



# Survey of practice in pediatric computed tomography

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# Introduction

CT is a major diagnostic tool in children, and when performed for appropriate indications with proper technical parameters, the benefits far exceed the very small individual risk. Children are more sensitive to radiation than are adults, and are likely to have a life expectancy so that any radiation-induced cancer would be expressed. The technique factors used in pediatric CT can and should be reduced in comparison with adult technique factors because smaller patients attenuate fewer x-rays. It is important to reduce radiation dose but still maintain acceptable (diagnostic) image quality.

# Purpose

The purpose of this study was to assess the current practice in pediatric computed tomography (CT) examinations in several hospitals in Bulgaria.

## Materials and Methods

- The standard forms provided by the IAEA for survey of the pediatric CT practice were used.
- 13 radiologists and 12 radiographers from 12 CT rooms filled two different questionnaires about their practice.
- Third form was used to collect information:
  - about the type of the CT scanner;
  - the number of pediatric examinations in year;
  - the routine protocols used for different age groups;
  - the patient doses in terms of CT dose index (CTDI).

# Results

X-ray unit	2007						2009					
	adults			children			adults			children		
	Head	Thorax	Abdomen	Head	Thorax	Abdomen	Head	Thorax	Abdomen	Head	Thorax	Abdomen
Paz_Tos_300_1	45	10	30	-	-	-	50	20	45	-	-	-
Sof_Tos_Aqu_2	-	-	-	-	-	-	-	-	-	-	-	-
Plo_Sie_SOM_3	-	-	-	-	-	-	3600			27	2	2
Plo_Sie_SOM_4	-	-	-	304	29	98	-	-	-	82	7	-
Sof_Tos_Aqu_5	-	-	-	-	-	-	-	-	-	-	-	-
Sof_Pic_200_6	1853	106	362	39	3	7	2116	324	443	33	3	4
Pop_Pic_PQ_7	201	9	8	-	-	-	281	15	13	-	2	3
Rus_GE_Bri_8	-	-	-	-	-	-	-	-	-	-	-	-
Sof_Hit_CT_9	21	100	-	14	13	-	2661	43	13	992	3	0
Vra__10	-	-	-	-	-	-	-	-	-	-	-	-
Plo_GE_CT_11	-	-	-	-	-	-	2884	903	1426	160	30	53

- 6 hospitals responded about the frequency of the pediatric head, chest and abdomen CT examinations performed in 2009;
- the number of procedures ranged from 5 to 995 per center.

# Results

X-ray unit	ADULT: CTDIvol (mGy)			children: CTDIvol (mGy)											
				<1 y			1-5 y			5-10 y			10-15 y		
	H	T	A	H	T	A	H	T	A	H	T	A	H	T	A
Sof_Tos_Aqu_2	100.7/67.1	21.9	21.9	25.8	10.7	10.7	25.8	10.7	10.7	-	7.6	7.6	-	11.9	11.9
Plo_Sie_SOM_3	51.9	15.41	5.93	-	-	-	29.7	3.44	3.81	-	-	-	-	-	-
Sof_Tos_Aqu_5	100.7/67.1	21.9	21.9	-	40.1	40.1	-	40.1	40.1	-	-	-	-	-	-
Rus_GE_Bri_8	75.27/66.9	10.46	8.7	21.46	9.12	11.48	33.77	4.25	4.76	24.68/34.33	-	-	-	-	-
Plo_GE_Bri_12	118.14/35.29	17.76	9.28	-	-	10.81	33.77	-	-	-	-	-	-	-	-

- Large variations in dose were found:
  - ✓ up to factor of 4 – 10, among the centers within the same age group for a given procedure;
  - ✓ the pediatric dose being twice higher the adult dose in one of the hospitals.

# Results

- Dedicated pediatric CT rooms do not exist in Bulgaria.
- Seven departments use dedicated CT protocols for children but in only 67% of the CT rooms indication based protocols are used.
- The decision to perform CT examination is taken by:
  - referring clinician in 30,8%;
  - by radiologist in 7,7% ;
  - by both in 61,5%.

# Results

- Previous images and/or patient dose records are not typically required when refereeing to CT;
- In 50% of cases the scout image is performed in AP projection, in 42% – in lateral or both and 8% of the radiographers don't know it (in the cases when only the radiologist works with the CT equipment);
- 41,7% of radiographers answered that in more than 50% of cases sedation is used for small children (<5 years), 41,7% - it is used in less than 50% and 16,7 % - it is always used.



# Results

- 41,7 % of the radiographers indicated that they keep records of patient dose, 33,3 % - don't keep and 25 % answered that they don't know.
- Bismuth shields to reduce dose to the breast or to the eye are not used and they are not known in the country.

# Conclusions

- The collected detailed data provided preliminary information how the patient doses in pediatric CT can be reduced.
- Recommendations were given based on the findings:
  - for alternative use of safer non-ionising techniques (US and MRI);
  - or use of low dose x-ray techniques;
  - use of proper patient immobilization and shielding;
  - better optimization of scanning protocols.