This study was aimed at assessing the current practice in paediatric computed tomography (CT) examinations in one hospital in Bulgaria and providing information on how the paediatric CT protocols have been optimised to reduce patient dose. The frequency of paediatric CT examinations was explored for a period of three years. Age-based protocols were used for head CT, leading to protocols have been optimised to reduce patient dose. The frequency of paediatric CT examinations.

**Head CT: Exposure factors and dose values for child 1-5 yr**

**Table 1:** Number of paediatric patients for the past years (0-15 years)

<table>
<thead>
<tr>
<th>Year</th>
<th>No of patients (0-15y)</th>
<th>Head CT</th>
<th>Abdomen &amp; Thorax CT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>75</td>
<td>65</td>
<td>10</td>
</tr>
<tr>
<td>2011</td>
<td>60</td>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>83</td>
<td>70</td>
<td>13</td>
</tr>
</tbody>
</table>

**Head CT: Exposure factors and dose values for 0-1 m infants**

<table>
<thead>
<tr>
<th>Patient No</th>
<th>Year of examination</th>
<th>Age (age group)</th>
<th>kV</th>
<th>mA</th>
<th>mAs</th>
<th>Trot (s)</th>
<th>Beam width (mm)</th>
<th>CTDIvol (mGy)</th>
<th>DLP (mGy.cm)</th>
<th>No of slices</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2010</td>
<td>(&lt;1m)</td>
<td>120</td>
<td>150</td>
<td>75</td>
<td>0.5</td>
<td>0.5x32</td>
<td>25.8</td>
<td>260.3</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>2011</td>
<td>(&lt;1m)</td>
<td>120</td>
<td>150</td>
<td>75</td>
<td>0.5</td>
<td>0.5x32</td>
<td>25.8</td>
<td>260.3</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>2012</td>
<td>(&lt;1m)</td>
<td>120</td>
<td>150</td>
<td>75</td>
<td>0.5</td>
<td>0.5x32</td>
<td>25.8</td>
<td>260.3</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>2013</td>
<td>(&lt;1m)</td>
<td>120</td>
<td>150</td>
<td>75</td>
<td>0.5</td>
<td>0.5x32</td>
<td>25.8</td>
<td>260.3</td>
<td>16</td>
</tr>
</tbody>
</table>

**Head CT: Exposure factors and dose values for 1-5 yr**

<table>
<thead>
<tr>
<th>Patient No</th>
<th>Year of examination</th>
<th>Age (age group)</th>
<th>kV</th>
<th>mA</th>
<th>mAs</th>
<th>Trot (s)</th>
<th>Beam width (mm)</th>
<th>CTDIvol (mGy)</th>
<th>DLP (mGy.cm)</th>
<th>No of slices</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2010</td>
<td>(1-5y)</td>
<td>120</td>
<td>150</td>
<td>75</td>
<td>0.5</td>
<td>0.5x32</td>
<td>25.8</td>
<td>260.3</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>2010</td>
<td>(5-10y)</td>
<td>120</td>
<td>210</td>
<td>105</td>
<td>0.5</td>
<td>0.5x32</td>
<td>36.1</td>
<td>526.8</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>2010</td>
<td>(10-15y)</td>
<td>120</td>
<td>210</td>
<td>105</td>
<td>0.5</td>
<td>0.5x32</td>
<td>36.1</td>
<td>526.8</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>2012</td>
<td>(10-15y)</td>
<td>120</td>
<td>210</td>
<td>105</td>
<td>0.5</td>
<td>0.5x32</td>
<td>36.1</td>
<td>526.8</td>
<td>25</td>
</tr>
<tr>
<td>5</td>
<td>2013</td>
<td>(10-15y)</td>
<td>120</td>
<td>210</td>
<td>105</td>
<td>0.5</td>
<td>0.5x32</td>
<td>36.1</td>
<td>526.8</td>
<td>25</td>
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</tbody>
</table>

**Head CT: Exposure factors and dose values for 5-10 yr**

<table>
<thead>
<tr>
<th>Patient No</th>
<th>Year of examination</th>
<th>Age (age group)</th>
<th>kV</th>
<th>mA</th>
<th>mAs</th>
<th>Trot (s)</th>
<th>Beam width (mm)</th>
<th>CTDIvol (mGy)</th>
<th>DLP (mGy.cm)</th>
<th>No of slices</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2010</td>
<td>(10-15y)</td>
<td>120</td>
<td>210</td>
<td>105</td>
<td>0.5</td>
<td>0.5x32</td>
<td>36.1</td>
<td>526.8</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>2010</td>
<td>(10-15y)</td>
<td>120</td>
<td>210</td>
<td>105</td>
<td>0.5</td>
<td>0.5x32</td>
<td>36.1</td>
<td>526.8</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>2010</td>
<td>(10-15y)</td>
<td>120</td>
<td>210</td>
<td>105</td>
<td>0.5</td>
<td>0.5x32</td>
<td>36.1</td>
<td>526.8</td>
<td>25</td>
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<tr>
<td>4</td>
<td>2010</td>
<td>(10-15y)</td>
<td>120</td>
<td>210</td>
<td>105</td>
<td>0.5</td>
<td>0.5x32</td>
<td>36.1</td>
<td>526.8</td>
<td>25</td>
</tr>
<tr>
<td>5</td>
<td>2010</td>
<td>(10-15y)</td>
<td>120</td>
<td>210</td>
<td>105</td>
<td>0.5</td>
<td>0.5x32</td>
<td>36.1</td>
<td>526.8</td>
<td>25</td>
</tr>
</tbody>
</table>

**Paediatric abdomen and thorax examinations are rare and when carried out they are cardiac examinations.**

**2. Information to indicate how radiation protection is promoted and practised**

The Bulgarian translation of the Image Gently leaflet, as well as our own materials and information about the risks and benefits from medical exposure are available on the following websites:

- [http://www.youtube.com/watch?v=npDP1W9rgKY](http://www.youtube.com/watch?v=npDP1W9rgKY)

**3. How radiation protection during paediatric CT is practised in the facility**

In this hospital there are dedicated and optimised scanning protocols available for paediatric examinations, as well as indication-based protocols. The scout image and the CT scan of the paediatric abdomen are extended to the diaphragm. Automatic exposure control (AEC) used for abdomen and thorax CT. Dose to the eyes in head axial scan is reduced by angling the beam to avoid irradiation of the eyes. Because of the cardiac profile of this hospital, the patients undergoing CT are children in poor health. If they are not in a coma, they are sedated and axial mode is used for head CT. Straps are also used for immobilisation. There are a few cases of medical and parents support in the CT room. Medical staff give support in cases of poor sedation and halocel mode is used. If support is needed lead protective shielding is always used. Usually parents are not allowed to stay in the CT room. Whenever possible, lead shielding is used to protect patients. A medical physicist participates in radiation protection optimisation.

Low dose protocols for paediatric abdomen and thorax examinations using 80 kVp were available, but after the replacement of the x-ray tube the calibration failed on 80 kVp. The engineers have not been able to solve the problem and this voltage cannot be used any more.

**4. Assessment of the number of paediatric CT examinations that lack appropriateness**

MRI is not available in the hospital. The radiologists’ opinion (for the data collected by myself) is that all paediatric CTs were appropriate.

**5. Data on the percentage of dose reduction in CT of children**

After our evaluation, this CT room was pointed as a room with good practice (optimised CT protocols).

**6. How we child size our CT imaging**

For head CT – the protocols are age based (0-3 years; 3-12 years). A survey was performed for the child size for different ages and the conclusion suggested that it is better for head CT to create small variations in dose within the same age group for a given procedure. It can be shown that this CT unit follows best practice and no dose reduction strategy has been implemented.