International Perspectives on Radiation Protection

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Atoms for Peace: The First Half Century
1957–2007

Learning Objectives

1. To understand the system of radiation protection in international and national context
2. To become familiar with international action plan on radiation protection of patients
3. To become familiar with international organizations in the area of medical radiation protection
4. To understand the potential role you can play in international activities

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Why International System?

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Good & bad example of international action

Examples in Radiation Protection

- **Global acceptance of concepts and principles of radiation protection as developed by the International Commission on Radiological Protection (ICRP) such as justification, optimization and dose limitation.**
- **Conversely**
  - **dose limits for workers and members of the public, and**
  - **acceptance of SI units e.g. Sv and Gy against rem and rad.**

Radiation Protection of Patients

Universal agreement

- **No dose limits and**
- **Concept of diagnostic reference levels (DRLs) to be used with flexibility.**

International Actions are needed

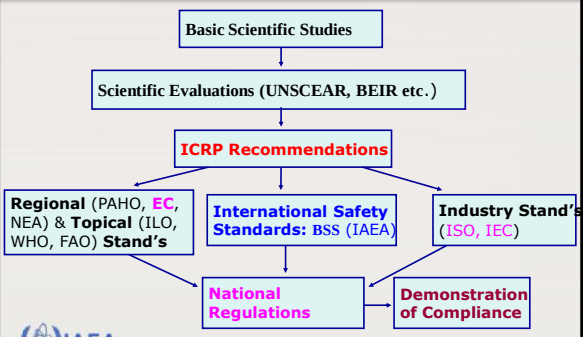
Besides harmonization, to

- Give impetus to some areas (mammography screening, exposure tracking…)
- Raise awareness about emerging issues (breast radio-sensitivity, cataract..)
- Forewarn about upcoming dangers if actions are not initiated well in time.

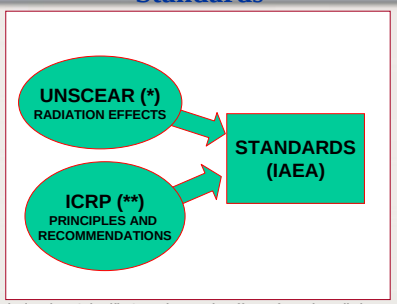
International Actions

- For example, the growing use of computed tomography (CT) and over-exposures in developed country has alerted other countries that they may face the same situation in future years

Organisations in the Cosmic Scheme

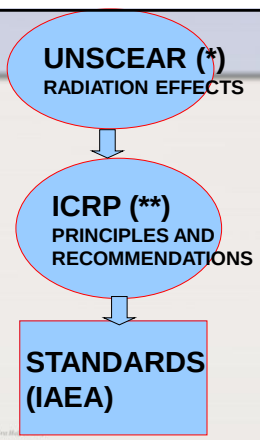


The Basis for the International Safety Standards



(*) United Nations Scientific Committee on the Effects of Atomic Radiation

(**) International Commission on Radiological Protection



A matter of interpretation

What people know MOST

ICRP--- Dose limits

IAEA--- Iran, Iraq actions

UNSCEAR---??

What you think that they do?

ICRP

- Establishes principles of radiation protection
- Provides protection philosophy

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- Has programs for promoting
  - Nuclear medicine, radiotherapy and medical physics
  - Radiation protection of patients

Probably what you wish to know is

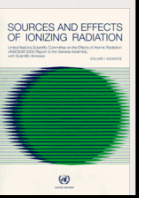
- How International organizations work?
- What are their individual mandates?
- How they cooperate to prepare International system?
- Is international system mandatory for Member States?
- Application of Standards.

UNSCEAR

- UNSCEAR was established by the General Assembly of the United Nations in 1955.
- Its mandate in the United Nations system is to assess and report levels and effects of exposure to ionizing radiation.
- Governments and organizations throughout the world rely on the Committee's estimates as the scientific basis for evaluating radiation risk and for establishing protective measures.

UNSCEAR

- The original committee was composed of senior scientists from 15 designated UN Member States, namely Argentina, Australia, Belgium, Brazil, Canada, Czechoslovakia, Egypt, France, India, Japan, Mexico, Sweden, the UK, the USA and the USSR.
- Currently 21 countries
- Last report 2008
- HQ in Vienna
- Meeting once every year



ICRP	IAEA
Independent Charity	Independent international organisation under UN family
Established to advance for the public benefit the science of Radiological Protection, in particular by providing recommendations and guidance on all aspects of protection against ionising radiation	Pillars: Safety and Security; Science and Technology; and Safeguards and Verification.

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ICRP INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

Main Commission

C1 | C 2 | C 3 | C 4 | C 5

Task Groups (TG)
Working Parties (WP)
Budget: $300,000

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Current Membership

Main Commission

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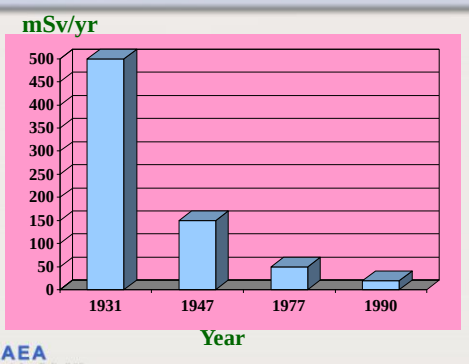
Changes in occupational Dose Limit (ICRP)



Tissue weighting factors

	ICRP 26 (1977)	ICRP 60 (1991)	ICRP 103 (2007)
	W_T	W_T	W_T
Gonads	0.25	0.20	0.08
Breast	0.15	0.05	0.12
Red bone marrow	0.12	0.12	0.12
Lung	0.12	0.12	0.12
Thyroid	0.03	0.05	0.04
Bone surface	0.03	0.01	0.01
Colon	-	0.12	0.12
Stomach	-	0.12	0.12
Bladder	-	0.05	0.04
Oesophagus	-	0.05	0.04
Liver	-	0.05	0.04
Skin	-	0.01	0.01
Brain	-		0.01
Salivary glands	-		0.01
Remainder	0.30*	0.05**	0.12

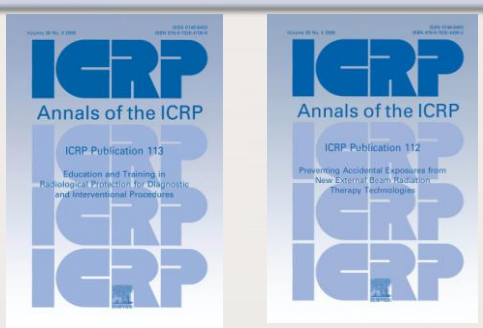
Remainder in Tissue weighting factors

Remainder organs	Stomach, lower large intestine, salivary glands, liver *When the gastrointestinal tract is irradiated, the stomach, small intestine, lower large intestine and upper large intestine are treated as four separate organs and are included in the remainder tissues. With WT = 0.06 each.	Adrenals, brain, upper large intestine, small intestine, kidney, muscle, pancreas, spleen, thymus, uterus **When one of remainder tissues receives an equivalent dose in excess of the highest dose in any of the twelve main organs, a weighting factor of 0.025 should be applied to that tissue and a weighting factor of 0.025 to the average dose in the rest of the remainder	Adrenals, extrathoracic (ET) region, gall bladder, heart, kidney, lymphatic nodes, muscle, oral mucosa, pancreas, prostate (♂), small intestine, spleen, thymus, uterus/cervix (♀)

The Genetic Risk Estimate Is Smaller, But…

Gonad shielding wherever practicable in order to keep doses ALARA !

Recent publications of ICRP



Upcoming Publications of ICRP C3

1. Patient and Staff Radiological Protection in Cardiology
2. Radiological Protection in Fluoroscopically Guided Procedures Performed outside the Imaging Department
3. Radiological protection in paediatric diagnostic and interventional radiology

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- Radiation protection in charged particle radiotherapy

Topics under discussion ICRP C3

- Occupational protection in Brachytherapy
- Justification: Framework on justification on the use of ionizing radiation in medical imaging
- Occupational protection issue in relatively higher exposure situations in interventional procedures
- Radiation protection in cone-beam CT (medical and dental).
- Extending the use of reference levels to interventional radiology
- Protection in PET (PET/CT) and cyclotrons
- Screening with ionising radiation in asymptomatic individual
- Follow up of persons accidentally exposed

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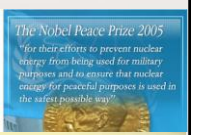
- Headquarter in Vienna
- 2400 staff from> 90 countries
- Director General, 6 Deputy DG, Directors, SH, UH
- €320 million



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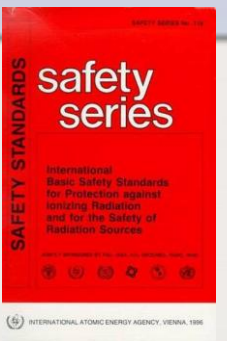
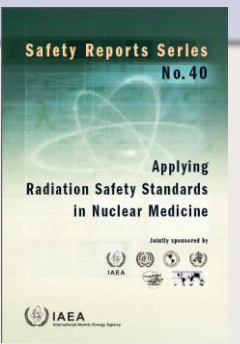
IAEA- Development of Standards

- The IAEA is the world´s center of cooperation in the nuclear field.
- It was set up as the world´s "Atoms for Peace" organization in 1957 within the United Nations family.





http://rpop.iaea.org

Are International Standards Binding?

- No
- But in practice, they tend to for countries seeking IAEA assistance
- National Standards and Regulations are based on BSS

National regulations-developing countries

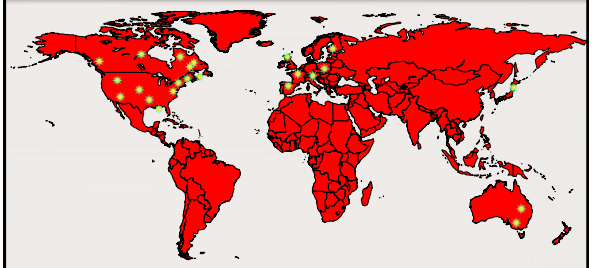
All member states of the IAEA are given full opportunity to participate in process of development and revision of BSS

- Specific aspects of patient protection and then key elements of revision of International systems (IAEA BSS and European BSS). The revised BSS is expected to be agreed this year.

DIRECTION of Work

1. **Assessing how safe are patients in radiological examinations**
2. **Comparing with Standards**
3. **Taking actions where necessary**
4. **Make patients safer**

2001 Radiation doses to Patients in Radiological Imaging



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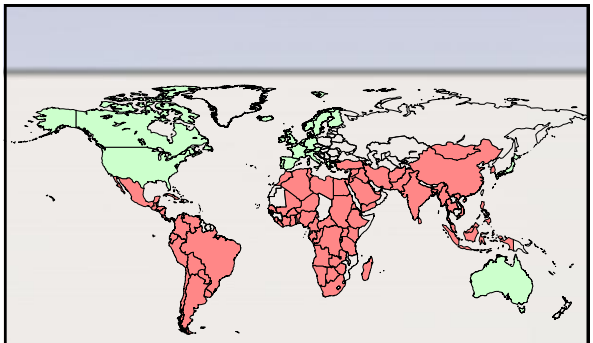

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AJR June 2008

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Patient Doses in Radiographic Examinations in 12 Countries in Asia, Africa, and Eastern Europe: Initial Results from IAEA Projects

OBJECTIVE. The purpose of this study was to survey image quality and the entrance surface air kerma for patients in radiographic examinations and to perform comparisons with diagnostic reference levels.

SUBJECTS AND METHODS. In this multinational prospective study, image quality and patient radiation doses were surveyed in 12 countries in Africa, Asia, and Eastern Europe, covering 45 hospitals. The rate of unsatisfactory images and image quality grade were noted, and causes for poor image quality were investigated. The entrance surface doses for adult patients were determined in terms of the entrance surface air kerma on the basis of X-ray tube output measurements and X-ray exposure parameters. Comparison of dose levels with diagnostic reference levels was performed.

RESULTS. The fraction of images rated as poor was as high as 53%. The image quality improved up to 16 percentage points in Africa, 13 in Asia, and 22 in Eastern Europe after implementation of a quality control (QC) program. Patient doses varied by a factor of up to 88, although the majority of doses were below diagnostic reference levels. The mean entrance surface air kerma values in mGy were 0.33 (chest, posteroanterior), 4.07 (lumbar spine, anteroposterior), 8.53 (lumbar spine, lateral), 3.64 (abdomen, anteroposterior), 3.68 (pelvis, anteroposterior), and

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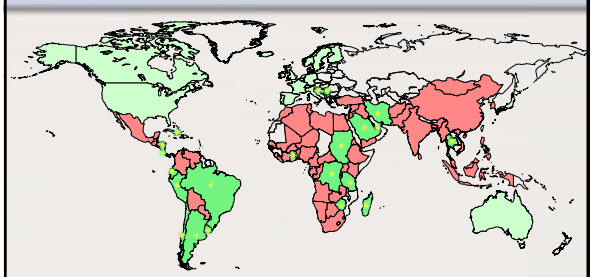
Plus 9 countries in Latin American region

Patient Doses in Radiographic Examinations in Asia, Africa, Latin America and Eastern Europe



Argentina
Brazil
Chile
Costa Rica
Cuba

Ecuador
Nicaragua
Peru
Uruguay

Bosnia and Herzegovina
Democratic Republic of the Congo
Ghana
Iran

Serbia
Sudan
Saudi Arabia
Tanzania

Thailand
UAE
Zimbabwe
Madagascar

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Radiography

- **In all countries radiation doses (ESAK) within Reference Levels and thus not higher than those in developed countries**
- **Poor image quality (4 to 53%)**
- **Improvements achieved (QC)**
  - **1.4 to 85% reduction in dose (ESAK)**
  - **2 to 16 percent points reduction in poor quality images**

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X-rays Often Repeated for Patients in Developing Countries

IAEA Moves to Help Improve Quality of Medical Radiography

Staff Report Staff Report

Patients in developing countries often need to have X-ray examinations repeated so that doctors have the image quality they need for useful medical diagnosis, the IAEA is learning. The findings come from a survey involving thousands of patients in 45 hospitals and 12 countries of Africa, Asia and Eastern Europe.

"Poor image quality constitutes a major source of unnecessary radiation to patients in developing countries," emphasizes Dr. Madan Rehani of the IAEA Division of Radiation, Waste and Transport Safety, which carried out the survey under technical cooperation (TC) projects of the IAEA.

- **First multi-national scientifically planned study of this kind**
- **What are problems pertaining dose & image quality rather than equipment testing (QC)**

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DIRECTION of Work- Radiography

1. Assessing how safe are patients in radiological examinations ✓
2. Comparing with Standards ✓
3. Taking actions where necessary ✓
4. Make patients safer ✓

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AJR August 2009

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Madan M. Rehani[22]

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

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.

Increasingly, interventional procedures are being performed us-

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

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IMAGING

Patient radiation exposure during interventional procedures needs greater attention

AUGUST 7, 2009 | Marlene Busko

Vienna, Austria - A study in developing countries reports that staff protection from radiation during interventional procedures such as PTCA is generally good, but patient radiation-dose optimization is neglected [1].

However, by participating in the study, "many professionals in so many countries now have a 'feel' for radiation dose and have become sensitized to dose assessment and dose management for the first time," study coordinator **Dr Madan M Rehani** (**International Atomic Energy Association** [IAEA], Vienna, Austria) told **heartwire**.

To determine how safe patients and staff are during interventional procedures involving radiation, IAEA researchers examined 2004 to 2007 prospective data from 55 hospitals in one developed country (Greece) and 19 developing countries (eight in Eastern Europe, five in Africa, and six in Asia).

Only 57% of the facilities, however, were able to estimate patient radiation dose with a kerma-area-product (KAP) meter, and none had experience in its use. A total of 62% of coronary angioplasties had dose levels above current dose reference levels.

This shows that radiation protection for patients "needs to be higher on the agenda," Rehani said.

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Clinical implications for all countries

This is a well-executed study with implications for practitioners in both the developed and developing world, **Dr Thomas C Gerber** (Mayo Clinic, Jacksonville, FL), who was not involved with the study, told **heartwire**.

"My general sense is that we don't emphasize radiation protection for personnel and patients sufficiently in our training of new physicians, at least in cardiology. More could be done. Many physicians perceive the medical physics training part as dry and boring, but I think it can be made interesting and engaging," he said.

Operators should have enough expertise to perform straightforward procedures with a radiation exposure that is "as low as reasonably achievable" and be able to perform complex procedures without an excessive increase in radiation exposure, Gerber noted.

> We don't emphasize radiation protection for personnel and patients sufficiently in our training of new physicians, at least in cardiology. More could be done.

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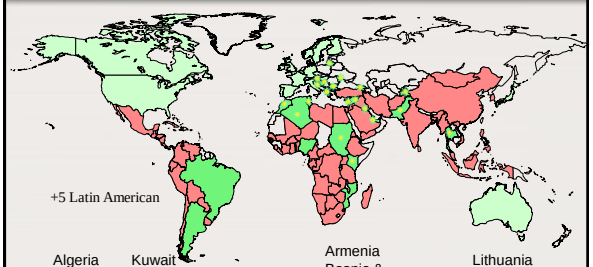
Radiation exposure to patients during interventional procedures: Information availability



+5 Latin American

Algeria
Kenya
Morocco
Sudan
Tunisia

Kuwait
Lebanon
Syria
Thailand
United Arab Emirates (UAE)
Pakistan

Armenia
Bosnia & Herzegovina
Bulgaria
Croatia
Greece

Lithuania
Moldova
Slovenia
Tajikistan

+5 Latin American

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Interventional Procedures

1. Assessing how safe are patients in radiological examinations ✓
2. Comparing with Standards ✓
3. Taking actions where necessary ✓
4. Make patients safer ✓

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Are there enough of these specialised procedures performed in Developing countries or this is advanced technique only in developed countries?

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Children

TABLE 8: Annual Number of Diagnostic, Therapeutic, and Diagnostic and Therapeutic Procedures in Participating Hospitals That Treated Both Adult and Pediatric Patients 2006

Country	Adults	Children	Total Annual Workload	Percentage of Children in Annual Workload	Percentage of Children Compared With Adult Workload
Algeria	3,684	0	3,684	0	0
Kenya	339	138	477	28.9	40.7
Morocco	4,841	210	5,051	4.2	4.3
Sudan	3,570	189	3,759	5.0	5.3
Tunisia	4,619	252	4,871	5.2	5.5
Kuwait	5,664	288	5,952	4.8	5.1
Lebanon	3,890	18	3,908	0.5	0.5
Syria	3,941	50	3,991	1.3	1.3
Thailand	6,977	16	6,993	0.2	0.2
United Arab Emirates	527	0	527	0	0
Pakistan	12,338	989	13,327	7.4	8.0
Armenia	1,919	178	2,097	8.5	9.3
Bosnia and Herzegovina	1,106	20	1,126	1.8	1.8
Bulgaria	2,110	160	2,270	7.0	7.6
Croatia	460	0	460	0	0
Greece	5,775	966	6,741	14.3	16.7
Lithuania	8,660	30	8,690	0.3	0.3
Moldova	7,136	65	7,201	0.9	0.9
Slovenia	8,225	194	8,419	2.3	2.4
Tajikistan	310	170	480	35.4	54.8

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PATIENT DOSES IN CT EXAMINATIONS IN 18 COUNTRIES: INITIAL RESULTS FROM INTERNATIONAL ATOMIC ENERGY AGENCY PROJECTS

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

PAEDIATRIC CT EXAMINATIONS IN DEVELOPING COUNTRIES

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,*]

- **28 countries, but dose information from 19 countries of Africa, Asia and Eastern Europe**
- **The frequency of paediatric CT examinations was 20% (Africa), 16% (Asia) and 5% (E. Europe) of all CT examinations in participating centres**
- **Eleven CT facilities in six countries were found to use adult CT exposure parameters for paediatric patients**

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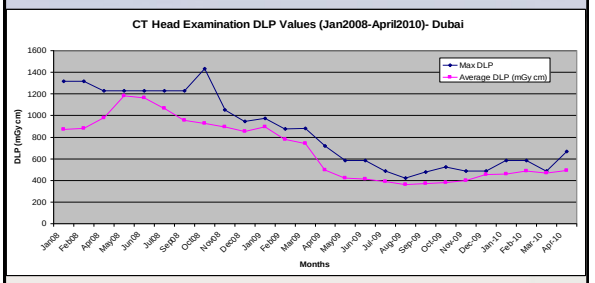
Brain CT- Adults, UAE (Dubai)

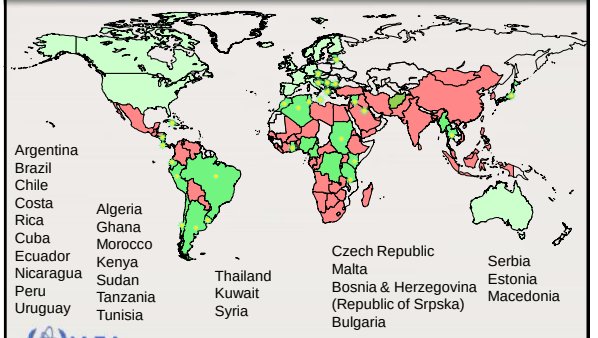


How CT Dose has changed over period

Dose management actions following awareness, review of DLP values and analysis of causes when values are high and management in following patients thus increasing awareness among staff on regular basis

Patient doses in CT examinations based on IAEA projects

Information availability chart



Some information also available from other countries not in project

CT

1. Assessing how safe are patients in radiological examinations ✓
2. Comparing with Standards ✓
3. Taking actions where necessary ✓
4. Make patients safer ✓

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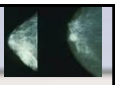
journal homepage: www.elsevier.com/locate/ejrad

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 Oola[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,*]

Mammography



- 54 mammography units in 17 countries of Asia, Africa and Europe
- >21000 mammography images evaluated
- Poor image quality in ≈25-30%
- Radiation dose mostly within reference level, but some cases unacceptably low
- Reduction in poor images by ≈10-50%

Mammography

1. Assessing how safe are patients in radiological examinations ✓
2. Comparing with Standards ✓
3. Taking actions where necessary ✓
4. Make patients safer ✓

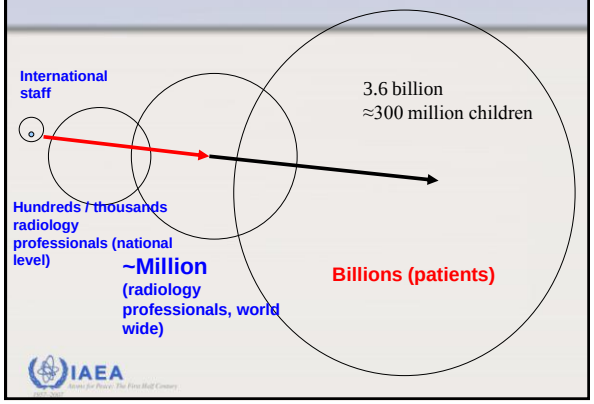
IAEA survey of practice in pediatric CT in 40 countries in Asia, Europe, Latin America, and Africa

40 countries that participated

146 CT facilities (scanners) at 126 hospitals

Armenia (1),	Iran (10),	Oman (1),	Sudan (3),
Belarus (1),	Israel (7),	Pakistan (5),	Syria (8),
Bosnia & Herz (3)	Kuwait (5),	Paraguay (3),	Tanzania (3),
Brazil (5),	Lebanon (6),	Peru (1),	Thailand (2),
Bulgaria (12),	Lithuania (3),	Poland (1),	The Former Yugoslavia Republic (FYR) of Macedonia (5),
China (3),	Malaysia (5),	Qatar (1),	United Arab Emirates UAE (15).
Costa Rica (1),	Malta (1),	Serbia (3),	
Croatia (3),	Mexico (2),	Singapore (1),	
Czech Republic (6),	Montenegro (1),	Slovakia (4),	
Estonia (2),	Moldova (5),	Slovenia (1),	
Indonesia (1),	Myanmar (1),	Sri Lanka (2)	

Need to reach millions & more



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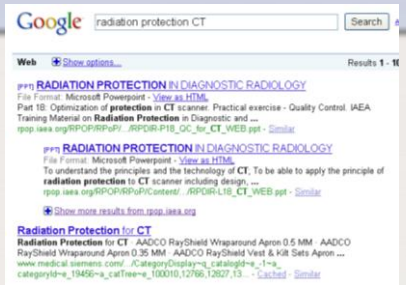
Website http://rpop.iaea.org

10 million hits/year



Strength of CONTENTS
Similarly other areas

IAEA

Website http://rpop.iaea.org

- Number 1 website in the World in this field
- Established in Sept. 2006
- 189 countries/territories

IAEA

160,465 visits came from 189 countries/territories

Detail Level: City | Country/Territory | Sub Continent Region | Continent Dimension: None

Site Usage Goal Set 1 Views:

Visits	Pages/Visit	Avg. Time on Site	% New Visits	Bounce Rate
160,465	2.57	00:02:29	73.32%	68.65%
% of Site Total: 100.00%	Site Avg: 2.57 (0.00%)	Site Avg: 00:02:29 (0.00%)	Site Avg: 73.31% (0.02%)	Site Avg: 68.65% (0.00%)

	Detail Level: Country/Territory	Visits ↓	Pages/Visit	Avg. Time on Site	% New Visits	Bounce Rate
1.	United States	50,222	1.86	00:01:31	83.95%	77.21%
2.	United Kingdom	13,444	1.79	00:01:30	81.63%	77.92%
3.	Canada	6,985	1.74	00:01:16	83.84%	80.29%
4.	India	6,637	2.49	00:02:21	85.40%	72.41%
5.	Australia	4,972	2.16	00:01:55	78.46%	73.23%
6.	Malaysia	3,560	2.21	00:02:34	73.65%	73.09%
7.	Spain	3,327	4.52	00:04:18	60.41%	47.37%
8.	Philippines	3,203	2.01	00:02:04	82.27%	74.27%
9.	Germany	2,228	3.39	00:03:12	63.20%	56.28%
10.	Japan	2,151	3.14	00:02:44	50.91%	53.23%
11.	Brazil	2,150	3.93	00:04:15	62.23%	56.47%
12.	Italy	2,144	4.17	00:03:19	56.90%	55.18%

IAEA

13.	Mexico	1,906	3.64	00:05:23
14.	Argentina	1,836	3.85	00:04:16
15.	Poland	1,686	2.81	00:02:23
16.	Ireland	1,634	2.65	00:02:18
17.	Portugal	1,501	3.80	00:03:48
18.	France	1,501	3.79	00:02:59
19.	Iran	1,498	3.74	00:04:03
20.	Croatia	1,493	1.84	00:01:20
21.	Saudi Arabia	1,479	2.71	00:03:06
22.	United Arab Emirates	1,466	2.74	00:02:29
23.	Austria	1,370	4.87	00:03:15
24.	South Africa	1,298	2.40	00:02:09
25.	Belgium	1,255	3.57	00:03:49
26.	Romania	1,194	3.69	00:03:15
27.	Greece	1,184	3.67	00:03:18
28.	Indonesia	1,167	2.15	00:02:55
29.	Finland	1,158	2.32	00:01:56
30.	Peru	1,154	4.82	00:08:16
31.	Sweden	1,105	3.20	00:02:31
32.	Singapore	1,100	2.20	00:02:33
33.	Pakistan	1,057	3.01	00:04:11
34.	Chile	1,004	3.66	00:05:35
35.	Netherlands	983	2.98	00:02:42
36.	Turkey	974	3.09	00:03:24
37.	New Zealand	960	2.71	00:02:47

38.	Egypt	950	2.54	00:02:31
39.	Colombia	928	3.96	00:04:57
40.	Thailand	927	3.27	00:03:37
41.	South Korea	860	2.95	00:03:30
42.	Czech Republic	840	3.70	00:02:59
43.	Lithuania	821	3.74	00:02:55
44.	China	818	3.94	00:03:41
45.	Hong Kong	782	3.32	00:03:59
46.	Switzerland	754	3.56	00:03:03
47.	Bulgaria	745	3.41	00:03:50
48.	Israel	722	3.06	00:02:46
49.	Taiwan	652	2.94	00:02:45
50.	Russia	643	2.21	00:01:42
51.	Slovenia	638	2.82	00:02:12
52.	Slovakia	633	2.85	00:03:05
53.	Norway	624	3.17	00:03:09
54.	(not set)	532	1.67	00:02:04
55.	Hungary	520	3.70	00:04:38
56.	Venezuela	519	3.64	00:04:31
57.	Sudan	515	3.34	00:05:34
58.	Serbia	503	3.56	00:03:10
59.	Denmark	493	2.65	00:01:59
60.	Vietnam	449	3.29	00:03:17

Is there information from the IAEA for PATIENTS?

Home ▸ Patients and Public

Information for Public

Radiation is an essential part of our life

Radiation is an essential part of daily life. From birth, we are exposed to radiation from cosmic rays in our surroundings and from food and drink that may contain traces of radioactivity. In fact, even the human body contains small amounts of radioactivity (in the form of radioisotopes of potassium, caesium and radium). The typical adult body emits about 24,000 gamma rays per minute, a very tiny amount of radiation. There are many different types of radiation that can act as a source of exposure for patients. We will focus on one type, ionizing

1. What is radiation dose and dose rate?
2. Why are there many dose quantities?
3. What is the mechanism by which ionizing radiation may harm a living organism?
4. What are the main biological effects that may be caused by radiation?
5. What are the sources of radiation exposure?
6. Can radiation be measured easily?
7. How is the risk of cancer connected with dose?
8. How much is the risk for cancer as a result of radiation exposure?
9. What is radiation sickness?
10. How has radiation use benefitted humankind?
11. How can radiation use be made safer?

IAEA Atoms for Peace: The First Half Century

User: REHAM, Madan Mohan

IAEA | Safety in Radiological Procedures (SAFRAD)

Home | Hospitals | Event Reports | Query Reports | Registrations | Resources | About Project

Safety in Radiological procedures

Cardiac Catheterization Lab, San Carlos Hospital, Madrid

The IAEA has a sub-programme on Radiation Protection of Patients that operates under an International Action Plan. This is the first ever programme dedicated to radiation protection of patients started in 2001 by an international organization. A dedicated website was established in 2006 that is becoming a popular resource for credible information for health professionals, patients and public.

The website provides information on radiation safety in interventional procedures besides other areas in radiology, radiotherapy, nuclear medicine, dental radiology, pregnancy and for children. Also training material has been provided for free download for use by health professionals.

SAFRAD (SAFety in RADiological procedures) is a voluntary reporting system where patients submitted to defined trigger levels or events in fluoroscopically-guided interventional procedures are included in an international database. The primary objective of the system is educational in nature. It is believed that going through the process of SAFRAD itself results in safety. For more information about SAFRAD, click here.

IAEA Atoms for Peace: The First Half Century

Home ▸ Training

Free Material

- Diagnostic and Interventional Radiology →
- Radiotherapy →
- Nuclear Medicine →
- Prevention of Accidental Exposure in Radiotherapy →
- Cardiology →
- PET/CT →
- Paediatric Radiology →
- Digital Radiology →

English | Español | Русский

40,000 downloads per year

IAEA Atoms for Peace: The First Half Century

Regional Training courses

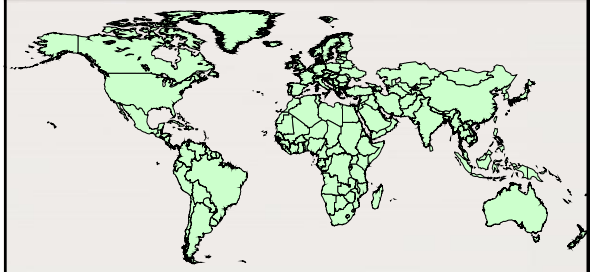
Radiation Protection in	2010	2009	2008	2007	2006	2005	2004	2003	2002
Diagnostic & Interventional Radiology	Algeria Kenya Italy	Brazil	Italy Serbia	Cost Rica Italy	Kuwait Thailand	Kuwait	Kenya Kuwait	India Kuwait Slovenia	France Kenya Kuwait Malaysia
Nuclear Medicine					UAE		Saudi Arabia	Turkey	Albania 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	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)	Slovenia	Singapore Nicaragua							
Pediatric and Pregnancy	Mexico								
Digital Radiology	Colombia								

IAEA Atoms for Peace: The First Half Century

How you can be involved

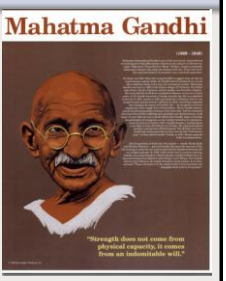
- Expert assignments in countries
- Lecturer in training course
- Expert in preparing new training material, new guidance documents
- Revision of material
- Translation

Vision: World map of patient safety situation Justification, Optimization



Miles to go before I sleep-Robert Frost

"Whatever you do will be insignificant, but it is very important that you do it"




ICRP
INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION
Working towards making medical exposure a Safer practice
Thank You
IAEA