



# A Patient Centric Initiative to Reduce Radiation Dose to Pediatric Patients in Computer Tomography Chest and Abdomen procedures

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# Objective

An initiative to reduce radiation dose to pediatric patients during Computer Tomography's chest and abdomen related procedures based on international best practices.

# Methods

- The need for radiation dose management is critical in the light of JCI Sentinel Event (Issue 47) as well as Advisory Board's document "Managing Radiation Risk". An assessment was carried out to determine the level of radiation dose being employed for pediatric patients for CT chest and abdomen examinations and was also compared to the international recommendations. The assessment showed that the radiation dose was typically higher than the recommended standards.
- The initiative by the Healthcare Informatics team spanned from educational to technical aspects to address the higher radiation dose. Internationally defined best practices and radiation dose reference levels were identified. CT modalities were configured for appropriate reduced dose protocols, technologists were educated, radiologists were consulted on the image quality and reduced radiation dosage, an in-house system was developed to extract process and archive the radiation dose results of each procedure and finally produce meaningful reports.

# Results

The initiative managed to reduce the pediatric Chest and Abdomen procedure's average CT radiation doses by 43% and 62% respectively compared to the average radiation dose that that was delivered in procedures prior to the initiative. This also resulted in bringing the dose levels within the reference levels defined by international bodies. For comparison, ICRP publication 87 reference levels were utilized.

# Dose Reduction Initiative at AKU

## Radiology

Results – Sample dose levels for Pediatric CT exams after dose reduction efforts.

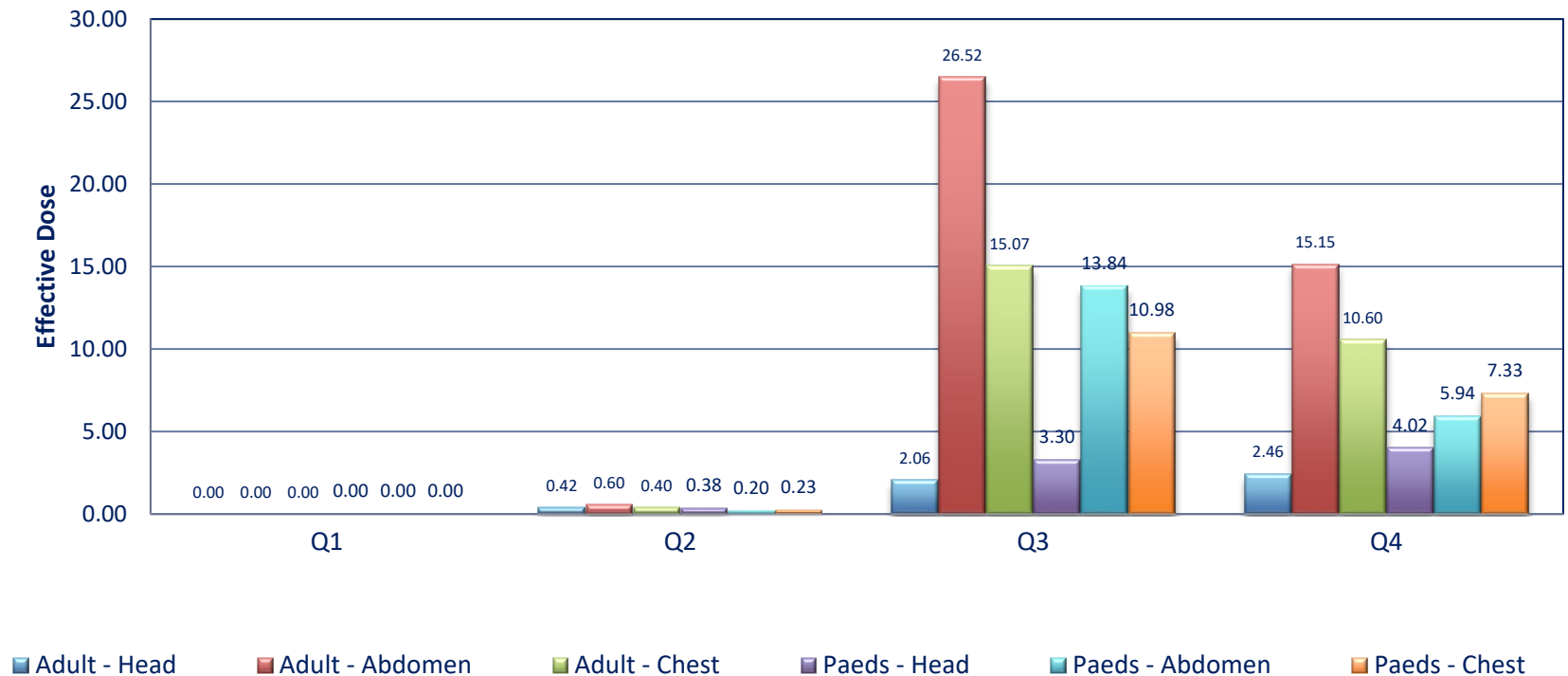
AKU typical Values

International Standard

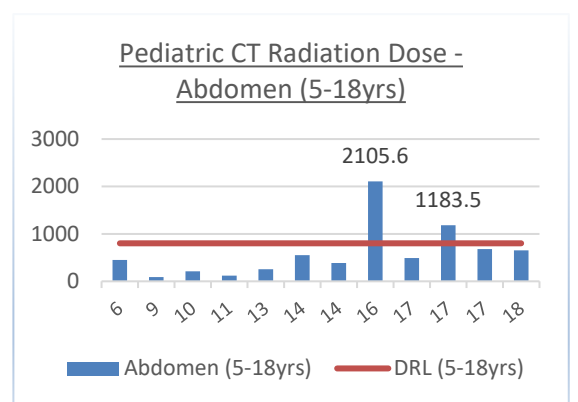
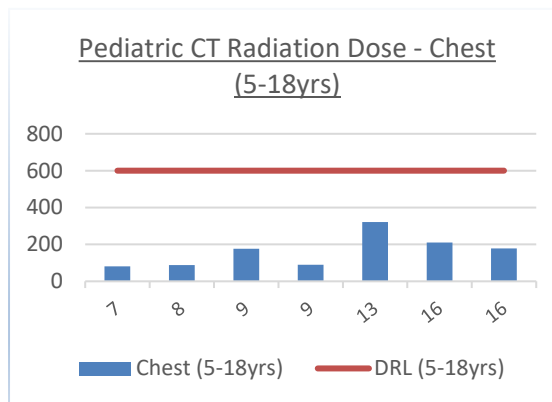
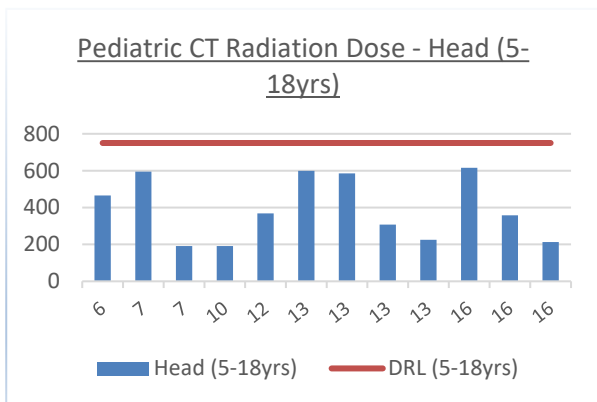
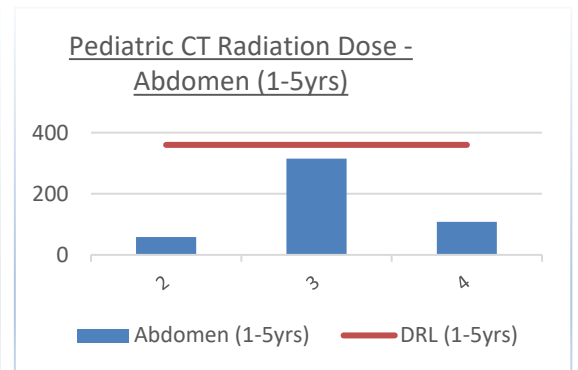
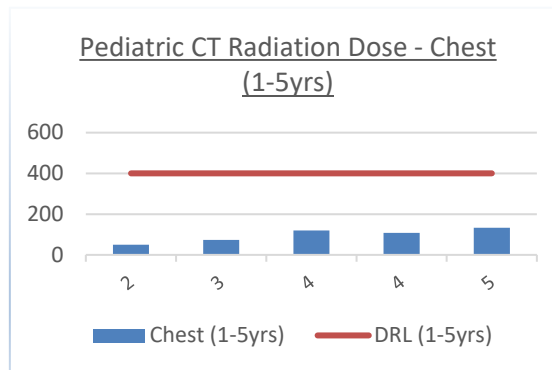
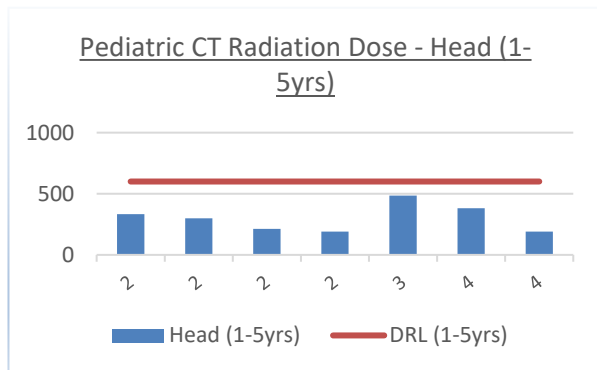
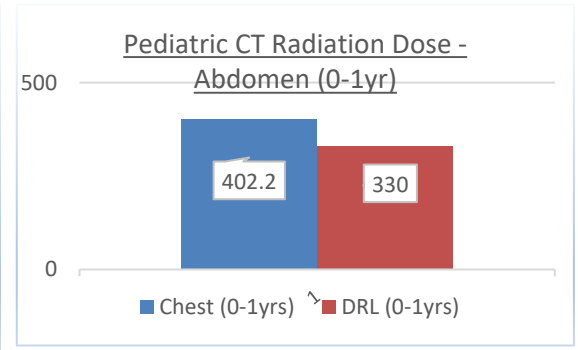
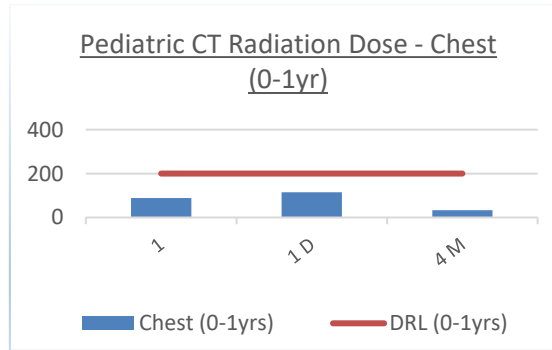
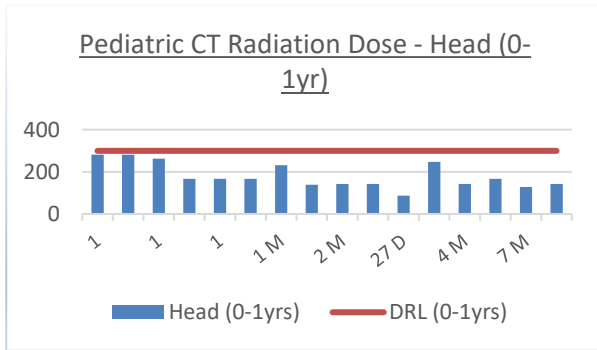
MR#	Age	Study	AKU CT DLP (DLP)	International Standard (DLP)
	<1	CT Angio	33	50
	2Y	CT Angio	41	75
	1.2Y	CT Angio	42	50
	<1	Chest w Contrast	36	200
	<1	Abdomen w contrast	153	330
	1.2Y	Head w/o contrast	457	600

# Dose Reduction Initiative at AKU Radiology

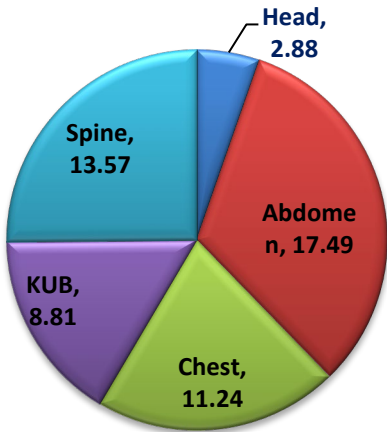
Effective Dose Trends (Aquilion ONE)  
2014



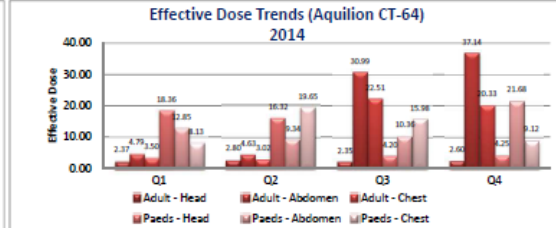
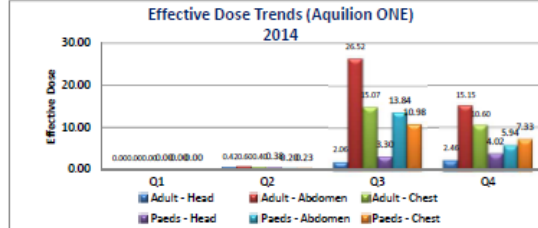
# Dose Reduction Initiative at AKU Radiology



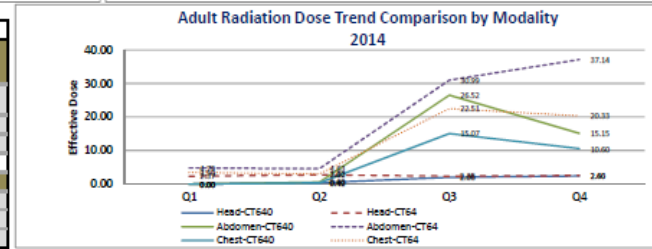
# Dose reduction results



## Department of Radiology CT Radiation Dose Analyses

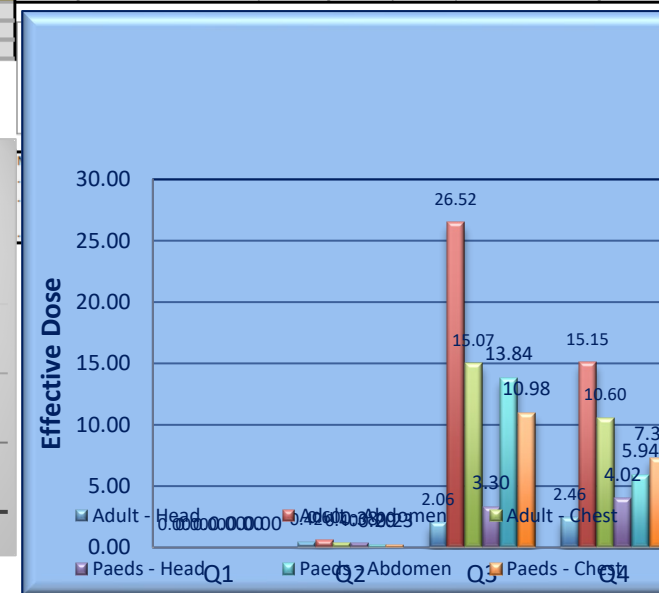
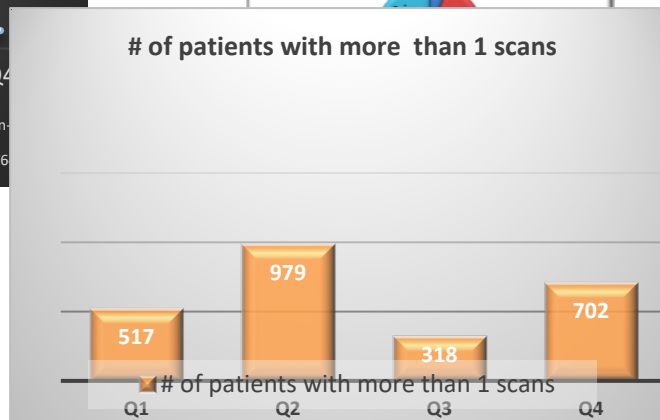
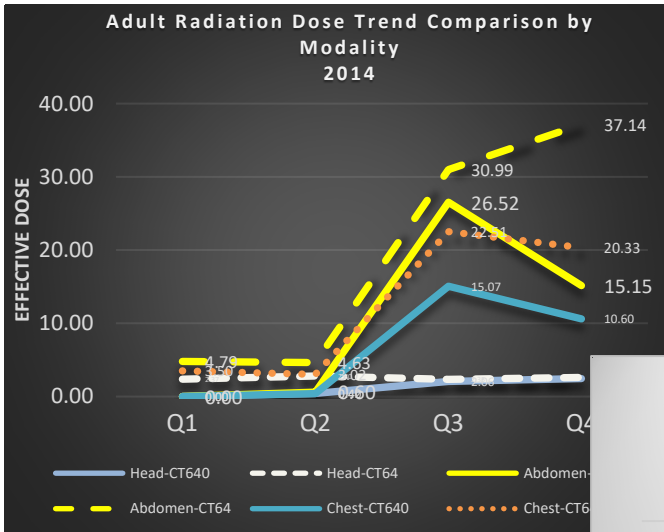


	PRE 2011	Aquilion ONE (CT640)	% Dose Reduction	Aquilion (CT64)	% Dose Reduction
<b>ADULT</b>					
Head	2.1	2.9	34%	2.6	21%
Abdomen	26.9	17.5	-35%	37.1	38%
Chest	16.6	11.2	-32%	20.3	23%
<b>PAEDS</b>					
Head	1.6	4.6	194%	4.3	170%
Abdomen	14.1	6.3	-55%	21.7	54%
Chest	8.2	7.7	-6%	9.1	11%



	ICRP Ref.	Aquilion ONE (CT640)	% difference from Reference	Aquilion (CT64)	% difference from Reference
<b>ADULT</b>					
Head	2.2	2.9	0.30	2.6	0.18
Abdomen	11.7	17.5	0.49	37.1	2.17
Chest	9.1	11.2	0.23	20.3	1.23
<b>PAEDS</b>					
Head	3.0	4.6	0.55	4.3	0.42
Abdomen	9.0	6.3	-0.29	21.7	1.41
Chest	13.8	7.7	-0.44	9.1	-0.34

Adult	Exam	Accession	Effective Dose	Paeds	Exam	Accession	Effective Dose
85.17	SPINE WITHOUT CONTRAST	37037611	34.01	37.14	CT CHEST WITH CONTRAST	37566552	37.14
84.29	ABDOMEN W & WITHOUT CONTRAST	37539311	22.20	20.33	CHEST ABDOMEN AND PELVIS WITH CONTRAST	37612551	20.33
79.49	CHEST ABDOMEN AND PELVIS WITH CONTRAST	37571041	19.89	15.15	ABD & PELVIS WITH CONTRAST	37011321	15.15
78.12	ABDOMEN WITH CONTRAST	37539621	16.25	10.60	ABDOMEN WITH CONTRAST	37084931	10.60
	ABDOMEN WITH CONTRAST	37693711	13.92	2.80	ABDOMEN WITH CONTRAST	37587081	2.80





# Future Direction

- ✓ Improve the image quality and reduce dose through technology and **optimization**
- ✓ **Awareness** among the medical community
- ✓ **Facilitate** other centres to optimize their clinical radiation dose
- ✓ Facilitate centres throughout Pakistan.

# Conclusion

Adopting a patient centric approach in a proactive manner, the team was able to assess and identify an area that had a direct bearing on patient care and was able to plan and implement an environment that provided significant reduction in the radiation dose being administered to pediatric patients during CT chest and abdomen examinations.