Patient exposure Tracking: IAEA Smart Card/SmartRadTrack project

Madan M Rehani, PhD
International Atomic Energy Agency, Vienna, Austria
M.Rehani@iaea.org
What Was and What is Now

2006
- Why track examinations?
- What for?
- How is it going to be useful?
- How to do it?
- What dose quantities?
- Is it possible, may be by 2030?

2012
- Who does not want it?
- It is possible ✓
- It is done ✓
- It is promising area
- How to extend coverage?
- How to include nuclear medicine?
Sessions in Many Conferences
Critics

- 2003: Started talking about it, but **NO** from almost all

- **Not feasible**

- Why? What are you going to use it for?

- It may implicate staff for having given more radiation dose to patient.
Situation before 2008

FUTILITY

No matter how hard you try, you will fail.
Looking back

- It was good that I did not pursue it aggressively about 5 years ago
- Radiation units were not as matured
- PACS not talking to each other
- e-Health was in infancy
- Reports of few tens of or of ≥100 mSv doses to an individual were not there
NOW in 2011

Who Doesn't Want It?
IAEA Smart Card/SmartRadTrack Project

Although the scope of the Smart Card project that was initiated by the IAEA in 2006 was comprehensive, it tended to give a narrow impression and, thus, the new name Smart Card/SmartRadTrack has been adopted. It includes following possibilities:

a. An electronic card that contains a patient’s information, including radiation exposure history.
b. A card only as a digital signature to access the radiation exposure data that is actually available online. A patient-accessible website can serve as a ‘virtual’ card.
c. The information about radiation exposure history is made available in e-health records in a manner that can help track individual patients’ exposure over time. With interoperability, it should provide the possibility of access from anywhere.
d. In countries where neither an electronic card nor e-health record is feasible, a methodology to achieve information on tracking all radiological procedures, such as a radiation passport, somewhat like a vaccination card, could be initiated.

The project is aimed at:

Project in part by Extra budgetary grant from U S Govt.
IAEA Smart Card/SmartRadTrack Project
rpop.iaea.org/RPOP/RPoP/Content/News/smart-card-project.htm
Although the scope of the Smart Card project that was initiated by the IAEA in 2006 was comprehensive, it tended to give a narrow impression and, thus, the new ...

Report of the IAEA Smart Card/SmartRadTrack Project meeting
rpop.iaea.org/RPOP/RPoP/.../report-SmartRadTrack-project.htm
The brief report of the recent Technical Meeting held on 18-21 Oct.2010 is available.

Smart Protection - International Atomic Energy Agency (IAEA)
www.iaea.org/Publications/Magazines/Bulletin/.../50205813137.html
by MM Rehani - Cited by 3 - Related articles
An electronic “Smart Card” could serve as a digital medical record of radiation exposure for patients who want one.

Joint position statement for the IAEA Smart Card/SmartRadTrack ...
https://rpop.iaea.org/.../joint-position-statement-IAEA-smartcard-...
Joint position statement for the IAEA Smart Card/SmartRadTrack protect, 30 January - 1 February 2012. As a follow-up of the recommendations of the earlier ...

[PDF] AbstractID: 14438 Title: IAEA Smart Card Initiative for Patient Expo...
File Format: PDF/Adobe Acrobat - Quick View
Smart Protection

A ‘smart card’ that contains patients’ information including radiation dose data would help protect them from radiation effects.

Until a decade ago, radiation protection programmes in the world were largely dominated by actions that concerned protection of the staff at the medical facility. Patient protection was felt to be not as important, as it was assumed that a patient undergoes examination with ionizing radiation once or only a few times in his or her lifetime.
Madan M. Rehani

Une protection intelligente

Une carte à puce pourrait servir de carnet électronique d’irradiation médicale pour les patients qui le souhaitent.

Jusqu’à

Il y a une décennie, les programmes de radioprotection en médecine avaient principalement pour objet la protection du personnel médical. La protection des patients était jugée moins importante car on partait de l’hypothèse qu’au cours de leur vie, ceux-ci ne subiraient qu’un...
Smart Protection

【作 者】Madan M. Rehani
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【出版日期】2009
【卷 号】Vol.50
【期 号】No.2
【关键词】Radiation Protection; Medical Facilities; Radiation Doses; Healthcare Profession

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August 2009

IAEA MOUNTS EFFORT TO RECORD PATIENT DOSE

In April of this year, the International Atomic Energy Agency announced a new project to record medical radiation exposures to patients over a lifetime. Besides calling attention to the increased exposure from the growing volume of x-ray examinations, the IAEA also notes a jump in patient exposure from CT scans as distinct from traditional x-ray examinations, said Madan Rehani, an IAEA radiation safety specialist.

The IAEA has invited the ISR and other international organizations to participate in the design of a “smart card” which people might carry to record their radiation exposures over a lifetime. How such a system might function has not been determined, he said.
IAEA calls for enhanced radiation protection of patients

The International Atomic Energy Agency (IAEA), in collaboration with other international organizations, is developing a series of measures aimed at strengthening patient radiation dose protection. The focus of recent efforts is a Smart Card project, to log how much radiation a person receives in the course of a lifetime.

Tracking Patient Radiation Dose: IT Implications

by Cat Vasko

In February, the FDA announced a new initiative to reduce unnecessary radiation exposure from CT, nuclear-medicine, and fluoroscopy exams. The agency’s three-pronged approach will include issuing safeguard requirements for device manufacturers, incorporating quality-assurance measures in mandatory CMS accreditation for imagers, and creating national dose registries to aid in the development of diagnostic-radiation reference levels.
International agency wants smart cards to track patient radiation histories

By Paula Gould | May 4, 2009

The International Atomic Energy Agency has launched an effort to create a running total of how much medical radiation patients are exposed to over time by issuing smart cards and modifying electronic medical records.

IAEA safety experts note that tracking dose for patients would provide a level of protection already available to medical practitioners. Standard protocols already exist to monitor levels of ionizing radiation that radiologists, technologists, and nursing staff are exposed to over prolonged periods.

The wearing of film badge or thermoluminescent dosimeters for several weeks or months is common practice. No such efforts, however, are made to record the cumulative x-ray dose received by patients.
PHILADELPHIA, PA (July 22, 2010) -- Patients going from one radiology facility or one doctor to another, or indeed moving from one country to another, can leave a confusing trail of documentation about radiation exposure in radiological examinations. M. Rehani, who works at the International Atomic Energy Agency (IAEA) in Vienna, Austria, will report today at the 52nd meeting of the American Association of Physicists in Medicine (AAPM) on efforts to develop an international system for tracking patient exposures. The idea was first broached in 2001 but became an active program only around 2008.

Called a Smart Card/SmartRadTrack, the system ultimately may be something like an ATM card. It does not contain money on it but allows one to use the card to access money and account details. For the patient, radiation exposure history is sufficient whereas for health authorities radiation dose information is needed. Aggregate data obtained through the eHealth system would enable countries to establish radiation and exposure standards and help in future epidemiological studies. This would require manufacturers to develop equipment and software for tracking procedures and doses.

The presentation "IAEA Smart Card Initiative for Patient Exposure" by M Rehani will be at 8:30 a.m. on Thursday, July 22, 2010 in Room 202 of the Pennsylvania Convention Center.

‘Smart Card’ project aims to better protect patients from radiation, say UN experts

29 April 2009 – A Smart Card project to log how much radiation a person receives in the course of a lifetime is among the latest efforts by the United Nations International Atomic Energy Agency (IAEA) and its partners to ensure better protection of patients from any unnecessary exposure.

IAEA says making radiotherapy accessible is a key component in any comprehensive cancer control programme.

Radiation safety experts from the IAEA have lauded advances in imaging technology that enable doctors to detect hidden diseases and make better diagnoses. At the same time, they caution that overuse of high-tech scanning procedures may unnecessarily expose patients to increased radiation levels.

Of particular concern are procedures such as computed tomography (CT) scans because they deliver higher doses of radiation to patients in comparison to conventional X-rays (radiographs), according to a news release issued by the agency.
IAEA Calls for Enhanced Radiation Protection of Patients

Suggestions

1. Radiation Protection of Patients
   - by IAEAvideo
   - 1,027 views

2. IAEA Safeguards Analytical Laboratory
   - by IAEAvideo
   - 772 views

3. IAEA Chief Addresses Historic UN Security Council
   - by IAEAvideo
   - 1,792 views

4. IAEA Chief speaks to Press Nigeria
   - by IAEAvideo
   - 1,120 views

5. Euratom: Radiation Protection - 4th of 4 relate...
When there is light, everyone can see, but........
Number of CT Examinations

31,500 patients
190,712 CT examinations
22 year period

• 33%: ≥ 5 CT exams
• 5%: 22-132 exams

Sodickson et al.
Radiology 251; 175-184, 2009
Estimated Cumulative Dose

- 15%, ED > 100 mSv
- 4%, 250 - 1375 mSv
- 1% > 399 mSv

Sodickson et al. Radiology 251; 175-184, 2009
Estimated Radiation Exposure from Medical Imaging in Hemodialysis Patients

Andreana De Mauri,* Marco Brambilla,† Doriana Chiarinotti,* Roberta Matheoud,† Alessandro Carrieri,‡ and Martino De Leo*

*Nephrology Department, †Medical Physics Department, and ‡Radiology Department, University Hospital “Maggiore della Carità,” Novara, Italy

ABSTRACT
Radiation exposure accompanying medical imaging associates with cancer risk. Patients with recurrent or chronic diseases may be especially at risk, because they may undergo more of these procedures. The aim of this study was to assess the individual cumulative effective doses (CEDs), which quantify radiation from medical imaging procedures, in a cohort of 106 hemodialysis patients during a median follow-up of 3 years. We retrospectively calculated individual radiation exposures by collecting the number and type of radiologic procedures from hospital records. We also estimated organ doses for computed tomography procedures. The mean and median annual CEDs were 21.9 and 11.7 mSv per patient-year, respectively. The mean and median total CEDs per patient during the study period were 57.7 and 27.3 mSv, respectively. By radiation dose group, we classified 22 patients as low (<3 mSv/yr), 51 as moderate (3 to <20 mSv/yr), 22 as high (20 to <50 mSv/yr), and 11 as very high (≥50 mSv/yr). Seventeen patients had a total CED >100 mSv, a value associated with a substantial increase in risk for cancer-related mortality. Of the total CEDs, 76% was a result of CT scanning. The annual CED significantly associated with age and transplant waitlist status. In summary, this study shows that a significant fraction of surviving hemodialysis patients during a 3-year period receives estimated radiation doses that may put them at an increased risk for cancer.

Repeated radiological radiation exposure in patients undergoing surgery for urinary tract stone disease in Victoria, Australia

Paul Manohar and Philip McCahy
Department of Urology, Casey Hospital, Berwick, Victoria 3806, Australia

- To assess radiation exposure in patients attending for surgery for urinary tract stones.

PATIENTS AND METHODS

- Fifty-eight consecutive patients attending for stone surgery were asked to provide their radiological imaging over the preceding year.
- Radiation dosage was recorded where available. Individual radiology providers were contacted to provide additional data.

Patients had attended 12 different providers on 22 sites. Only three providers routinely recorded computed tomography (CT) radiation dose.
- Up to 26 patients (44%) were subjected to at least 50 mGy radiation in the course of their treatment with at least eight (13.8%) receiving over 100 mGy from CT scans alone.
- CT and image intensifier radiation dose varied considerably between providers even for the same patients.

Cumulative radiation exposure should reduce exposure and risk.

KEYWORDS

• Stiles BM, Mirza F, Towe CW, Ho VP, Port JL, Lee PC, Paul S, Yankelevitz DF, Altorki NK
Cumulative radiation dose from medical imaging procedures in patients undergoing resection for
Time to act
and act TOGETHER

Joint position statement with
WHO/FDA/ ESR/ IOMP/ISRRT
Nationwide PACS- Estonia (1.3m)

- CT, interventional, NM, radiography and mammography (excl. dental) in PACS
  - Government
    - Teaching medical institutions
    - Non-teaching Hospitals
  - Private medical institutes:
  - Private CT clinics:
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<th>Study Date</th>
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Courtesy E Gerrshkevitsh
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<th>DLP (mGy·cm)</th>
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Total Exam DLP: 405.11

1/1

GE MEDICAL SYSTEMS

Courtesy E Gerrshkevish
Gender:
Date of Birth:
Status:
Pregnancy Status: Unknown
Medical Alerts: N/A
Contrast Allergies: N/A

Study Information
Accession Number: EEH21N1110816004
Referring Physician: UNKNOWN
Reason for Study: N/A
Study Date: 18.09.2011
Study Time: 8:39:00
Requesting Physician: UNKNOWN
Study Description: SOMATOSTATINI RETSEPTORITE STSINTIGRAAFIA
Procedure code: 6934
Procedure description: SOMATOSTATINI RETSEPTORITE STSINTIGRAAFIA
Resource Name: UNKNOWN
Modality: CT

Report Information
Report Status: APPROVED
Diagnostic Code: N/A
Impression: N/A
Interpretation Date: N/A
Interpretation Time: N/A
Interpretation Transcribed:

Kogu keha statiitne stsintgraafia Tc-99m - Teknoloogia - 526 MBq
KDJEFECT uuringi nõrkade ja kõhu piirkonnast.

Kliinisest NET?
Kogu keha uuringut visualiseerub fysioloogiline märkumine kogunemine manda, põimas, neerades, kusepõles, toonist viitab intensiivsemast kogunemisest ka kõppaamas.
Aeglaselt põhjustatud märkumine kogunemist ei tõhustada.

SPET/ICT-uuringu visualiseerub preparaadil fysioloogiline kogunemine, aeglaselt preparaadil kogunemist ei sõltu.
Similar Situation but at sub-national level

- Finland
- Denmark
- Malta
- ........about a dozen countries
IAEA Survey for Smart Card/SmartRadTrack Project

76 countries (All of the six most populous countries and 16 of the 20 most populous)
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How useful do you think a radiation exposure tracking program would be (assuming practicalities are attended to)?

- Extremely useful: 28.9%
- Very useful: 60.5%
- Moderately useful: 10.5%
- Mildly useful: 0.0%
- Not useful: 0.0%

Total=76 countries
IAEA Survey in 76 countries

- Eight (11%) countries indicated that such a program is actively being planned and
- 3 (4%) stated that they have a program for tracking procedures only, but not for dose.
- 8 respondents from 8 different countries (Belgium, Bulgaria, Iran, Italy, Lebanon, PR of China, Slovakia and USA), stated that such a program is actively being planned.
• Which types of studies will be tracked?
• What radiation quantities will be tracked?
• Goals of the program: Justification, Optimization, QA, policy development, licensure/certification/regulation, decision support for ordering examinations, risk assessment, research and for population doses.
3.156. The justification of medical exposure for an individual patient shall be carried out through consultation between the radiological medical practitioner and the referring medical practitioner, as appropriate, with account taken, in particular for patients who are pregnant or breast-feeding or paediatric, of:

(a) The appropriateness of the request;
(b) The urgency of the procedure;
(c) The characteristics of the medical exposure;
(d) The characteristics of the individual patient;
(e) Relevant information from the patient’s previous radiological procedures.
PROTECTION OF PATIENTS AND OTHER INDIVIDUALS SUBMITTED TO MEDICAL EXPOSURE

Article 80
Justification

The referrer and the practitioner as specified by Member States, shall seek, where practicable, to obtain previous diagnostic information or medical records relevant to the planned exposure and consider these data to avoid unnecessary exposure.
Clinical responsibility: responsibility regarding individual medical exposures attributed to a practitioner, notably: justification; optimisation; clinical evaluation of the outcome; cooperation with other specialists and the staff, as appropriate, regarding practical aspects; obtaining information, if appropriate, of previous examinations; providing existing medical radiological information and/or records to other practitioners and/or referrer, as required; giving information on the risk of ionising radiation to patients and other individuals involved, as appropriate.
Misconceptions

- Radiation doses on a card with patient
- Card like ATM card or Credit Card
- Acts as digital signature to access information online
IAEA launches project to develop methodologies to track radiation exposure of patients for Radiation SmartCare

Although the scope of the Smart Card project that was initiated by the IAEA in 2006 was comprehensive, it tended to give a narrow impression and, thus, the new name Smart Card/SmartRadTrack has been adopted. It includes following possibilities:

a. An electronic card that contains a patient's information, including radiation exposure history.
b. A card only as a digital signature to access the radiation exposure data that is actually available online. A patient-accessible website can serve as a 'virtual' card.
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d. In countries where neither an electronic card nor e-health record is feasible, a methodology to achieve information on tracking all radiological procedures, such as a radiation passport, somewhat like a vaccination card, could be initiated.

The project is aimed at:

Project in part by Extra budgetary grant from U S Govt.
Tracking radiation exposure of patients

As recently as only 6 years ago, it was not possible to come across a radiation-induced skin injury (erythema such as a burn, or hair loss) to a patient resulting from CT. However, in 2009–10, overexposure of about 400 patients undergoing brain-perfusion CT protocols, resulting in hair loss or skin redness in some patients, was brought to the attention of the US Food and Drug Administration and in media reports. 20 years ago, it was not possible to come across a patient who had undergone scores of CT scans in a few years, especially the patient without cancer. Did we see this coming? The answer is largely “no” for visible radiation effects and “probably yes” for usage. In view of these recent events, what might be the scenario in a few years? There are no indications that the increase in CT use will decrease. On the contrary, CT might replace some traditional fluoroscopy-based angiographic procedures. The medical profession has a responsibility to account for radiation exposure from medical imaging.

What are the risks and are the risks real? Essentially there are two types of radiation effects. Ones that are visible, documented, and confirmed (deterministic effects:...
Foremost necessity

Use of Patient Identifier
ASOCIACIÓN ESPAÑOLA
Primera de Socorros Mutuos
Bulevar Artigas y Palmar - MONTEVIDEO

Información Ecográfica

Nombre: [nombre] Nro. Usuario: 0123467892
Matrícula: 261391 Edad: 34 C.I.: 1170447-9
Fecha Ejecución: 19/12/2007 Hora Ejecución: 08:25
Medico solicitante: [nombre] N.C. 10445
Tipo de ecografía: APARATO URINARIO

Riñón derecho:
De 119 mm. Long., con un espacio parasanguinoluto de 10 mm.

INFORME DE ECOGRAFÍA

DOMICILIO: SORIANO 1064 EIS/101
NUMERO DE HISTORIA: 1170447

Céd.Ident: 1157368-2
36 Countries who responded to IAEA survey

Algeria, Argentina, Armenia, Bosnia and Herzegovina, Bulgaria, Colombia, Costa Rica, Czech Republic, Egypt, Estonia, Finland, Greece, Honduras, Hong Kong (China), Ireland, Kenya, Lithuania, Malaysia, Macedonia, Malta, Mexico, Moldova, Montenegro, Portugal, Nicaragua, Romania, Russian Federation, Serbia, Singapore, Slovakia, Slovenia, Spain, Sri Lanka, Sudan, Tajikistan, Tanzania, Uruguay
Is there a unique permanent identification number for every person in the country valid for life?

- Yes: 81%
- No: 19%

Total: 36
Is this permanent number used for X ray examinations whenever a person visits a hospital?

- YES: 44%
- NO: 56%

Total=36
If this number is NOT used, it is because of:

- Confidentiality issue of patient: 8%
- Lack of technology: 92%

Percentages out of 20 answers!!
Most basic: paper card

Like Vaccination card

Merits:

• Helps tracking of individual exposure history
• Can serve a great deal of purpose
• Is very good so long as it is maintained and used

Demerits:

• Record is only with patient, not with health care system
• Is highly dependent upon patient and health care provider
IAEA X-ray record card

Actions on Patient ID
Actions on data collection on repeated examination
Where are we now?
Unique Card Number

• World Population 6.7 billion
• Credit Cards have already 16 digits. That can cover all people in world
• BUT health system unfortunately has not been as sexy to global service providers as financial
Issues nearly Resolved

• Use of reference dose quantities (e.g. DLP & CTDI in CT; KAP & CAK in fluoroscopy …)
• CT & fluoroscopy have dose displays & records
• DICOM- communication of images
• IHE- Structured dose reports, REM communication of dose
The Need for an Integrated Approach to Tracking Radiation Exposure: Challenges with Nuclear Medicine

M Mercuri, M Rehani, A Einstein

Paper under Communication
Practicability issues largely unresolved

- Use of patient identifiers
- Off line studies
- Nuclear Medicine
European Commission planning to give patients secure access to digital health records by 2015

European Commission Information Society & Media DG | information technology (IT) | 10/25/2010

HAMBURG, GERMANY – (HealthTech Wire / PremiumPro) – The European Commission’s Digital Agenda for Europe (DAE) is a flagship initiative of the EU 2020 strategy, which focuses on sustainable growth through ICT. eHealth is a key part of it, said Flora Girogio of the EC’s ICT for Health unit, speaking at the Global eHealth Forum in Hamburg today. The DAE will develop the necessary infrastructure.

There are seven pillars, which encompass issues ranging from developing interoperability and standards to ultra fast Internet access, digital literacy and eGovernment solutions. The EC invests €11 billion until 2020 in driving and developing Europe’s digital infrastructure. The goal is to raise Internet coverage to 100% by 2013 and to facilitate data exchange at greater than 30 Mbps by 2020. Standards and interoperability among IT systems across Member States is another major concern of the DAE, and by 2012 a minimum set of common patient data should be available for interoperable patient records. The EC-funded eSOS project, involving 12 Member States, has launched a pilot project in this area. Girogio also announced that a Memorandum of Understanding is to be signed between the United States and Europe in around four months on the interoperability of health data exchange.

Story Highlights

› EC to invest €11 billion in driving and developing Europe’s digital infrastructure
› “In Europe, healthcare is a human right.”
› Europeans will get secure online access to their medical health data by 2015

MoU US & Europe for health care data exchange
PATIENT EXPOSURE TRACKING: THE IAEA SMART CARD PROJECT

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Recommendations from Meeting of the IAEA

Smart Card/SmartRadTrack Project
25-27 January, 2010


• Action for manufacturers
• Government
• Appropriate groups, professional societies and organizations, and regulatory bodies
What do referring physicians think?
## Referring physicians

<table>
<thead>
<tr>
<th>Country</th>
<th>Resp.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Czech Republic</td>
<td>175</td>
<td>28.14%</td>
</tr>
<tr>
<td>Finland</td>
<td>90</td>
<td>14.47%</td>
</tr>
<tr>
<td>India</td>
<td>51</td>
<td>8.20%</td>
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<tr>
<td>Pakistan</td>
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<tr>
<td>Croatia</td>
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</tr>
<tr>
<td>FYR Macedonia</td>
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<tr>
<td>Brazil</td>
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</tr>
<tr>
<td>Indonesia</td>
<td>24</td>
<td>3.86%</td>
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<tr>
<td>Philippines</td>
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<tr>
<td>Iran</td>
<td>16</td>
<td>2.57%</td>
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<tr>
<td>Kazakhstan</td>
<td>15</td>
<td>2.41%</td>
</tr>
<tr>
<td>Hungary</td>
<td>14</td>
<td>2.25%</td>
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<tr>
<td>Malaysia</td>
<td>14</td>
<td>2.25%</td>
</tr>
<tr>
<td>Lebanon</td>
<td>12</td>
<td>1.93%</td>
</tr>
<tr>
<td>USA</td>
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</tr>
<tr>
<td>Sri Lanka</td>
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<td>P.R. China</td>
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<td>0.80%</td>
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<tr>
<td>Republic of Moldova</td>
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<tr>
<td>Georgia</td>
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<tr>
<td>Lithuania</td>
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<tr>
<td>Australia</td>
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<tr>
<td>Bulgaria</td>
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<tr>
<td>Ireland</td>
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</tr>
<tr>
<td>Spain</td>
<td>1</td>
<td>0.16%</td>
</tr>
<tr>
<td>UK</td>
<td>1</td>
<td>0.16%</td>
</tr>
</tbody>
</table>

622 physicians from 28 countries
How often in your clinical practice do you think knowing history of previous CT scans will help in making a better decision?

- Always: 23.0%
- Mostly: 49.0%
- Occasionally: 21.1%
- Rarely: 6.9%
Do you think having a system by which you have quick information about patients dose history will be helpful?

- Yes: 60.6%
- Maybe: 31.4%
- Not really: 7.9%
- No answer: 0.2%
We are in a situation where turning back is Not possible
Recap

- 2006 vs 2012
- Current momentum, series of studies
- IAEA survey: 76 countries-status & interest
- IAEA & EU requirements
- Patient identifier
- Issues nearly resolved & unresolved
- Referring physician’s survey: IAEA
Thank You

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IAEA
Atoms for Peace: The First Half Century