MEDICAL EXPOSURE IN 2016 IN ROMANIAN RADIOLOGICAL DEPARTMENTS

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PURPOSE

- Improvement of existing methodological framework for medical exposure surveillance in order to reduce the risk associated with X-ray diagnostic medical exposure and to optimize the quality of the radiological act.
INTRODUCTION: LEGAL BASIS AND RESPONSIBILITIES

- National legal framework harmonized with the Community provisions stipulate the obligation and responsibility of the public health network to ensure the radiological protection of the patient during the medical exposures to ionizing radiation.

- A survey of medical exposure of the Romanian population is performed annually, in accordance with Romanian regulations and European Directive 2013/59 Euratom.

- The mechanism for collecting and reporting the patient doses at the national level, was established by the MoH Orders no. 1542/2006, no. 1003/2008 and no. 1255/2016.
INTRODUCTION: LEGAL BASIS AND RESPONSIBILITIES

• The centralized data, at the hospital level, are reported quarterly by the licensee to Radiation Hygiene Laboratory of the Public Health Departments, depending on the territorial assignation.

• Ministry of Health through the National Institute of Public Health - Bucharest Regional Centre for Public Health, centralizes the data of medical exposure to ionizing radiation reported by Radiation Hygiene Laboratory of the local Public Health Departments from counties and Bucharest, and elaborates an annual report.

• Medical exposure level is expressed in terms of annual collective dose and is estimated from annual frequencies and the mean effective dose per procedure for different types of radiological procedures.
INTRODUCTION: LEGAL BASIS AND RESPONSIBILITIES

Hospital Reporting Form

Territorial Ionizing Radiation Hygiene Laboratory (RHL)
Ministry of Health

NATIONAL DOSE REGISTRY

Ionizing Radiation Hygiene Laboratory Network

LEVEL 1

LEVEL 2

LEVEL 3
METHOD

• Observational descriptive study, in transversal approach based on reported data by the radiological departments from Romanian hospitals during 2016, centralized at county level and reported to the National Institute of Public Health.

• In conformity with the national regulations, for each type of examination assessed variables were:

  ✓ total number of exams and their distribution per age and gender groups

  ✓ estimated average values for DAP (dose-area product), DLP (dose-length product), in case of CT exams and MGD (mean glandular dose), in case of mammography

  ✓ mean effective doses, calculated using the conversion coefficients from NRPB R262

  ✓ annual collective dose, determined from the mean effective doses and the frequencies for each type of radiological examination
RESULTS

- The radiological examinations were grouped in five categories: radiography (including dental), fluoroscopy, computed tomography, cardiology and non-cardiology interventional radiology.

- A total of 5,938,451 radiological procedures were reported:
  - 5,007,458 exams for radiography (including 864,390 dental),
  - 383,536 exams for fluoroscopy,
  - 503,337 CT exams,
  - 28,252 cardiology interventional radiology procedures and
  - 15,868 non-cardiology interventional radiology procedures.

- The reporting rate (as ratio of reporting units and total authorized units) is 75% for radiography (40% for dental), but only 25% for CT exams and 30% for interventional radiology, meaning that the actual number of annual radiological consumption is much higher than the results from report.
# RESULTS - Mean effective dose (mSv) per examination type for the main X-ray procedures

<table>
<thead>
<tr>
<th>Conventional Radiology</th>
<th>Computed Tomography</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination Type</td>
<td>Mean Effective Dose (mSv)</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>Head</td>
<td>0.045</td>
</tr>
<tr>
<td>Thorax (AP) 0.066 (LAT) 0.107</td>
<td>Thorax 11.96</td>
</tr>
<tr>
<td>Abdomen</td>
<td>0.345</td>
</tr>
<tr>
<td>Pelvis and hip</td>
<td>0.414</td>
</tr>
<tr>
<td>Arms and Legs</td>
<td>0.003</td>
</tr>
<tr>
<td>Cervical Spine</td>
<td>0.063</td>
</tr>
<tr>
<td>Lumbar Spine (AP) 0.270 (LAT) 0.365</td>
<td>Trunk (thorax, abdomen, pelvis) 36.25</td>
</tr>
<tr>
<td>Thoracic Spine (AP) 0.220 (LAT) 0.221</td>
<td>Whole body (Head, trunk) 43.22</td>
</tr>
<tr>
<td>Breast (CC) 0.208 (MLO) 0.227</td>
<td></td>
</tr>
<tr>
<td>Thorax (fluoroscopy)</td>
<td>0.227</td>
</tr>
<tr>
<td>Ba-meal (fluoroscopy)</td>
<td>1.092</td>
</tr>
<tr>
<td>Ba-emena (fluoroscopy)</td>
<td>0.603</td>
</tr>
</tbody>
</table>
RESULTS – Contribution of X-ray examinations to collective effective dose estimated for reported radiological procedures

- CT Abdomen
- CT Thorax
- CT Abdomen+Pelvis
- CT Trunk
- CT Head
- CT Pelvis
- CT Lumbar Spine
- CT Thorax+Abdomen
- RX Lumbar Spine
- CT Cervical Spine
- Cardiac Angiography
- CT Whole Body
- PTCA
- RX Pelvis
- RX Thorax
- Fluoro Thorax
- Fluoro Gastroduodenal
- RX Abdomen
RESULTS

- The estimated values of mean effective dose for radiography and fluoroscopy are less than the typical effective dose in European countries (RP 180 “Medical Radiation Exposure of the European Population”), but the estimated values of mean effective dose for CT examinations are much higher than the typical effective dose in European countries.

- The annual collective dose estimated for reported radiological procedures:
  - 1.198 mSv/capita – Computed tomography examinations
  - 0.041 mSv/capita – Radiography examinations
  - 0.036 mSv/capita – Fluoroscopy examinations
  - 0.023 mSv/capita – Interventional radiology procedures

- Computed tomography contribution to annual collective dose is 1.198 mSv/capita, total annual collective dose for all radiological examinations being 1.298 mSv/capita.
DISCUSSION AND CONCLUSIONS

- The most important contributions to the collective effective dose (87%) are from CT exams (abdomen, pelvis, thorax, abdomen-pelvis, trunk or whole body, followed at a distance by the cardiac angiography and angioplasty, radiography and fluoroscopy examinations (radiography of lumbar spine, pelvis, thorax, abdomen and the fluoroscopy of thorax and gastrointestinal tract).

- Based on these results, special attention should be given to the justification process for each CT examination.

- CT exams, especially for vulnerable groups (children, pregnant) must be perfectly justified for each individual patient and, in the same time, CT protocols must be optimized (low dose protocols).

- In the case of interventional radiology procedures, despite the high doses, the contribution to collective dose is lower than for CT because the frequency of these procedures is very much lower.