ICRP & IAEA Actions on Radiation Protection in CT

Madan M. Rehani, PhD
Secretary, ICRP Committee 3
International Atomic Energy Agency, Vienna, Austria
1997: Review of situation in ICRP

- There were no cases of skin injuries from CT
- There was no momentum on cancer risk estimates from CT scans
- Manufacturers not really concerned about patient doses as hardly customers asked for it
- Most emphasis on faster and faster CT scanners
• 1999- ICRP sets up a Task Group on Patient doses in CT
Task Group

• M.M. Rehani (Chairman)

• Members:
  – G. Bongartz (Switzerland); S.J. Golding (UK);
    L. Gordon (Sweden); W. Kalender (Germany);
    T. Murakami (Japan); P. Shrimpton (UK)

• Corresponding members:
  – R. Albrecht (USA) and K. Wei (China)
ICRP Publication 87 (2001)


*BMJ* 2000;320:593-594 (4 March)

**Editorials**  
Rehani & Berry

**Radiation doses in computed tomography**

The increasing doses of radiation need to be controlled
Diagnostic Imaging Online
April 13, 2000

CT radiation dose questions draw international attention

Radiation dosage from CT scans could become a matter of debate if international calls for reduced radiation levels move forward.

Writing last month in the British Medical Journal, Dr. Madan Rehani, chairperson of an international task force on safer dosage standards for CT scans, made the case for a closer look at CT radiation levels.

"The increasing doses of radiation need to be controlled worldwide," he said.

The task force was established by the International Commission on Radiological Protection (ICRP). The organization meets in Zurich this month to discuss safer dosage recommendations.

While the ICRP believes that there is cause for concern about high radiation dosage in CT scans, some physicians claim that there is no basis for alarm.

"The FDA approves a technology only after due research. Radiation is used discerningly in our country. America is one of the most conscious medical communities when it comes to radiation safety, and radiation is used wisely by physicians only after weighing cost and benefit, keeping in mind safety of the patients," said Dr. Jonathan Goldin, an assistant professor of radiology at the University of California, Los Angeles, who studies radiation safety and regulation of CT and other imaging devices.
Manufacturer orientation in ICRP 87

Table 5
Possibilities for patient dose reduction with CT

<table>
<thead>
<tr>
<th>Measures for the user</th>
<th>[Measures for the manufacturer]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checking the indication and limiting the scanned volume</td>
<td>Increasing the pre-filtration of the radiation spectrum</td>
</tr>
<tr>
<td>Adapting the scanning parameters to the patient cross-section</td>
<td>Attenuation-dependent tube current modulation</td>
</tr>
<tr>
<td>Pronounced reduction of mAs values for children</td>
<td>Low-dose scanning protocols for children and special indications</td>
</tr>
<tr>
<td>Use of spiral CT with pitch factors &gt; 1 and calculation of overlapping images instead of acquiring overlapping single scans</td>
<td>Automatic exposure control for conventional CT and spiral CT</td>
</tr>
<tr>
<td>Adequate selection of image reconstruction parameters</td>
<td>Noise-reducing image reconstruction procedures</td>
</tr>
<tr>
<td>Use of z-filtering with multi-slice CT systems</td>
<td>Further development of algorithms for z-filtering and adaptive filtering</td>
</tr>
</tbody>
</table>

Specific use of the new possibilities which multi-slice CT systems offer can also serve to limit the dose. The new approaches to z-interpolation and z-filtering, which allow...
AJR issue with many articles & Editorial

CT scans in children linked to cancer later

By Steve Sternberg
USA TODAY

Each year, about 1.6 million children in the USA get CT scans to the head and abdomen — and about 1,500 of those will die later in life of radiation-induced cancer, according to research out today.

What’s more, CT or computed tomography scans given to kids are typically calibrated for adults, so children absorb two to six times the radiation needed to produce clear images, a second study shows. These doses are “way bigger than the sorts of doses that people at Three Mile Island were getting.”

David Brenner of Columbia University says, “Most people got a tenth or a hundredth of the dose of a CT.”

Both studies appear in February’s American Journal of Roentgenology, the nation’s leading radiology journal. The first, by Brenner and colleagues, is the first to estimate the risks of radiation-induced fatal cancer” from pediatric CT scans. Until a decade ago, CT scans took too long to perform on children without giving them anesthesia to keep them still, today’s scanners spiral around the patient in seconds, providing cross sections, or “slices,” of anatomy.

Doctors use CT scans on children to search for cancers and ailments such as appendicitis and kidney stones.

“There’s a huge number of people who don’t just receive one scan,” says Fred Mettler of the University of New Mexico, noting that CT scans are used for diagnosis and to plan and evaluate treatment. “The breast dose from a CT scan of the chest is somewhere between 10 and 20 mremograms. You’d want to think long and hard about giving your young daughter 10 to 20 mremograms unless she really needs it.”

Mettler recently published a study showing that 11% of the CT scans at his center are done on children younger than 15, and they get 70% of the total radiation dose given to patients. Children have more rapidly dividing cells than adults, which are more susceptible to radiation damage. Children also will live long enough for cancers to develop.

Researchers led by Lane Donnelly at Cincinnati’s Children Hospital found that children often get radiation doses six times higher than necessary. Cutting the adult dose in half would yield a clear image and cut the risk a like amount, Brenner says. “Radiologists genuinely believe the risks are small,” he says. “I suspect they’ve never been confronted with numbers like this.”

Brenner, Lee Rogers, Paterson, Donolly, Nickoloff, Haaga

ICRP INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION
Era on ATTENTION to radiation in CT

Manufacturers vying with each other on Radiation Dose
After ICRP 87

• Spiral CT 1999-2000
• 2000-2003: Doses in MDCT are higher
• Newer applications
• Potential for
  – Steep increase in usage
  – Multiple CT examination
• Watched literature on patient doses
2005: ICRP

• Established another TG on Patient dose Management in MDCT
• Chair: Madan Rehani
• Others members:
  – M.K. Kalra, USA
  – C.H. McCollough, USA
  – H.D. Nagel, Germany
• Corresponding members
  – L. Collins, NSW, Australia
  – W. Kalender, Erlangen, Germany
ICRP Publication 102, 2007

Annals of the ICRP

Managing Patient Dose in Multi-Detector Computed Tomography (MDCT)
Single most important point in new document

Be aware!!

About image quality that you are using

Guidance on HOW to optimize
This can also happen

CT perfusion with DSA

4 Major culprits in increasing dose

- Shorter scanning times (time is intuitive, that it may result in lesser radiation dose—very little if any, published data available on this),
- Image quality higher than necessary (knowledge),
- Unjustified examinations,
- Not using the features that the machine provides
Time for CHANGE

Played role

• Presaging problem
• Developing guidance (Emphasizing on application of ICRP principle principles)

Current situation:

• Manufacturer-radiation dose TOP on the agenda
• Momentum among users on optimization
• Growing momentum on justification
Cone Beam CT
The Nobel Peace Prize 2005

“for their efforts to prevent nuclear energy from being used for military purposes and to ensure that nuclear energy for peaceful purposes is used in the safest possible way”
Common Impression

- Super regulator
- Use only Top Down approach (developing regulation, enforcement...)

Bottom-up approach
### 40 Less resourced countries

Countries (scanners) 146 CT facilities at 126 hospitals

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

First such multi-national study
IAEA study covering 40 countries

1. Technology
IAEA Survey in 40 less resourced countries

CT equipment

Year of installation
- After 2005: 65%
- 1997 - 2004: 29%
- Before 1996: 3%
- Unknown: 3%

Number of detector rows
- MDCT with >=64 detectors: 31%
- MDCT with 2-40 detectors: 46%
- SDCT: 23%
IAEA Survey in 40 less resourced countries

- CT equipment

AEC (TCM) available?

- Yes: 84%
- No: 16%

AEC available?

- Yes: 0%
- No: 100%

Dose display available?

- Yes: 79%
- No: 21%
IAEA Survey in 40 countries

• 141 radiographers/technologists answered

Dedicated scanning protocols for pediatric examinations available? Yes, in overall 94%

- Africa (7 answers)
- Latin America (63 answers)
- Asia (63 answers)
- Europe (60 answers)
- Total (141 answers)
IAEA Survey in 40 countries

- 141 radiolographers/technologists answered

Indication based protocols? Available in about 58%

![Bar chart showing the responses from different regions: Africa (7 answers), Latin America (63 answers), Asia (63 answers), Europe (60 answers), Total (141 answers). The chart indicates the percentage of positive responses.]

Rehani. ICRP & IAEA- Rad Prot in CT
IAEA study covering 40 countries

1. Technology

2. Pediatric CT practice
   a. Technique
IAEA Survey in 40 countries

Most commonly used kVp=120

Head CT
IAEA Survey in 40 countries

Most commonly used kVp=120 Chest CT [80-110 in 30% in newborn and 12% only for older]

---

**Chest examination**

| Tube voltage | %  
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>80 kV</td>
<td>0</td>
</tr>
<tr>
<td>90 kV</td>
<td>0</td>
</tr>
<tr>
<td>100 kV</td>
<td>0</td>
</tr>
<tr>
<td>110 kV</td>
<td>0</td>
</tr>
<tr>
<td>120 kV</td>
<td>80</td>
</tr>
<tr>
<td>130 kV</td>
<td>0</td>
</tr>
<tr>
<td>140 kV</td>
<td>0</td>
</tr>
<tr>
<td>150 kV</td>
<td>0</td>
</tr>
</tbody>
</table>

Legend:
- < 1y
- 1-5y
- 5-10y
- 10-15y
- Adult
RESULTS: Typical exposure parameters

Mean values of tube current utilized for head, chest and abdomen exams w.r.t patient age
IAEA Survey in 40 countries

• 138 radiographers/technologists answered

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

- Africa (7 answers)
- Latin America (9 answers)
- Asia (62 answers)
- Europe (60 answers)
Scout Image

Recommendations given

• 80 kVp instead of 120 kVp,
• minimum X-ray tube current,
• 180° tube position (PA projection)
138 radiographers/technologists answered

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

16% extends to breast
IAEA study covering 40 countries

1. Technology
2. Pediatric CT practice
   a. Technique
   b. Dose
# 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)

<table>
<thead>
<tr>
<th>Mode</th>
<th>Tube voltage, kV</th>
<th>Tube current, mA</th>
<th>t rot, s</th>
<th>Pitch value</th>
<th>CTDIvol, mGy</th>
</tr>
</thead>
<tbody>
<tr>
<td>helical</td>
<td>80</td>
<td>129</td>
<td>0.5</td>
<td>1.3</td>
<td>1.89</td>
</tr>
<tr>
<td>helical</td>
<td>120</td>
<td>120</td>
<td>0.5</td>
<td>0.984</td>
<td>10.21</td>
</tr>
<tr>
<td>helical</td>
<td>80</td>
<td>240</td>
<td>0.5</td>
<td>0.984</td>
<td>2.64</td>
</tr>
<tr>
<td>helical</td>
<td>80</td>
<td>100-250</td>
<td>0.5</td>
<td>0.96</td>
<td>4.26</td>
</tr>
<tr>
<td>helical</td>
<td>100</td>
<td>180</td>
<td>0.4</td>
<td>0.98</td>
<td>3.2</td>
</tr>
<tr>
<td>helical</td>
<td>120</td>
<td>80</td>
<td>0.4</td>
<td>1.375</td>
<td>4.5</td>
</tr>
<tr>
<td>helical</td>
<td>80</td>
<td>25</td>
<td>0.5</td>
<td>0.9</td>
<td>0.71</td>
</tr>
<tr>
<td>helical</td>
<td>120</td>
<td>80</td>
<td>0.6</td>
<td>0.9</td>
<td>10</td>
</tr>
</tbody>
</table>

Scope for improvement and harmonization
<table>
<thead>
<tr>
<th>CTDI$_{vol}$ (mGy)</th>
<th>&lt; 1y</th>
<th>1-5y</th>
<th>5-10y</th>
<th>10-15y</th>
<th>Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>min</strong></td>
<td>0.8</td>
<td>0.8</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>max</strong></td>
<td>40.1</td>
<td>75.0</td>
<td>29.8</td>
<td>45.0</td>
<td>61.0</td>
</tr>
<tr>
<td><strong>average</strong></td>
<td>8.0</td>
<td>11.2</td>
<td>9.0</td>
<td>11.4</td>
<td>16.2</td>
</tr>
<tr>
<td><strong>median</strong></td>
<td>5.0</td>
<td>6.3</td>
<td>7.6</td>
<td>9.6</td>
<td>13.4</td>
</tr>
<tr>
<td><strong>3d quarter</strong></td>
<td>10.7</td>
<td>13.0</td>
<td>12.0</td>
<td>14.3</td>
<td>18.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DRL in CTDI$_{vol}$ (mGy)</th>
<th>UK, 2005</th>
<th>Switzerland, 2008</th>
<th>Germany, 2007</th>
<th>France, 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20*</td>
<td>20*</td>
<td>30*</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>9</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>2.5</td>
<td>4</td>
<td>6.5</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>4.5</td>
<td>7</td>
<td>-</td>
</tr>
</tbody>
</table>

*DRLs in CTDI$_{vol,16}$, Swiss as displayed by scanner, others 32 cm
Chest & Abdomen

- CTDI_{vol} values are similar or higher than the DRL values in UK and Switzerland, with a maximum difference of 53% for age group <1 y.
- Compared with the DRLs in France, values from this survey are higher by 42-63%, but they are higher than the DRL values in Germany by 85 – 320%.
Head CT

• CTDI$_w$ values were higher than the latest UK DRL values for children by,
  – 62% for age group <1y,
  – 27% for (1-5) y,
  – 22% for (5-10) y.

• The third quartile CTDI$_{vol}$ values are lower by 3 to 16% than the DRLs in UK, Germany and France, depending on the age group, but they are higher than corresponding values in Switzerland by up to 45%.

• Gantry tilt or patient head repositioning was applied by more than 75% of operators.
IAEA study covering 40 countries

1. Technology

2. Pediatric CT practice
   a. Technique
   b. Dose
   c. Appropriateness
QUESTIONNAIRE - RADIOLOGIST

• 129 radiologists answered

Are written referral guidelines for imaging available in your hospital? *Not available in about Half*

- Europe (52 answers)
- Asia (62 answers)
- Latin America (8 answers)
- Africa (7 answers)
Appropriateness Issues

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

- Infant with hydrocephalus
- Infant with congenital torticollis
- Child with acute abdominal pain
- Child with pleural effusion
- Child with persistent headache

The chart shows the number of answers for each condition, with the following options:
- CT
- X-ray
- US
- MRI
- None

Rehani. ICRP & IAEA- Rad Prot in CT
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
IAEA study covering 40 countries

1. Technology
2. Pediatric CT practice
   a. Technique
   b. Dose
   c. Appropriateness
   d. Frequency
## Frequency of pediatric CT exams

95 CT facilities in 28 countries

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of CT facilities</th>
<th>Frequency of pediatric examinations in 2007 (%)</th>
<th>Frequency of pediatric examinations in 2009 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>mean</td>
<td>range</td>
</tr>
<tr>
<td>Europe</td>
<td>30</td>
<td>4.6</td>
<td>0.1 – 18.2</td>
</tr>
<tr>
<td>Asia</td>
<td>57</td>
<td>9.4</td>
<td>0.1 – 29.0</td>
</tr>
<tr>
<td>Latin America</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Africa</td>
<td>7</td>
<td>9.6</td>
<td>4.2 – 19.7</td>
</tr>
<tr>
<td>All countries</td>
<td>95</td>
<td>7.5</td>
<td>0.1 – 29.0</td>
</tr>
</tbody>
</table>
IAEA study covering 40 countries

1. Technology

2. Pediatric CT practice
   a. Technique
   b. Dose
   c. Appropriateness
   d. Frequency
   e. Referral
QUESTIONNAIRE - RADIOLOGIST

• 129 radiologists answered

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

- All countries
- Africa
- Latin America
- Asia
- Europe

0% 50% 100%

both radiologist referring clinician

IAEA.org International Atomic Energy Agency
IAEA study covering 40 countries

1. Technology

2. Pediatric CT practice
   a. Technique
   b. Dose
   c. Appropriateness
   d. Frequency
   e. Referral
   f. Patient support & sedation
IAEA Survey in 40 countries

- 141 radiolographers/technologists answered

Are any immobilization means available, e.g. swaddling clothes, straps, etc.?

- Africa (7 answers)
- Latin America (63 answers)
- Asia (63 answers)
- Europe (60 answers)
- Total (141 answers)

<table>
<thead>
<tr>
<th>Region</th>
<th>Total (141 answers)</th>
<th>Europe (60 answers)</th>
<th>Asia (63 answers)</th>
<th>Latin America (63 answers)</th>
<th>Africa (7 answers)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yes</strong></td>
<td>90%</td>
<td>88%</td>
<td>87%</td>
<td>85%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>No</strong></td>
<td>10%</td>
<td>12%</td>
<td>13%</td>
<td>15%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Don't know</strong></td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>
IAEA Survey in 40 countries

- 141 radiographers/technologists answered

How often does CT examination of pediatric patient need supporter in the room?

Africa (7 answers)

Latin America (63 answers)

Asia (63 answers)

Europe (60 answers)

Total (141 answers)

0% 20% 40% 60% 80% 100%

Hardly ever

in <50%

in >50%

always
IAEA Survey in 40 countries

- 141 radiolographers/technologists answered

How often is sedation used for small children (< 5 y old)?

- Africa (7 answers)
- Latin America (63 answers)
- Asia (63 answers)
- Europe (60 answers)
- Total (141 answers)

- Hardly ever
- in <50%
- in >50%
- always
IAEA study covering 40 countries

1. Technology

2. Pediatric CT practice
   a. Technique
   b. Dose
   c. Appropriateness
   d. Frequency
   e. Referral
   f. Patient support & sedation

3. Publications
Results under publication in 3 papers

- **Paper I**: Frequency of use and Appropriateness (Already accepted AJR)

- **Paper-II**: Procedures and Protocols (Submitted AJR).

- **Paper-III**: Impact assessment of optimization actions as identified in Paper II above (Likely to be submitted in Dec.11/Jan.2012)
PATIENT DOSES IN CT EXAMINATIONS IN 18 COUNTRIES: INITIAL RESULTS FROM INTERNATIONAL ATOMIC ENERGY AGENCY PROJECTS

W. E. Muhogora¹, N. A. Ahmed², A. Beganovic³, A. Benider⁴, O. Ciraj-Bjelac⁵, V. Gershman⁶, E. Gershkevitsh⁷, E. Grupetta⁸, M. H. Kharita⁹, N. Mantrakul¹⁰, M. Milakovic¹¹, K. Ohno¹², L. Ben Omrane¹³, J. Ptacek¹⁴, C. Schandorf¹⁵, M. S. Shabaan¹⁶, D. Stoyanov¹⁷, N. Toutaoui¹⁸, J. S. Wambani¹⁹ and M. M. Rehani²⁰,*

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¹⁷International Atomic Energy Agency, Vienna, Austria
¹⁸International Atomic Energy Agency, Vienna, Austria
¹⁹International Atomic Energy Agency, Vienna, Austria
²⁰International Atomic Energy Agency, Vienna, Austria

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


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4Clinical Centre of University of Sarajevo, Bolnicka 25-71000, Sarajevo, Federation of Bosnia & Herzegovina
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6University Clinic of Radiology, Skopje, The former Yugoslav Republic of Macedonia
7North Estonia Regional Hospital, Hiiu Street 44, 11619 Tallinn, Estonia
8St. Luke’s Hospital, St. Luke’s Road, Guardamangi, Malta
9Atomic Energy Commission of Syria, Damascus, Syria
10Department of Medical Sciences, Ministry of Public Health, Tiwanon Road, 11000 Nonthaburi, Thailand
11Centre National de Radioprotection, Rabat, Agdal, Morocco
12Clinical Centre Banja Luka, 12 Beba 6, 7800 Banja Luka, Republic of Srpska, Bosnia & Herzegovina
13Department of Radiology Technology, Faculty of Medical Sciences, College of Medical Sciences, Kuwait

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IAEA study covering 40 countries

1. Technology
2. Pediatric CT practice
   a. Technique
   b. Dose
   c. Appropriateness
   d. Frequency
   e. Referral
   f. Patient support & sedation
3. Publications
4. Training material
While **DOING** is best way to communicate message and to learn, there is **limited outreach** of projects aimed at making people do
Besides engaging professionals in project work, satisfying their information needs
IAEA study covering 40 countries

1. Technology

2. Pediatric CT practice
   a. Technique
   b. Dose
   c. Appropriateness
   d. Frequency
   e. Referral
   f. Patient support & sedation

3. Publications

4. Training material

5. Website
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≈ 200,000 visits/y, 190 countries
Advances in computed tomography (CT) technology have continued to open new clinical applications, including several procedures for evaluating heart disease. The speed with which CT technology is changing is somewhat unparalleled in medical imaging. The equipment is becoming faster and faster. In the 1990s, a patient had to remain in a CT gantry for a period of approximately 10 minutes for a chest CT, whereas now it takes a few seconds to scan the entire chest. This may give the impression that radiation dose in CT is small,
Radiation protection CT

CT Radiation Reduction | siemens.com
www.siemens.com/low-dose
Siemens Computed Tomography - Where patient safety means dose reduction

Radiation Protection | Rothband.com
www.rothband.com/Radiation-Protection
Huge Range of Structural & Personal Radiation Protection Products

Radiation Protection Systems, Inc.
www.rpsct.com/
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rpop.iaea.org/RPOP/RPoP/Content/Documents/.../RPD1R-L18_CT_WEB.ppt
File Format: Microsoft Powerpoint - Quick View
L18: Optimization of Protection in Computed Tomography (CT). IAEA Training Material on Radiation Protection in Diagnostic and Interventional Radiology. IAEA ...

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IAEA Training Material on Radiation Protection in Diagnostic and ...
IAEA Radiation dose CT

Scholarly articles for IAEA Radiation dose CT
- Dose Reduction in CT while Maintaining Diagnostic ... - Tsapaki - Cited by 47
- PET and PET/CT for radiation therapy planning: IAEA ... - MacManus - Cited by 84
- Radiation dose for pedicle screw insertion: ... - Slomczykowski - Cited by 77

PET/CT Scanning
- rpop.iaea.org/RPOP/RPoP/Content/.../6.../PETCTscan.htm - Cached
IAEA Radiation Protection of Patients ... The radiation exposure from CT has a very wide range depending on the type of the test, the area of the body scanned ...

IAEA Training Material on Radiation Protection in Cardiology
- rpop.iaea.org/RPOP/RPoP/Content/.../CARD_L11_CardiacCT_WEB.ppt
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IAEA. Cardiac CT - radiation doses, dose management and practical issues. L ...

CT Colonography
- rpop.iaea.org/rpop/rpop/content/.../1.../ctcolonography.htm - Cached
Nucleus · IAEA Radiation Protection of Patients ... What is the radiation ...

IAEA Aims to Reduce Unnecessary Child Radiation Doses
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New Era in CT scanning

More than 400 cases of radiation overexposure from CT scan in 8 hospitals, many suffering hair loss and skin injuries including as well a child of less than 2 years getting 150 times more radiation dose - these are newest situations never encountered before even though CT has been around since 1972 and the technology has been considered safe. Manufacturers, radiologists and radiographers never imagined that software problems that keep on getting reported from time to time with high tech radiotherapy machines resulting in serious incidents could ever occur with very well behaved CT machines.

Six years ago it was not easy to spot a case of either accidental exposure to patient in CT scan or a patient having skin injury from CT scans. With almost 115 years gone by, after the discovery of X rays by Roentgen, the current interest in radiation protection seems to be what it would have been about a century ago. This follows a period of almost half century (from 1930’s to 1980’s) when X rays started to be considered safe enough, making some health professionals rather complacent.

Continued occurrence of overradiation in brain CT

A report in the New York Times again brings attention to the problem that was publicized earlier.

Continued occurrence of overradiation in brain CT

A report of patients overradiated when undergoing brain perfusion CT was extensively covered by the International Atomic Energy Agency (IAEA) on this website about a year ago.

The incidents resulted in actions by the FDA and the signing of a bill into law in California.

Despite these actions, new reports of overradiation in brain perfusion CT have appeared.
Our Challenges

• Common goal but different settings

30 countries in our study are non-English Medical physicist!!
Some participants in projects
“Whatever you do will be insignificant, but it is very important that you do it”
Thank You

M.Rehani@iaea.org