max	97	115	159	250	280
	average	25	33	41	52	67
	median	23	30	36	42	59
	3d quarter	29	38	48	59	75
DRL in $CTDI_{vol}$ (mGy)	UK, 2005	30	45	50	-	65
	Switzerland, 2008	20	30	40	60	
	Germany, 2007	33	40	50	60	
	France, 2009	30	40	50	-	

RESULTS: Typical exposure parameters

$CTDI_{vol}$ – Chest examination

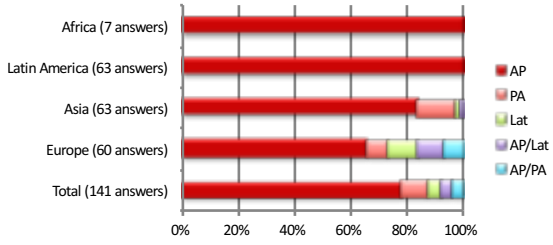
		< 1y	1-5y	5-10y	10-15y	Adult
CTDIvol (mGy)	min	0.4	0.5	0.5	0.5	4.7
	max	28.4	21.3	27.4	39.9	39.9
	average	5.2	6.0	7.3	9.9	12.3
	median	3.2	4.3	5.4	7.3	10.5
	3d quarter	6.8	7.3	9.3	13.0	15.5
DRL in $CTDI_{vol}$ (mGy)	UK, 2005	12*	13*	20*	-	-
	Switzerland, 2008	5	8	10	12	-
	Germany, 2007	1.7	2.7	4.3	6.8	-
	France, 2009	3	3.5	5.5	-	-

*DRLs in $CTDI_{vol,16}$

IAEA Survey in 40 countries

- **141 radiolographers/ technologists answered**

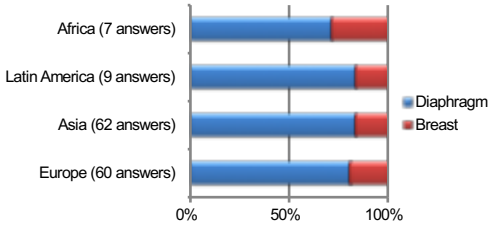
  Scout image for pediatric patient is performed usually in PA or AP projection?



QUESTIONNAIRE - RADIOGRAPHER

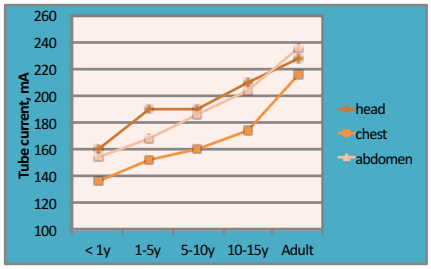
- **138 radiolographers/ technologists answered**

Is typical scout image and CT scan of the pediatric abdomen extend to the breast (B) or to diaphragm (D)?



RESULTS: Typical exposure parameters

Mean values of tube current utilized for head, chest and abdomen exams in function of patient age



Results: Typical exposure parameters

Protocols for **head examination** of infant (<1 y) in 8 CT facilities with the same 64-detector scanner model (Light Speed VCT, GE)

Scanner number	mode	Tube voltage, kV	Tube current, mA	t rot, s	Pitch value	$CTDI_{vol}$, mGy
39	helical	100	100	0.5	0.531	10.36
40	axial	120	125	1	NA	22.19
102	axial	120	240	0.5	NA	21.31
26	helical	100	50-250	0.8	0.531	23.06
29	axial	120/100	200/130	1	NA	24/16
8	axial	80	200	0.8	NA	6
124	axial	120	240	0.5	0.5	21.31
119	helical	120	80	0.6	0.9	10

5-fold variation

Results: Typical exposure parameters

Protocols for **chest examination** of infant (<1 y) in 8 CT facilities with the same 64-detector scanner model (Light Speed VCT, GE)

Scanner number	mode	Tube voltage, kV	Tube current, mA	t rot, s	Pitch value	$CTDI_{vol}$, mGy
39	helical	80	129	0.5	1.3	1.89
40	helical	120	120	0.5	0.984	10.21
102	helical	80	240	0.5	0.984	2.64
26	helical	80	100-250	0.5	0.96	1.2
29	helical	100	180	0.4	0.98	3.2
8	helical	120	80	0.4	1.375	4.5
124	helical	80	25	0.5	0.9	0.71
119	helical	120	80	0.6	0.9	10

14.5-fold variation

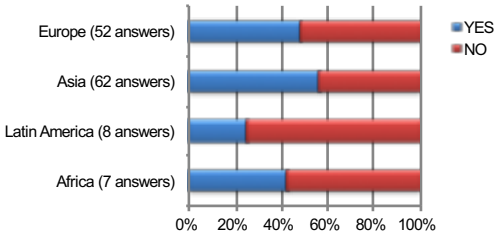
Message

1. Technology in use is largely modern
2. Trend of increasing CT in children in less resourced countries. As compared to E Europe, frequency in Asia & Africa is higher (2-3 times)
3. Situations of higher than necessary exposures are not uncommon (optimization)

QUESTIONNAIRE - RADIOLOGIST

- **129 radiologists answered**

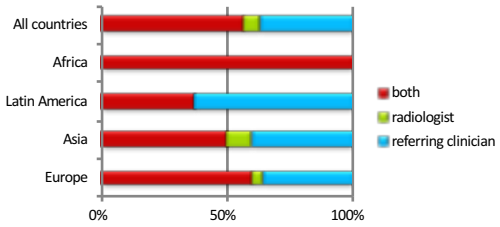
Are written referral guidelines for imaging available in your hospital?



QUESTIONNAIRE - RADIOLOGIST

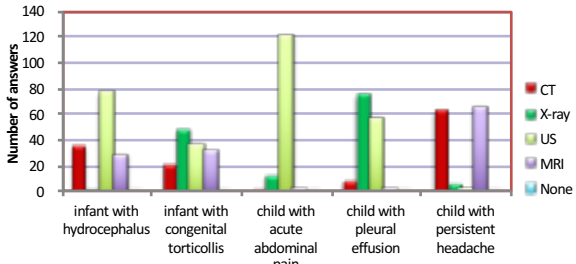
- **129 radiologists answered**

Who decides whether a CT examination of pediatric patient is to be performed?



Appropriateness Issues

Which examination is " the first choice examination" in case of:



Appropriateness Issues

Not according to available guidelines in

- Accidental head trauma, (not in about 50%. Minor trauma and suspected abuse)
- Infants with congenital torticollis;
- Children with possible ventriculo-peritoneal shunt malfunction and
- Young children (<5 years old) with acute sinusitis.
- _____

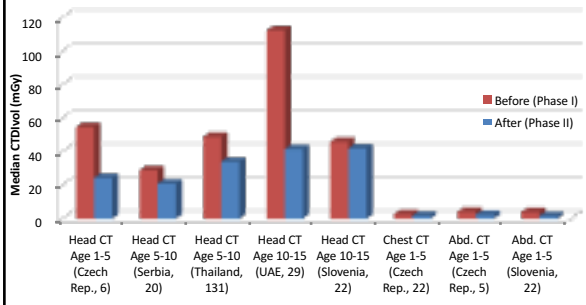
Mostly according to guidelines

- Infant with hydrocephalus (76% use other than CT)
- Child with indication for appendicitis (acute abdominal pain)
- Child with persistent headache

Message

1. Technology in use is largely modern
2. As compared to E Europe, frequency in Asia & Africa is higher (2-3 times)
3. Situations of higher than necessary exposures are not uncommon (optimization)
4. Detected situations where there is lack of appropriateness (Justification)

Impact of optimization



Message

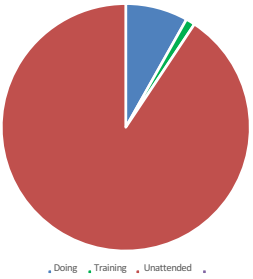
1. Technology in use is largely modern
2. Trend of increasing CT in children in less resourced countries. As compared to E Europe, frequency in Asia & Africa is higher (2-3 times)
3. Situations of higher than necessary exposures are not uncommon (optimization)
4. Detected situations where CT use is not in accordance with guidelines (Justification)
5. Improvements after feedback

Recap

- We know how things are
- We have provided feedback to help in improvement
- Documented improvements in some cases
- Believe that ball is set rolling and will continue
- Publications in recent years indicate that ball continues to roll

Our inputs

- Costs not higher than previous years
- Rest all actions by email (2-5hrs)
- Providing framework and Forms for data collection, mentoring and feedback on data received, updates on data, analysis and publishing of multi-national papers
- Motivation:
  - Being part of international group

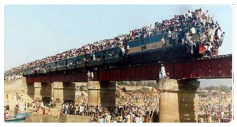


Global Scenario

United Nations Scientific Committee on Effects of Atomic Radiation (UNSCEAR) 2010

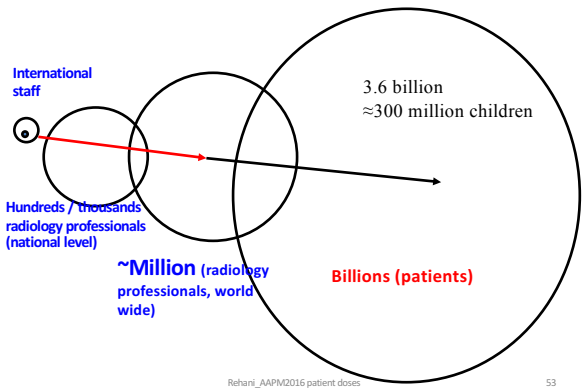
- 3.6 billion medical X ray procedures/year
- About 35 million nuclear medicine examinations
- About 5 million patients radiotherapy treatments

Making a difference



Challenge!!!!!

Medical Radiation Protection



Networks as effective tool

Information for
Health Professionals
Member States
Patients

Member Area
• Member States Area
• Drafts Management Area

Social Media

Home > Children

Networks on Radiation Protection of Children

Introduction

Children have higher radiation sensitivity than adults and have a longer life expectancy. Recently raised concerns about repeated and unnecessary use of relatively high dose examinations, such as CT in children, require specific focus. A number of studies have demonstrated that there is scope for strengthening justification and optimization of these procedures.

Based upon experience gained through the Asian Network of Cardiologists in Radiation Protection and Network of Gastroenterologists in Radiation Protection the IAEA has now established networks for Radiation Protection of Children in different regions. The Asian Network on Radiation Protection of Children was established in a meeting held in Bangkok from 15 to 17 December 2010, while a European network was initiated in Varna, Bulgaria, during a meeting held from 30 August to 1 September 2010.

The Alliance for Radiation Safety in Paediatric Imaging, Image Gently, is cooperating with the IAEA in this activity. The two organizations support each other's efforts to enhance radiation safety of children.

Radiation Protection of Children
(Asian Network under IAEA project RAS9055)

Newsletter
Issue No. 1
February 2011

Mission: To promote a rational and safe practice of medical radiation exposure in children

Radiation Protection of Children
(Asian Network under IAEA project RAS9055)

Newsletter
Issue No. 3
March 2012

Mission: To promote a rational and safe practice of medical radiation exposure in children

From the Editor's Desk

Harvey Teo, MBBS, FRCR
Deputy Head of Department of Diagnostic and Interventional Imaging
KK Women's and Children's Hospital, Singapore
(eteo66@yahoo.com)

Dear Colleagues,

The aim of this newsletter is to increase awareness of the problem of unnecessary radiation exposure in diagnostic radiology in Asia. It also serves to help us keep abreast of the latest techniques that help us achieve ALARA in our procedures. We can also help by distributing this newsletter to all staff in our departments as well as to interested parties within our countries such as our National Radiological societies.

Radiation protection is still a somewhat unglamorous topic as many radiologists would rather attend lectures on imaging topics pertaining to their specialty. I noticed this when I attended the International Pediatric Radiology conference held in London in June 2011. I attended a lecture on the imaging of congenital lung lesions which was full of thereof) of bismuth shields in this issue will be useful for our readers.

This newsletter has great contributions from Prof. Marilyn Goske, Dr. Panruethai Trinavarat and Dr. Anchali Krisanachinda from Thailand as well as Ms Esti Shelly from Israel informing us on the latest radiation protection initiatives in their respective countries. Finally we would like to thank Dr Madan Rehani from the IAEA for his support, guidance and advice on radiation protection.

Message of Chair, Image Gently

Marilyn J. Goske, MD
Professor, Cincinnati Children, Cincinnati, USA
(Marilyn.Goske@cchmc.org)

"Child-sizing" radiation exposure for pediatric CT scans

As medical radiation from CT scans is significantly higher that routine radiographs and the number of CT scans is increasing, it is important for radiologists, radiographers and medical physicists to be very thoughtful when selecting CT technique (mAs, kVp) and using their equipment properly when

AJR August 2009

Angioplasty

Virginia Tsapaki[1]
Nada A. Ahmed[2]
Jamila Salem AlSuwaidi[3]
Adnan Beganovic[4]
Abdelkader Benider[5]
Latifa BenOmrane[6]
Rada Borisova[7]
Sotirios Economides[8]
Leila El-Nachef[9]
Dario Faj[10]
Ashot Hovhannesyan[11]
Mohammad Hassan Kharita[12]
Nadia Khelassi-Toutaoui[13]
Nisakorn Manatrakul[14]
Ilkhom Mirsaidov[15]
Mohamed Shaaban[16]
Ion Ursulean[17]
Jeska Sidika Wambani[18]
Areesha Zaman[19]
Julius Ziliukas[20]
Dejan Žontar[21]
Madan M. Rehani[22]

Radiation Exposure to Patients During Interventional Procedures in 20 Countries: Initial IAEA Project Results

OBJECTIVE. The purpose of our study was to investigate the level of radiation protection of patients and staff during interventional procedures in 20 countries of Africa, Asia, and Europe.

SUBJECTS AND METHODS. In a multinational prospective study, information on radiation protection tools, peak skin dose (PSD), and kerma–area product (KAP) was provided by 55 hospitals in 20 mainly developing countries (nine mostly in Eastern Europe, five in Africa, and six in Asia).

RESULTS. Nearly 40% of the interventional rooms had an annual workload of more than 2,000 patients. It is remarkable that the workload of pediatric interventional procedures can reach the levels of adult procedures even in developing countries. About 30% of participating countries have shown a 100% increase in workload in 3 years. Lead aprons are used in all participating rooms. Even though KAP was available in almost half of the facilities, none had experience in its use. One hundred of 505 patients monitored for PSD (20%) were above the 2-Gy threshold for deterministic effects.

CONCLUSION. Interventional procedures are increasing in developing countries, not only for adults but also for pediatric patients. The situation with respect to staff protection is considered generally acceptable, but this is not the case for patient protection. Many patients exceeded the dose threshold for erythema. A substantial number (62%) of percutaneous transluminal coronary angioplasty procedures performed in developing countries in this study are above the currently known dose reference level and thus could be optimized. Therefore, this study has significance in introducing the concept of patient dose estimation and dose management.

Keywords: developing countries, IAEA activities, interventional procedures, patient safety, percutaneous transluminal coronary angioplasty (PTCA), radiation exposure, radiation safety, staff safety

DOI:10.2214/AJR.08.2115

increasingly, interventional procedures are being performed us-

One of the most important factors in such cases is that doctors with no or minimal

Mammography

European Journal of Radiology

journal homepage: www.elsevier.com/locate/ejrad

Image quality and dose in mammography in 17 countries in Africa, Asia and Eastern Europe: Results from IAEA projects

Olivera Ciraj-Bjelac[a,1], Simona Avramova-Cholakova[b,2], Adnan Beganovic[c,3], Sotirios Economides[d,4], Dario Faj[e,5], Vesna Gershan[f,6], Edward Grupetta[g,7], M.H. Kharita[h,8], Milomir Milakovic[i,9], Constantin Milu[j,10], Wilbroad E. Muhogora[k,11], Piruthavany Muthuvelu[l,12], Samuel Ola[m,13], Saeid Setayeshi[n,14], Cyril Schandorf[o,15], Ion Ursulean[p,16], Ivan R. Videnovic[q,17], Areesha Zaman[r,18], Julius Ziliukas[s,19], Madan M. Rehani[t,*]

European Journal of Radiology
Article in Press, Corrected Proof – Note to users

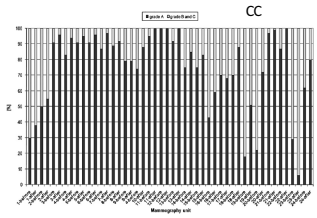
doi:10.1016/j.ejrad.2011.03.076 | How to Cite or Link Using DOI
Permissions & Reprints

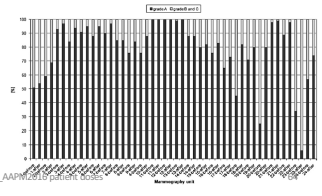
Radiation protection of patients in diagnostic radiology: Status of practice in five Eastern-European countries, based on IAEA project

Olivera Ciraj-Bjelac[a, 1], Adnan Beganovic[b, 2], Dario Faj[c, 3], Vesna Gershan[d, 4], Sonja Ivanovic[e, 5], Ivan R. Videnovic[f, 6] and Madan M. Rehani[g]

Image quality improvement

- Image quality improved by:
  - ***9 percentage for CC***
  - ***7 percentage points for MLO***
- Range: from a few percentage points to **more than 50 percentage points** in participating centres





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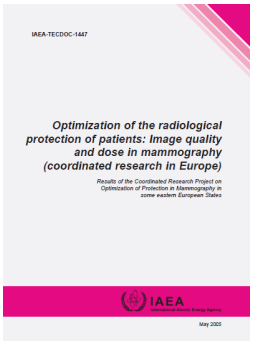

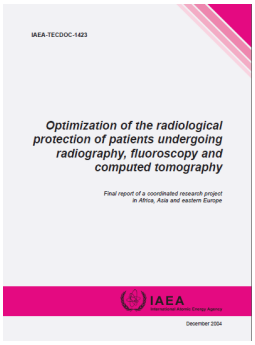

Europe (19 countries)

Country	CT	Interventional	Radiography	Mammography
Armenia	√	√	√	
Belarus	√			
Bosnia and Herzegovina	√	√	√	√
Bulgaria	√	√		√
Croatia	√	√	√	√
Cyprus	√			
Estonia	√			
FYROM	√		√	√
Greece		√		√
Czech Republic	√			
Lithuania	√	√		√
Malta	√			√
Moldova	√	√		√
Montenegro	√		√	
Romania				√
Poland	√			
Serbia	√		√	√
Slovakia	√			
Slovenia	√	√		

Africa

Country	CT	Interventional	Radiography	Mammography
Algeria	√	√		
Ghana	√		√	√
Congo			√	
Morocco	√	√		
Sudan	√	√	√	
Kenya	√	√		
Madagascar			√	
Tanzania	√		√	√
Tunisia	√	√		
Uganda				√
Zimbabwe			√	

Middle East

Country	CT	Interventional	Radiography	Mammography
Israel	√			
Kuwait	√	√		
Lebanon	√	√		
Oman	√			
Iran	√		√	√
Qatar	√			
Saudi Arabia			√	
Syria	√	√		√
UAE	√	√	√	

Asia

Country	CT	Interventional	Radiography	Mammography
Bangladesh			√	
China	√			
Indonesia	√			
Japan	√			
Malaysia	√			√
Myanmar	√			
Pakistan	√	√		√
Singapore	√			
Sri Lanka	√			
Thailand	√	√	√	
Tajikistan		√		

Latin America

Country	CT	Interventional	Radiography	Mammography
Brazil	√			
Costa Rica	√			
Mexico	√			
Paraguay	√			
Peru	√			

Doing more where need is more

Interventional Cardiologists

Radiation Protection (RP) survey	Vienna 2004 (25 countries)	Singapore 2005 (8 countries)	Ethiopia 2006 (9 countries)	Iran 2006 (6)	Bangkok 2006 (8 countries)
Is this 1st time you are attending a structured program on RP. Ans. Yes	88%	84%	93%	100%	93%
Any cardiologists conference you attended where there was lecture on RP. Ans. No	85%	100%	100%	100%	100%
Do you measure radiation dose to patient. Ans. No	96%	100%	87%	89%	71%

San Jose 2007 (11 countries of Latin-America)
Yerevan 2008 (7 countries of Eastern Europe)
Manila 2009 (8 countries)

Our Cardiologists trainers in Radiation Protection


Singapore


Tunisia


Thailand


Uruguay

They are ALL interventional cardiologists

Radiation Protection Dosimetry Advance Access published July 7, 2011

Radiation Protection Dosimetry (2011), pp. 1–5 doi:10.1093/rpd/ncr257

SKIN INJURIES IN INTERVENTIONAL PROCEDURES

Madan M. Rehani[1,*] and Suphot Srimahachota[2]
[1]Radiation Protection of Patients Unit, International Atomic Energy Agency, PO Box-100, A 1400 Vienna, Austria
[2]Division of Cardiology, Department of Medicine, King Chulalongkorn Memorial Hospital, Bangkok, Thailand

*Corresponding author: m.rehani@iaea.org; madan.rehani@gmail.com

Rehani & Srimahachota 2011

SKIN INJURIES IN INTERVENTIONAL PROCEDURES

e 1. Skin injury in a patient with chronic total occlusion: a) 2 mths, b) 6 mths, c) 8 mths after last PCI, and d) after the flap surgery.

Urologists, Orthopedic surgeons, Gastroenterologists, Gynecologists..

Question regarding Radiation Protection (RP)	Auckland, New Zealand 2006	Dubai, UAE 2007	Sofia, Bulgaria 2008	Montevideo, Uruguay 2008
Is this 1st time you are attending a structured program on RP. Answer: Yes	100 %	100%	100%	95%
Any conference you attended where there was lecture on RP. Answer: No	100%	87%	100%	100%
Do you measure radiation dose to patient. Answer: No	100%	95%	89%	95%
Do you use badge to monitor your personal exposure. Answer: Yes	20%	9%	78%	47%
Was this course relevant to you (highly relevant)	100% (80%)	100 % (75%)	100 % (88%)	100 % (96%)

Year	Place	Participation of Doctor(s) from countries
2006	Auckland, New Zealand	Bangladesh, China, India, Malaysia, Pakistan, Thailand, Vietnam
2007	Dubai, UAE	Bangladesh, Iran, Jordan, Lebanon, Mongolia, Pakistan, Sri Lanka, Thailand, Yemen, UAE
2008	Sofia, Bulgaria	Azerbaijan, Bosnia and Herzegovina, Croatia, Georgia, Kyrgyzstan, Lithuania, Poland, Bulgaria
	Montevideo, Uruguay	Bolivia, Brazil, Chile, Costa Rica, Ecuador, El Salvador, Panama, Paraguay, Peru, Uruguay, Venezuela

Training courses organized

Regional Training courses

Radiation Protection in	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
Diagnostic & Interventional Radiology including workshop on dose management	USA Qatar Finland Ghana* Algeria* Peru	Algeria Kenya Italy	Brazil	Italy Serbia	Cost Rica Italy	Kuwait Thailand	Kuwait	Kenya Kuwait	India Kuwait Slovenia	France Kenya Kuwait Malaysia
Nuclear Medicine						UAE		Saudi Arabia	Turkey	Albania Philippines
Radiotherapy/Prevention of Accidental Exposure in Radiotherapy			Chile		Thailand		Uruguay	Ecuador Malaysia Sudan Turkey	France Guatemala Jordan Korea	Chile Cuba Panama Turkey
Medicine (Trainer's Workshop)			Estonia					Argentina Thailand	Argentina Turkey	Prague
Cardiology	Cuba	Chile	Philippines	Armenia	Cost Rica	Chile Ethiopia Iran Thailand	Singapore	Vienna		
Radiation Protection for non-cardiologists, non-radiologists using Fluoroscopy				Bulgaria Uruguay	UAE	New Zealand				
Hybrid Imaging (PET/CT, SPECT/CT)	Uruguay	Slovenia	Singapore Nicaragua							

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Training of vascular surgeons in radiation protection

In providing radiation protection training, it has been the goal of the IAEA to include various medical specialists, in particular those who traditionally lack prior such training, e.g. vascular surgeons. The first course for these specialists was conducted by the IAEA in December 2012 for specialists from Asian countries. Realizing that vascular surgeons in many countries make extensive use of fluoroscopy but hardly have any training in radiation protection, the second course was organized by the IAEA for specialists from Iraq, Lebanon, Malaysia, Mongolia, Nepal, Oman, Singapore, Thailand and the UAE. The training program is available and training material as developed and made available for a similar group was adapted for this new group.

There is substantial interest among these specialists in getting oriented towards radiation protection. It is recommended that training programs in other parts of the world should also include vascular surgeons. Those interested in organizing such programs are welcome to get in touch with the Contact Point.

European Heart Journal Advance Access published January 8, 2014

European Heart Journal
doi:10.1093/eurheartj/eht394

ESC REPORT

The appropriate and justified use of medical radiation in cardiovascular imaging: a position document of the ESC Associations of Cardiovascular Imaging, Percutaneous Cardiovascular Interventions and Electrophysiology

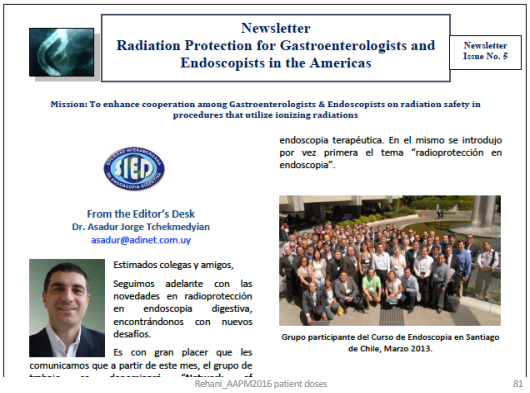
Eugenio Picano[1], Eliseo Vañó[2,3], Madan M. Rehani[4], Alberto Cuocolo[5], Lluis Mont[6], Vicente Bodi[7], Olivier Bar[8], Carlo Maccia[9], Luc Pierard[10], Rosa Sicari[1], Sven Plein[11], Heiko Mahrholdt[12], Patrizio Lancellotti[13], Juhani Knuuti[14], Hein Heidbuchel[15], Carlo Di Mario[16], and Luigi P. Badano[17]*

Radiation Exposure in Gastroenterology: Improving Patient and Staff Protection

Immanuel K.H. Ho, MD, FACG[1], Brooks D. Cash, MD, FACG[2], Henry Cohen, MD, FACG[3], Stephen B. Hanauer, MD, FACG[4], Michelle Inkster, MD, PhD, FACG[5], David A. Johnson, MD, MACG[6], Michael M. Maher, MD, FRCSI, FRCR, FFR(RCSI)[7], Douglas K. Rex, MD, MACG[8], Abdo Saad, MD[9], Ajaypal Singh, MD[9], Madan M. Rehani, PhD, FIOMP, FICNM[9] and Eamonn M. Quigley, MD, FACG[10]

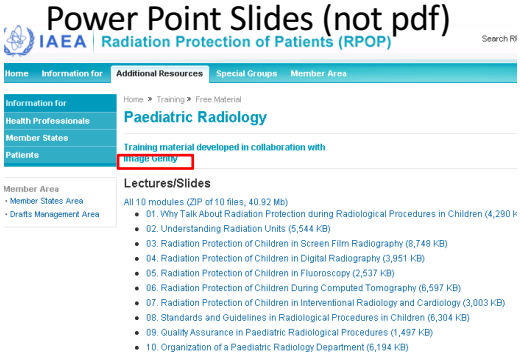
Medical imaging involving the use of ionizing radiation has brought enormous benefits to society and patients. In the past several decades, exposure to medical radiation has increased markedly, driven primarily by the use of computed tomography. Ionizing radiation has been linked to carcinogenesis. Whether low-dose medical radiation exposure will result in the development of malignancy is uncertain. This paper reviews the current evidence for such risk, and aims to inform the gastroenterologist of dosages of radiation associated with commonly ordered procedures and diagnostic tests in clinical practice. The use of medical radiation must always be justified and must enable patients to be exposed at the lowest reasonable dose. Recommendations provided herein for minimizing radiation exposure are based on currently available evidence and Working Party expert consensus.

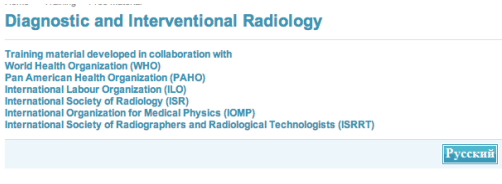
Am J Gastroenterol advance online publication, 20 May 2014; doi:10.1038/ajg.2014.122



In 2001, did we imagine this happening?

Power Point Slides (not pdf)





Home » Training

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- Digital Radiology
- Doctors using fluoroscopy outside radiology (Urologists, Gastroenterologists, Orthopaedic surgeons etc.)

Русский

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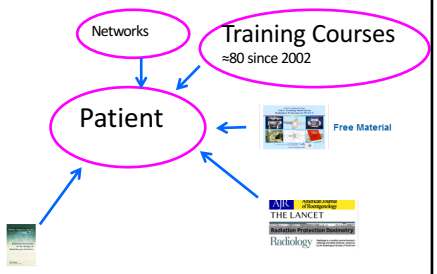
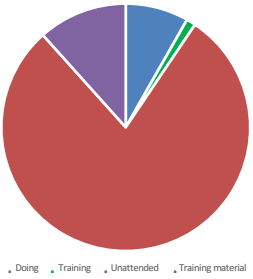
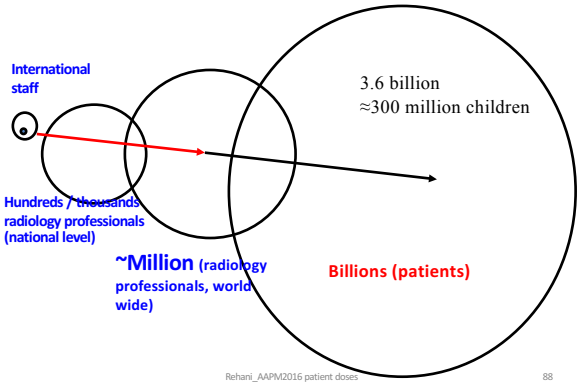
Medical Radiation Protection

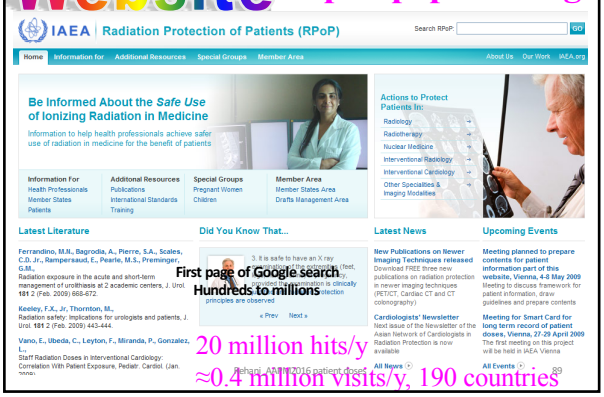




Medical Radiation Protection

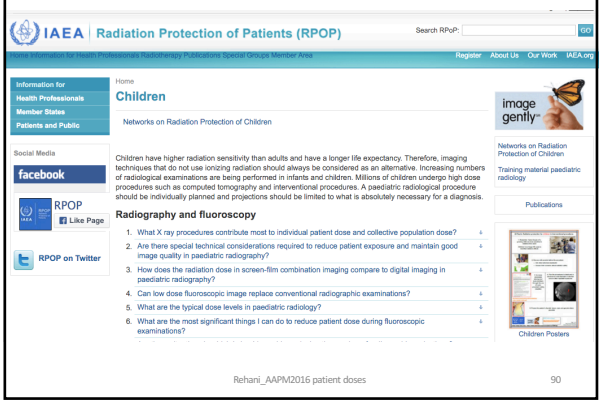


Website http://rpop.iaea.org

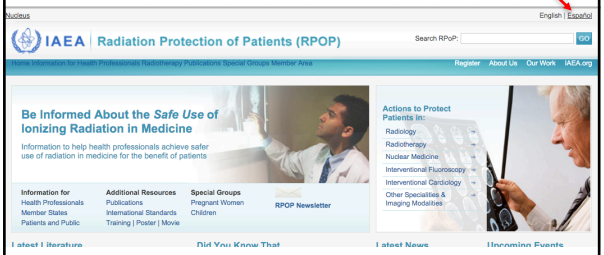


First page of Google search
Hundreds to millions

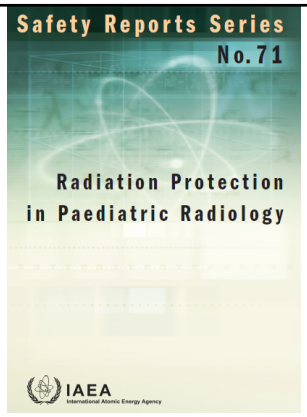
20 million hits/y
≈0.4 million visits/y, 190 countries



Translation

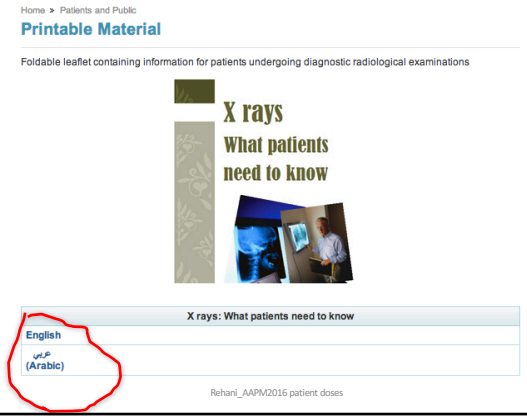


	Country / Territory	Sessions	% Sessions
1.	United States	126,044	26.17%
2.	Spain	33,885	7.04%
3.	Mexico	32,147	6.67%
4.	United Kingdom	31,934	6.63%
5.	Colombia	18,541	3.85%
6.	India	18,266	3.79%
7.	Argentina	14,854	3.08%
8.	Canada	14,781	3.07%
9.	Australia	13,970	2.90%
10.	Chile	11,960	2.48%

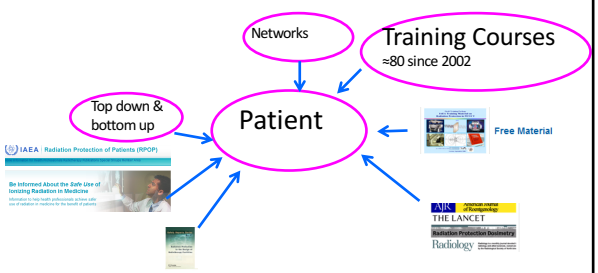


- Available for free download from RPOP website http://rpop.iaea.org

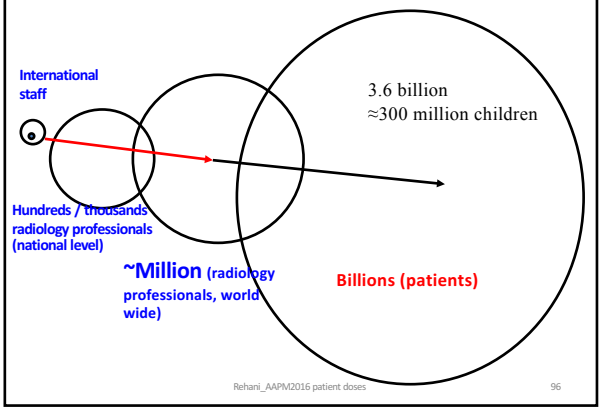
14 Publications in 10 years



Medical Radiation Protection



Medical Radiation Protection



What if Every x-ray machine in the world has a 10 pearls poster?

Posters


Fluoroscopy


Children


Computed Tomography

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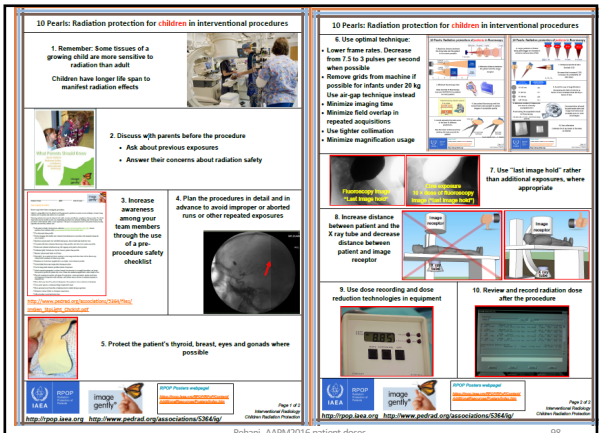

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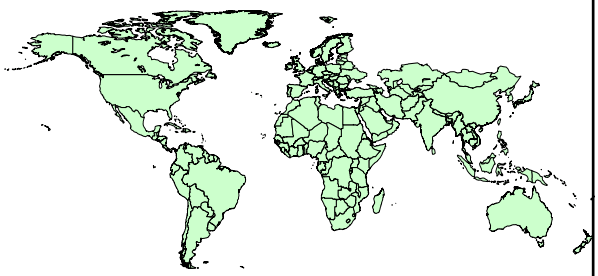
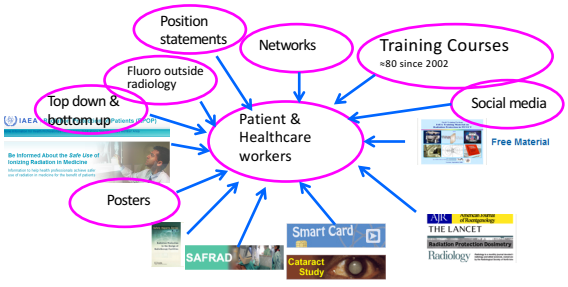
Vision: World map of patient safety situation
Justification, Optimization



Medical Radiation Protection



IAEA- Our FIRSTS

- FIRST to establish a Unit on RPOP
- FIRST, International Action Plan on RPOP
- FIRST, website dedicated to RPOP
- FIRST, free training materials for diverse areas
- FIRST, Networks of Cardiologists, Gastroenterologists, Children
- FIRST, Smart Card project
- FIRST, Reporting system (SAFRAD, SAFRON)

Did we make a difference?

Some participants in projects

Thank You

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