

Local paediatric DRLs for CT examinations in Athens. Where are we now?

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Aims and objectives

Methods and materials

Patient cohort: The study enrolled 851 pediatric patients who underwent head, neck, internal auditory canal (IAC), chest, and abdomen-pelvis (AP) CT examinations over an 11-month period at a dedicated children's hospital. Patients' characteristics are summarized on Table 1.

CT data acquisition: All CT examinations were performed on a 16-multidetector CT with the use of age-based protocols and automatic exposure control. Patients were scanned using iterative reconstruction algorithm (blend of 60% adaptive statistical iterative reconstruction and 40% filtered back projection). Head CT scans were performed in axial mode using a 2.5 mm slice thickness from the skull base to cerebellum tentorium and a 5 mm slice thickness from cerebellum tentorium to vertex. All other types of CT examinations were performed using helical mode.

CT dose indices: For the determination of DRLs, volume CT dose index (CTDIvol) and Dose Length Product (DLP) were retrospectively derived from the dose report stored in the hospital's Picture Archiving and Communication System (PACS). DRLs were set at the 75th percentile (3rd quartile) of CTDIvol, DLP per acquisition and total DLP. For the head, neck and IAC CT examinations, DRLs are referenced to the 16-cm-phantom and for the body (chest and AP) to the 32-cm-diameter phantom.

Table 1. Patients' characteristics.

CT Examination	Age group	Number of examinations	Number of acquisitions	Male/ Female	Age (yr)	Weight (kg)	Height (m)
Head	0-18 months	81	89	52/29	0.6±0.6	8.8±8.5	0.7±0.2
	18 months-5 y	99	110	60/39	3.3±1.1	15.7±5.3	1.0±0.1
	5-15 y	301	335	185/116	10.1±2.9	40.2±15.8	1.4±0.2
Neck	0-18 months	2	2	0/2	0.7±0.3	9.5±0.7	0.7±0.1

	18 months-5 y	10	17	7/3	3.6±1.1	18.0±6.0	1.0±0.2
	5-15 y	32	44	14/18	12.0±3.0	46.6±19.1	1.5±0.1
IAC	0-18 months	8	8	5/3	1.0±0.2	8.6±1.7	0.7±1.0
	18 months-5 y	19	24	11/8	3.0±1.1	14.8±3.4	1.0±0.1
	5-15 y	24	24	11/13	9.8±2.9	35.0±13.4	1.4±0.2
Chest	0-5 y	66	97	46/20	2.8±1.8	12.7±6.1	0.9±0.2
	5-16 y	147	187	91/56	11.7±3.2	47.0±19.3	1.5±0.2
AP	0-5 y	22	40	9/13	2.6±1.7	13.4±5.5	42.4±16.4
	5-16 y	40	64	16/24	10.6±2.9	0.9±0.3	1.5±0.2

Results

In the cohort participated 507 male (60%) and 344 (40%) female pediatric patients. 57% (481/851) of examinations were of head, 25% (213/851) of chest, 7% (62/851) of AP, 6% (51/851) of IAC and 5% (44/851) of neck. Two-phase CT scans were performed in approximately 22% of children.

Overall, across all age groups, DRLs ranges for CTDIvol were (23-68), (9-21), (37-44), (2-4), (2-3) mGy; for DLP per acquisition (370-705), (150-427), (235-273), (40-132), (70-132) mGy*cm and for total DLP (451-825), (259-536), (273-398), 51-150), (146-238) mGy*cm for head, neck, IAC, chest and AP CT examinations, respectively.

Figures 1-3 present the derived age-based DRLs in terms of the 75th percentile of 1) CTDIvol, 2) DLP per acquisition and 3) total DLP, for the five types of CT examinations.

According to European Guidelines on DRLs for Pediatric Imaging [2], at least 10 patients per type of CT examination per age group are needed to determine DRLs. Therefore, DRLs for smaller sample size are not presented (neck and IAC examinations 0-18 months age group, see Table 1).

Images for this section:

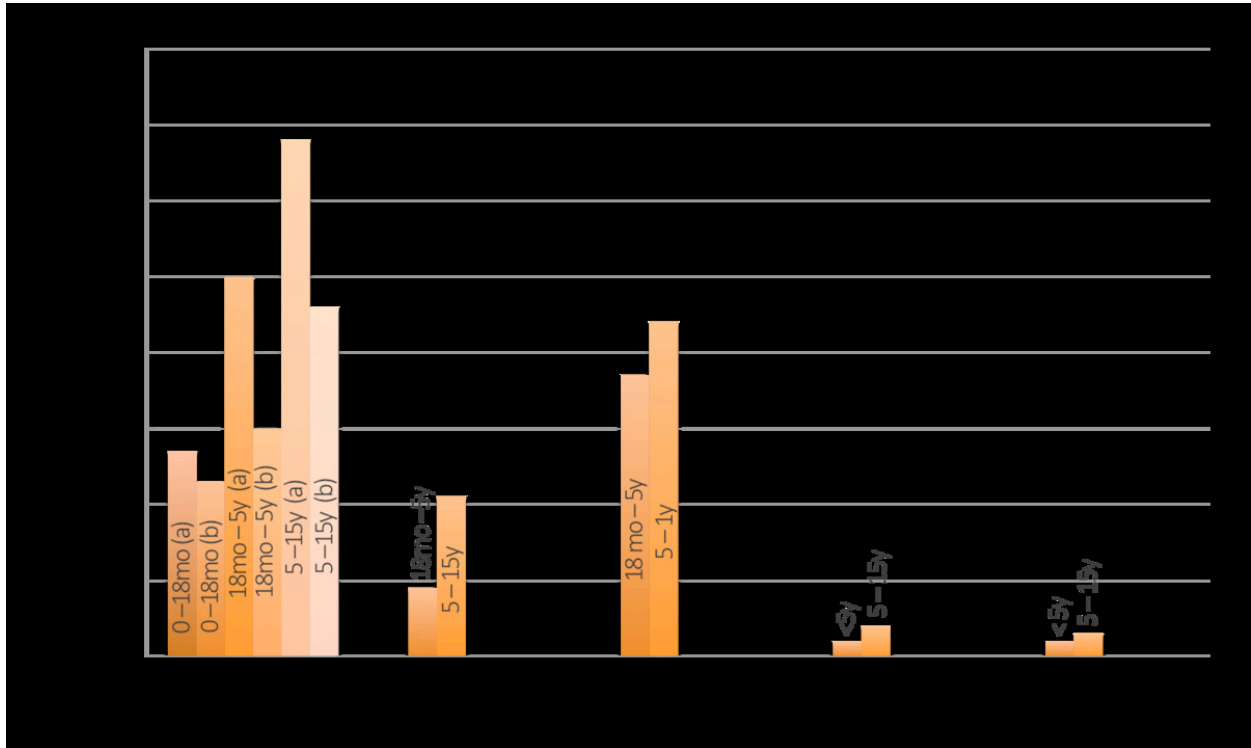


Fig. 1: Figure 1 presents the derived age-based DRLs in terms of the 75th percentile of CTDIvol (a: refers to CTDIvol using a slice thickness of 2.5 mm, b: refers to CTDIvol using a slice thickness of 5.0 mm, mo: months, y: years, IAC: internal auditory canal, AP: abdomen-pelvis)

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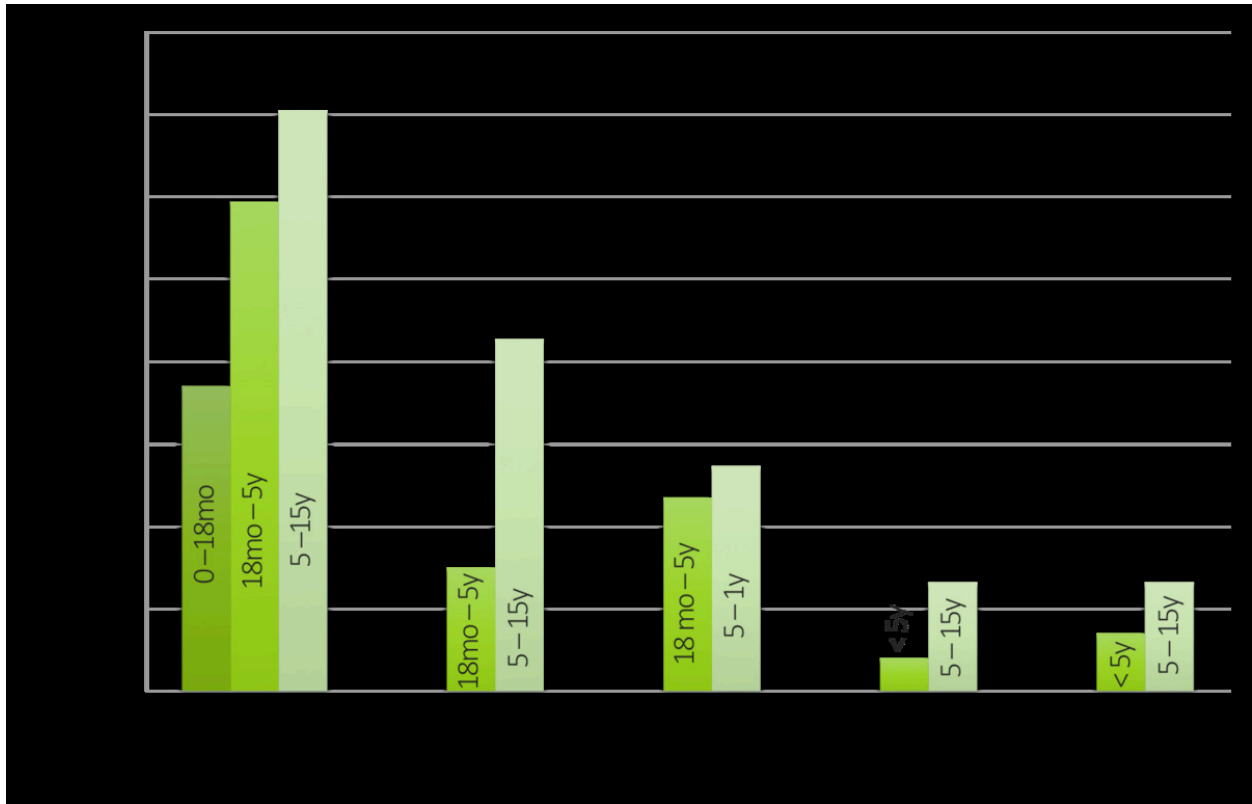


Fig. 2: Figure 2 presents the derived age-based DRLs in terms of the 75th percentile of DLP per acquisition (mo: months, y: years, IAC: internal auditory canal, AP: abdomen-pelvis)

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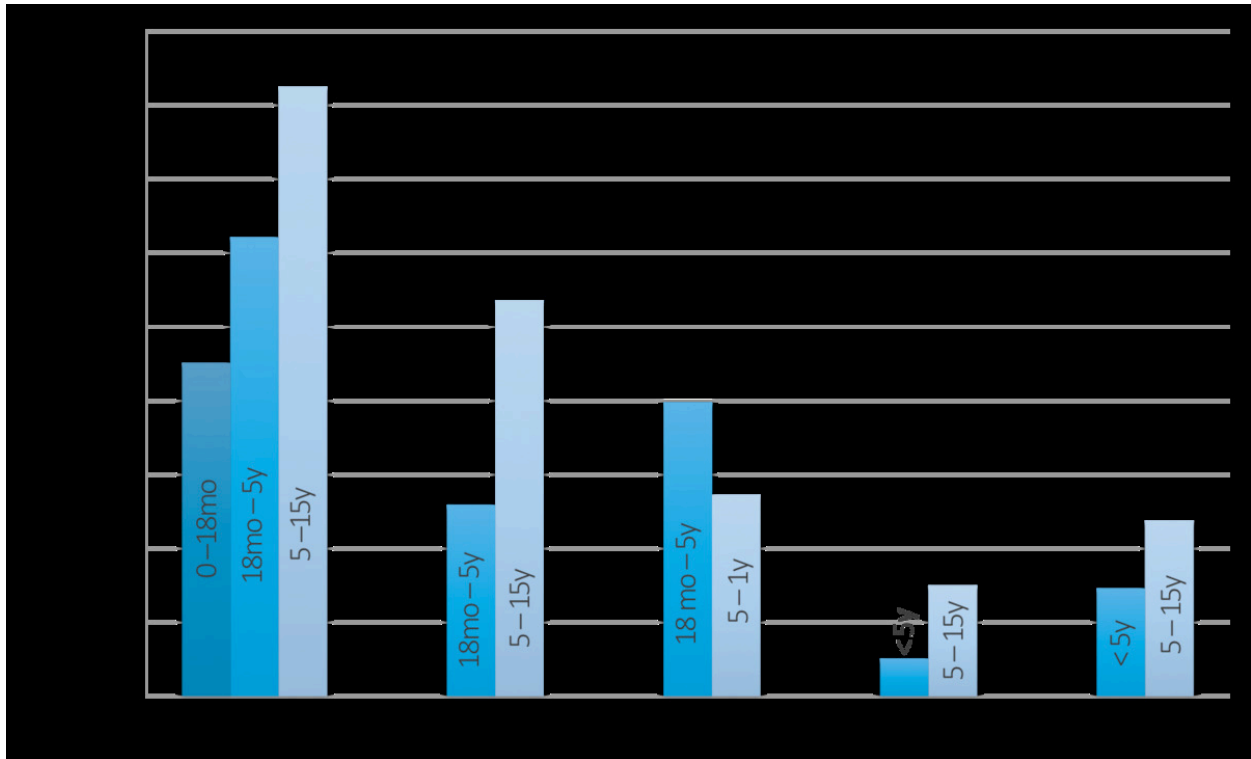


Fig. 3: Figure 3 presents the derived age-based DRLs in terms of the 75th percentile of total DLP (mo: months, y: years, IAC: internal auditory canal, AP: abdomen-pelvis)

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Conclusion

References

1. Miglioretti DL, Johnson E, Williams A, et al. The use of computed tomography in pediatrics and the associated radiation exposure and estimated cancer risk. *JAMA Pediatr.* 2013;167(8):700-7.
2. European Commission. European Guidelines on Diagnostic Reference Levels for Paediatric Imaging. Radiation Protection No 185; 2018.
3. European Council Directive 2013/59/Euratom on basic safety standards for protection against the dangers arising from exposure to ionising radiation and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom. *OJ of the EU. L13; 57: 1-73* (2014).