Implementation of a dose data collection software system: structure of data and CT preliminary results.

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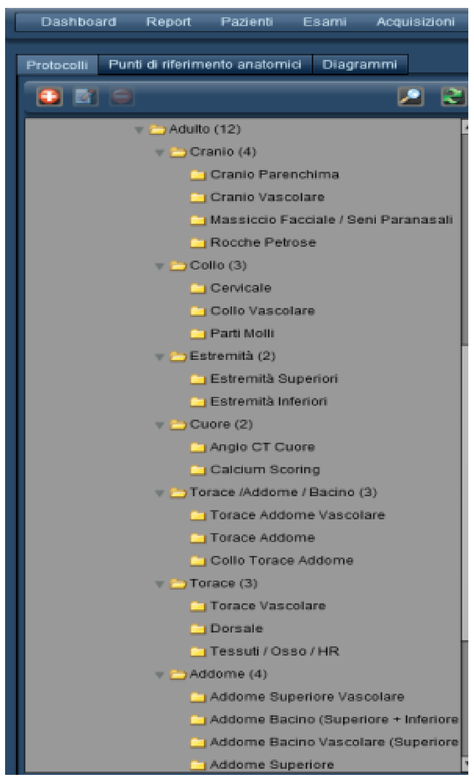
PURPOSE

CT protocols review and optimization require a considerable amount of time and dedicated staff especially to compare dose levels among multicenter institutions and with national and international average dosimetric values. The purpose of this work is to describe the structure of data collection for a dose radiation tracking software used to analyse a large amount of CT dose data. This should be done in order to audit scanner protocols, improve staff and patient safety and optimize all the diagnostic workflow.



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N. di fascicolo:
Redatto:
N. di revisione

R-06-06ini
01.04.2010

Circolare R-06-06
Valori diagnostici di riferimento nella tomografia computerizzata

Tabella 1: VDR e obiettivi per adulti

	Esame / accertamento	VDR (75 percentile) $CTDI_{vol}$ [mGy]	VDR (75 percentile) PDL [mGy·cm]	Obiettivo (25 percentile) $CTDI_{vol}$ [mGy]	Obiettivo (25 percentile) PDL [mGy·cm]
1	**Cranio / parenchima cerebrale** Accertamenti standard, ricerca di metastasi, ascesso, ...	65	1000	45	600
2	**Cranio (vascolare)** Emorragie, ricerca aneurismi, malformazioni artero-venose), ...	65	1000	45	600
3	**Massiccio facciale, seni** Traumatismo, sinusite, ...	25	350	10	150
4	**Base cranica, rocche petrose** Traumatismo, fratture, colesteatoma, ...	50	250	35	200
5	**Collo, colonna cervicale (parti molli, osso)** Adenopatia, ricerca di ascessi, ...	30	600	15	250
6	**Collo (vascolare)** Angio-CT, dissezione, ...	20	500	10	350
7	**Spalla (parti molli, osso)** Traumatismo, artro-CT, ...	30	500	15	250
8	**Torace (tessuti, osso, HR)** Infiltrati, adenopatie, ricerca di focolai, ...	10	400	5	250
9	**Torace (vascolare)** Embolia polmonare, ...	15	450	10	250
10	**Torace + addome superiore** Tumore polmonare, metastasi, ...	15	600	10	300
11	**Addome superiore** Fegato, milza, pancreas, metastasi, ...	15	400	10	200
12	**Addome superiore (vascolare)** Fegato, milza, pancreas, vasculopatie, ...	15	500	10	250
13	**Addome / bacino** Accertamenti standard, addome acuto, ascesso a seguito di linfoadenopatie, ...	15	650	10	350
14	**Addome / bacino (vascolare)** Angio-CT, status vascolare, ...	15	650	10	500
15	**Bacino (osso)** Traumatismo, malformazioni, ...	20	500	10	300
16	**Bacino (vascolare)** Angio-CT, status vascolare, ...	20	500	10	300
17	**Torace / addome / bacino** Traumatismo, polytrauma, status aorta, ...	15	1000	10	700
18	**Colonna lombare** Traumatismo, fratture, modifiche delle ossa, ...	30	850	15	300
19	**Estremità inferiori (vascolare)** Angio-CT, ...	15	1000	10	700
20	**Cuore (Angio-CT)** Valutazione cardio-vascolare, toracalgie, insufficienza cardiaca, ...	50	1000	30	500
21	**Cuore** Calcium-scoring	10	150	5	50

Figure 1. Protocol implementation and Swiss DRVs

METHODS

The software implementation team included a team leader, two radiology technologists, two medical physicists and the chief of radiology department. Very detailed data collection folders and diagnostic reference values (DRV) were created based on 25th percentile, as target value, and 75th percentile, as upper limit, values of CTDIvol and DLP extracted from Swiss CT DRV. Data were collected from seven different multislice CT scanners using the study description Dicom tag.

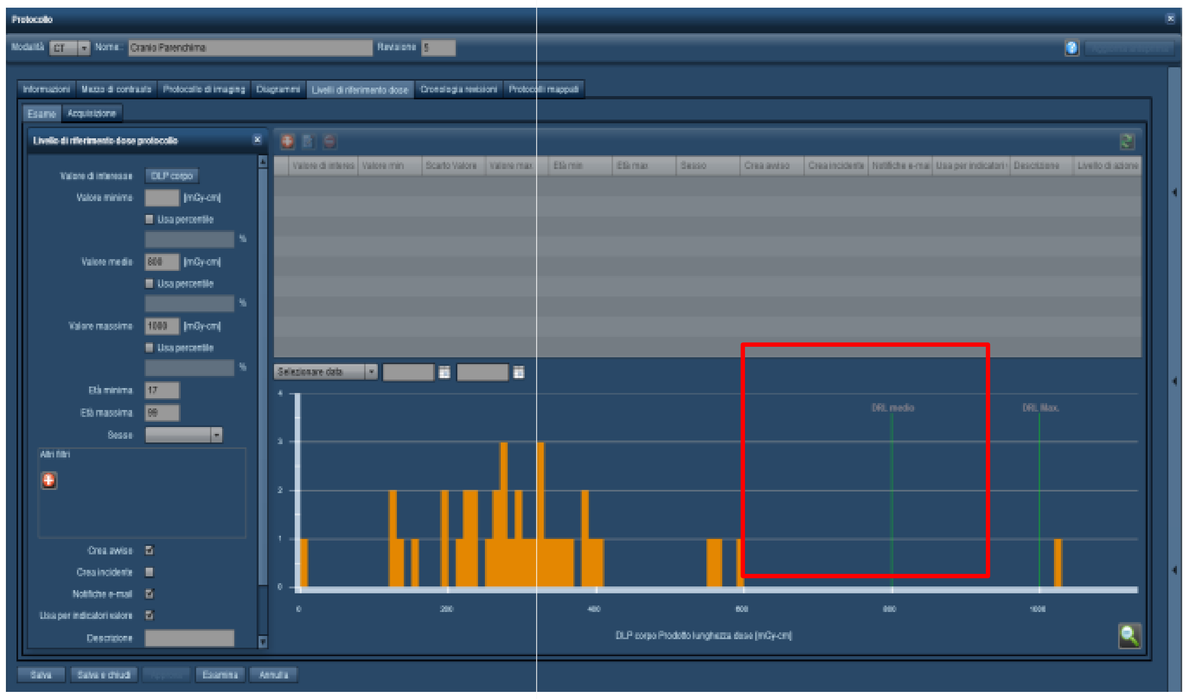

Figure 2. 25th an 75th percentile DRV

RESULTS

Direct protocol comparison, for each institution/scanner, is presented. About 90% of CT exams applied a dose inferior to Swiss DRV.

Figure 3. Percentual comparison of Ct exams above and below DLP threshold

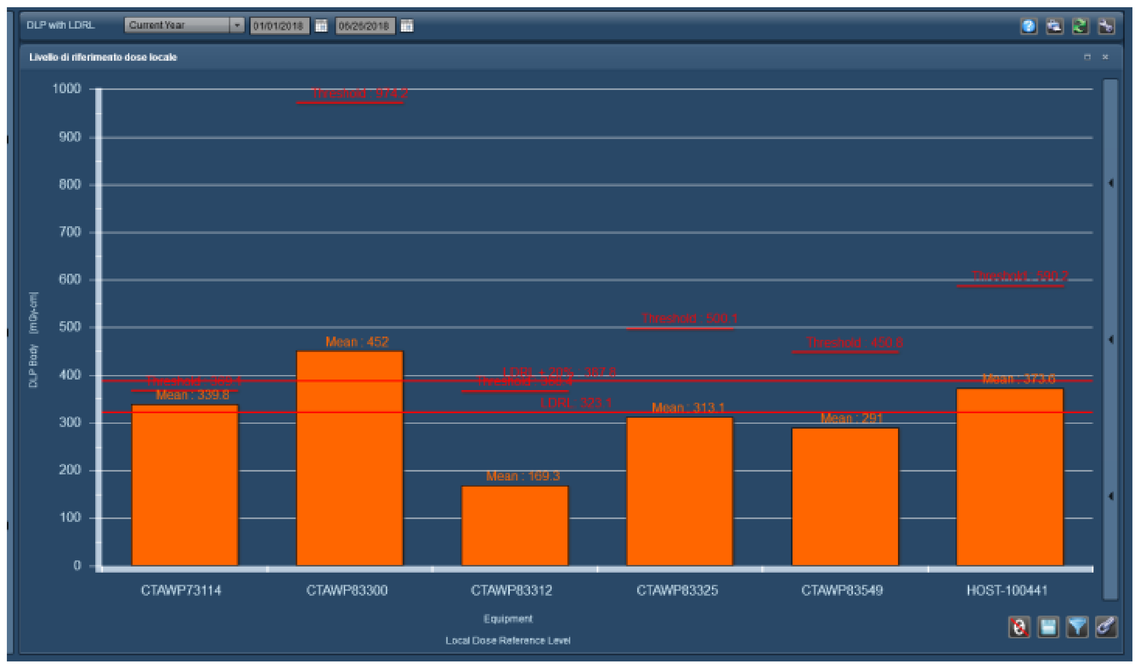

Figure 4. DLP comparison between CT for the same protocol

CONCLUSIONS

DVRs represent a benchmark useful to optimize radiation dose. Multisite cross-analysis of CT protocols allows the adoption of the best dose-optimized protocols in each center. Outliers and dose reduction strategies are discussed periodically within a team meeting: analyses are performed using a Montecarlo simulation tool to optimize future exams by varying setup parameters and study length. On request, total effective and individual organ dose values, are available especially for pregnant patients immediately after diagnostic examinations.

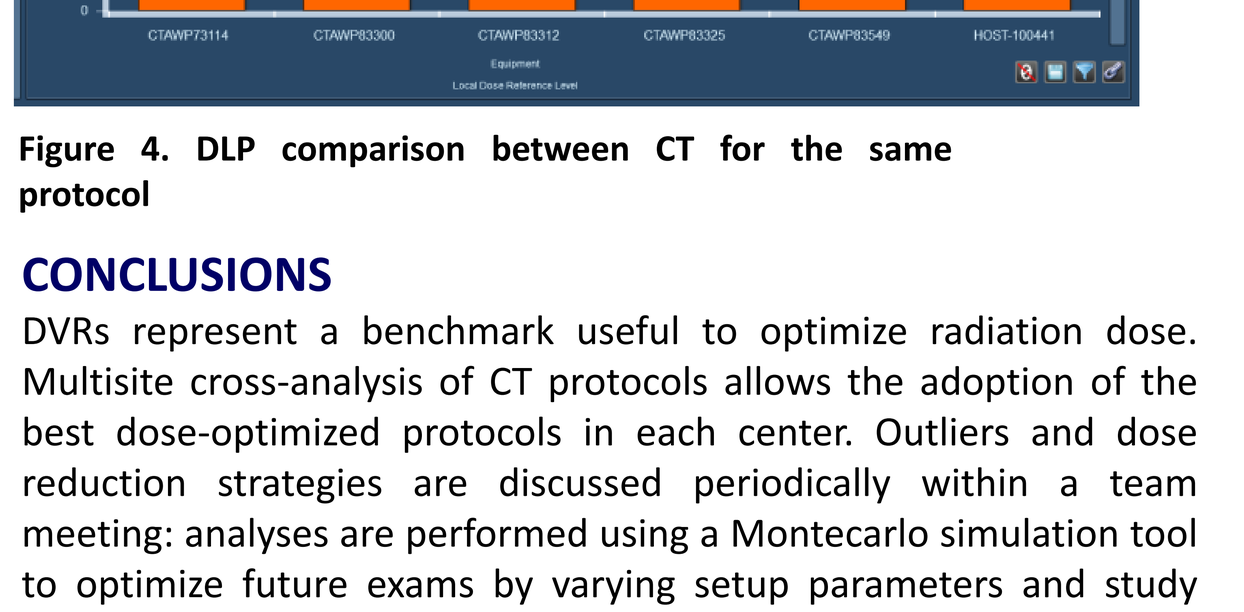

Figure 5. CT protocol verification after optimization