Evaluation, Comparison and optimization of the effects of manual versus software automated protocols on radiation dose and image quality in paediatric chest computed tomography

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OBJECTIVES
The aim of this study was to retrospectively compare the effects of switching from automated to manual acquisition parameters on image quality and radiation dose in a small paediatric cohort of patients and in several simulated paediatric chest CT scans utilizing a phantom.

In order to obtain the lowest possible dose-length-product (DLP) value while maintaining an adequate image quality, the scans were performed by manually reducing the dose below the lowest dose value proposed by automated software prior to the exam.

RESULTS
Dose to OAR, CTDIvol and DLP were substantially lower (90%, 58% and 32% respectively) adopting a manual approach, maintaining a good subjective image quality as demonstrated by a human visual scoring (VSA) test evaluation on images.

Through CT acquisitions, linearity and resolution were constant while image noise (mean 6.4, standard deviation 10.1) and uniformity (mean 6.4, standard deviation 10.1) varied between scans, as observed by 3 experienced radiologists by VSA.

MATERIALS AND METHODS
The Catphan CT phantom underwent simulated pediatric chest CT scans using both automated and manual parameters optimization approaches performed by a radiologist.

• Phantom was scanned within different protocols varying kV, mAs, pitch, IR.

• The subjective and objective image qualities were assessed by both radiologists and software.

• Computed tomography dose index (CTDI) and dose length product (DLP) values were collected and analyzed.

• Equivalent dose to organ at risk (OAR) was assessed with a Monte Carlo system tool of Radimetrics using a digital phantom simulating a six year old pediatric patient.

CONCLUSIONS
In both real and simulated paediatric chest CT studies manual acquisition settings generated the best results in terms of optimal dose-image quality ratio compared to automated parameters.

REFERENCES