



Clinical Dose Optimization

Executive Summary Report

Q4 2021

Hospital: Sample

Health System: Sample





Dear Patient Radiation Dose Committee,

We are pleased to present you with the Q4 executive summary report for your patient doses. This report presents key insights into your CT & Fluoroscopy dose management program with recommendations on how to improve the performance of your clinical protocols. Within this report, we compare your dose performance to external benchmarks, review patient exams that exceed alert thresholds and track and trend performance of most common protocols.

This report is designed to aid with meeting The Joint Commission requirements PC.01.03.01 A26 and PI.02.01.01 A6 as well as the American Association of Physics in Medicine Practice Guideline 1.a: CT Protocol Management and Review Practice Guideline and patient dose requirements outlined in VHA directive 1129. To fulfill regulatory requirements, this report should be reviewed with input and recommendations from the institution's Patient Radiation Dose Committee.

ProAqCT is honored to be your partner in quality imaging, and we look forward to working with you to deliver safe and optimal personalized imaging. If you have any questions concerning this report, please feel free to contact us at 1-844-ProAqCT (1-844-776-2728) or email us at support@proaqct.com.

Sincerely,
The ProAqCT Clinical Analytics Team





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Executive Summary

Summary of CT Dose Distribution and comparison to external Benchmarks for top ten protocols	
Finding	Recommended Corrective Action
50% tile dose for the Chest Abdomen Pelvis exceeded the national benchmark	Auto mA settings should be evaluated. Consider adjusting the Nosie Index (NI) on the protocol
50% tile dose for the Chest Without Contrast exceeded the national benchmark	Auto mA settings should be evaluated. Consider adjusting the Nosie Index (NI) on the protocol
50% tile dose for the Abdomen Pelvis With Contrast exceeded the national benchmark	Auto mA settings should be evaluated. Consider adjusting the Nosie Index (NI) on the protocol
50% tile dose for the Head Without Contrast exceeded the national benchmark	Scan Length should be adjusted to only cover base of skull through the vertex. Consider increasing the slice thickness of primary recon to 5 mm
50% tile dose for the Abdomen Pelvis Without Contrast exceeded the national benchmark	Auto mA settings should be evaluated. Consider adjusting the Nosie Index (NI) on the protocol
50%tile and 75% tile dose for the Brain Without Contrast exceeded the national benchmark	Develop a dedicated CTA protocol
The Median dose for CT C-Spine WO was more than 50% below the national benchmark	It is recommended to double the mAs. This will improve image quality while remaining low dose as compared to the national benchmark
Summary of Patient CT Dose Alert Review	
152 Alerts were reported in Q4	Alert Thresholds for Abdomen protocol should be reviewed
Body habitus was the most common reason for alerts in Q4	NA
Summary of Patient FL Dose Alert Review	
22 Alerts were reported in Q4	Technologists training on beam angulation and skin dose sparing should be completed by next quarter





Patient CT Dose Alert Summary

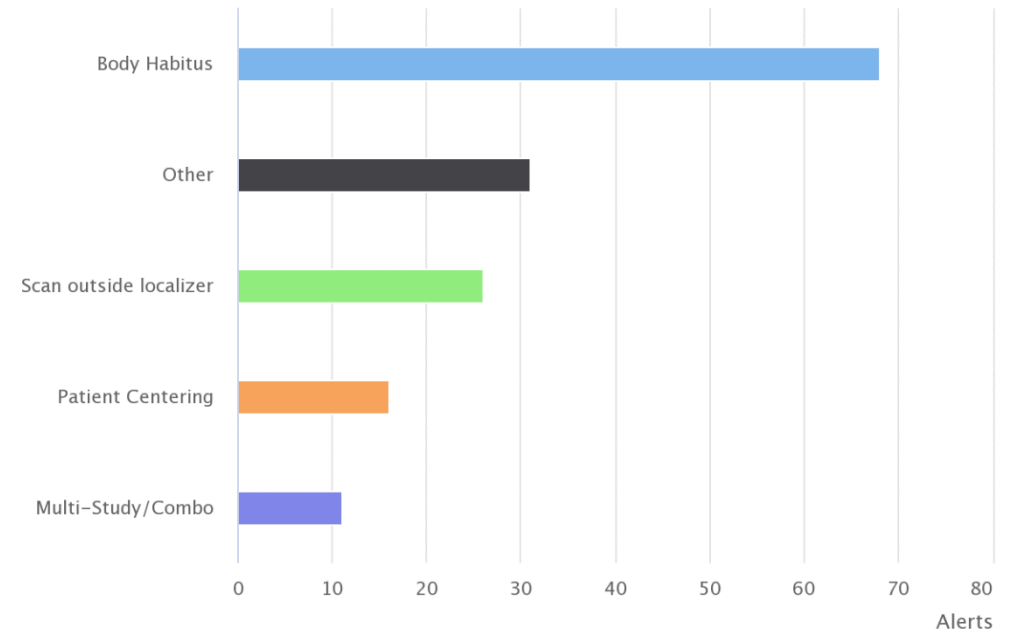
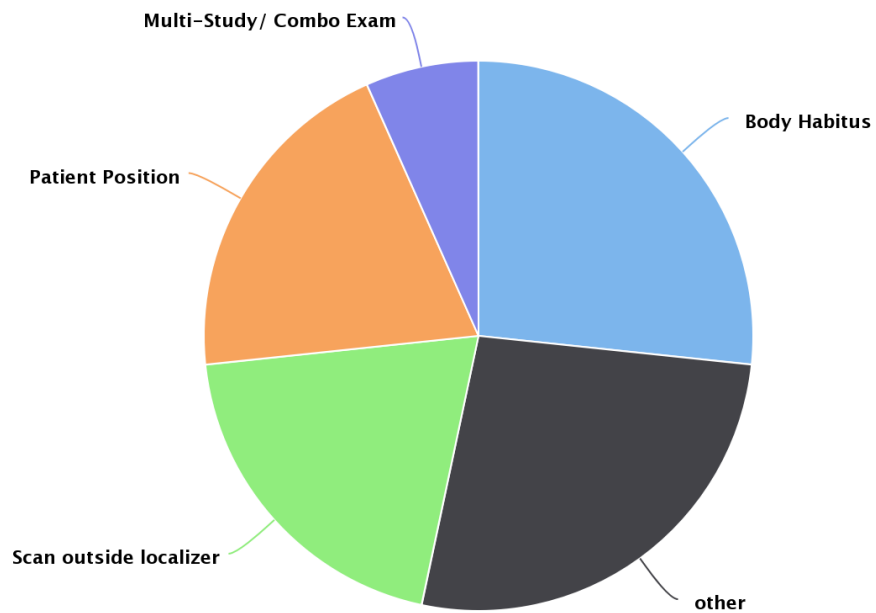


Table 1: Summary of Alerts Q4

Total Number of Exams	2456
Total Number of Alerts	152
% of Alerts	16.16%





Patient CT Dose Alert Trending

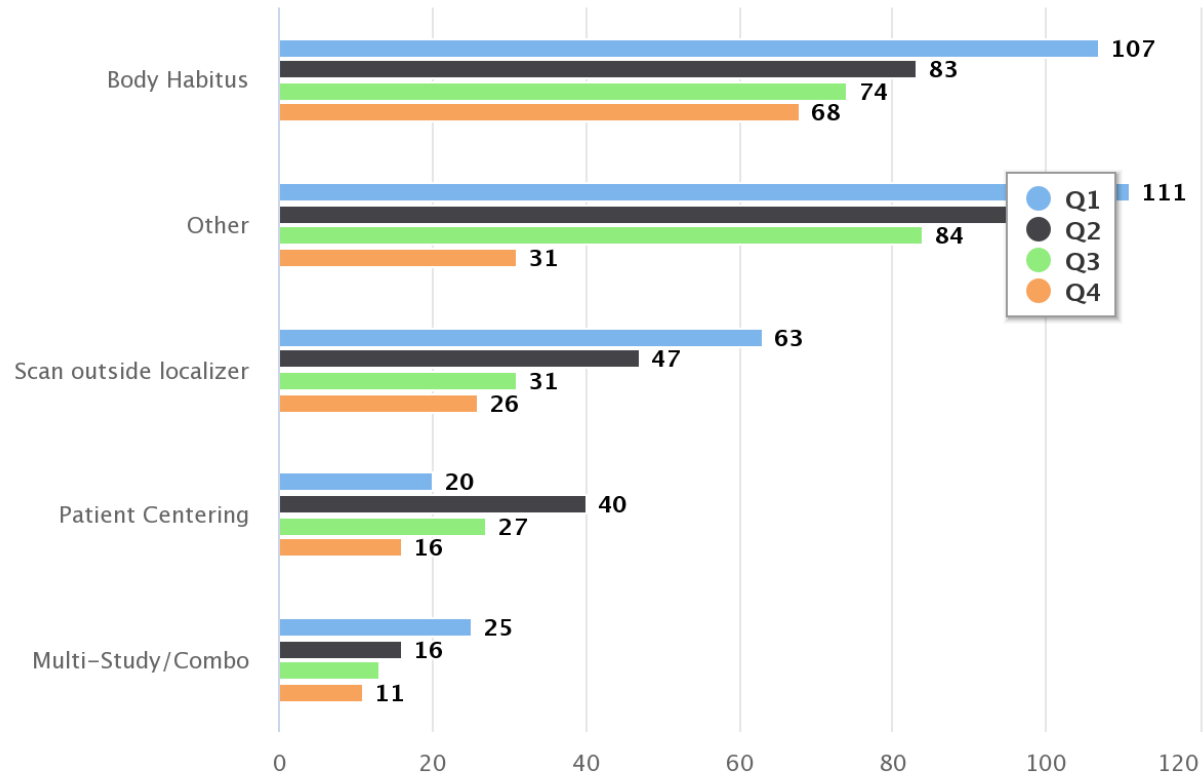


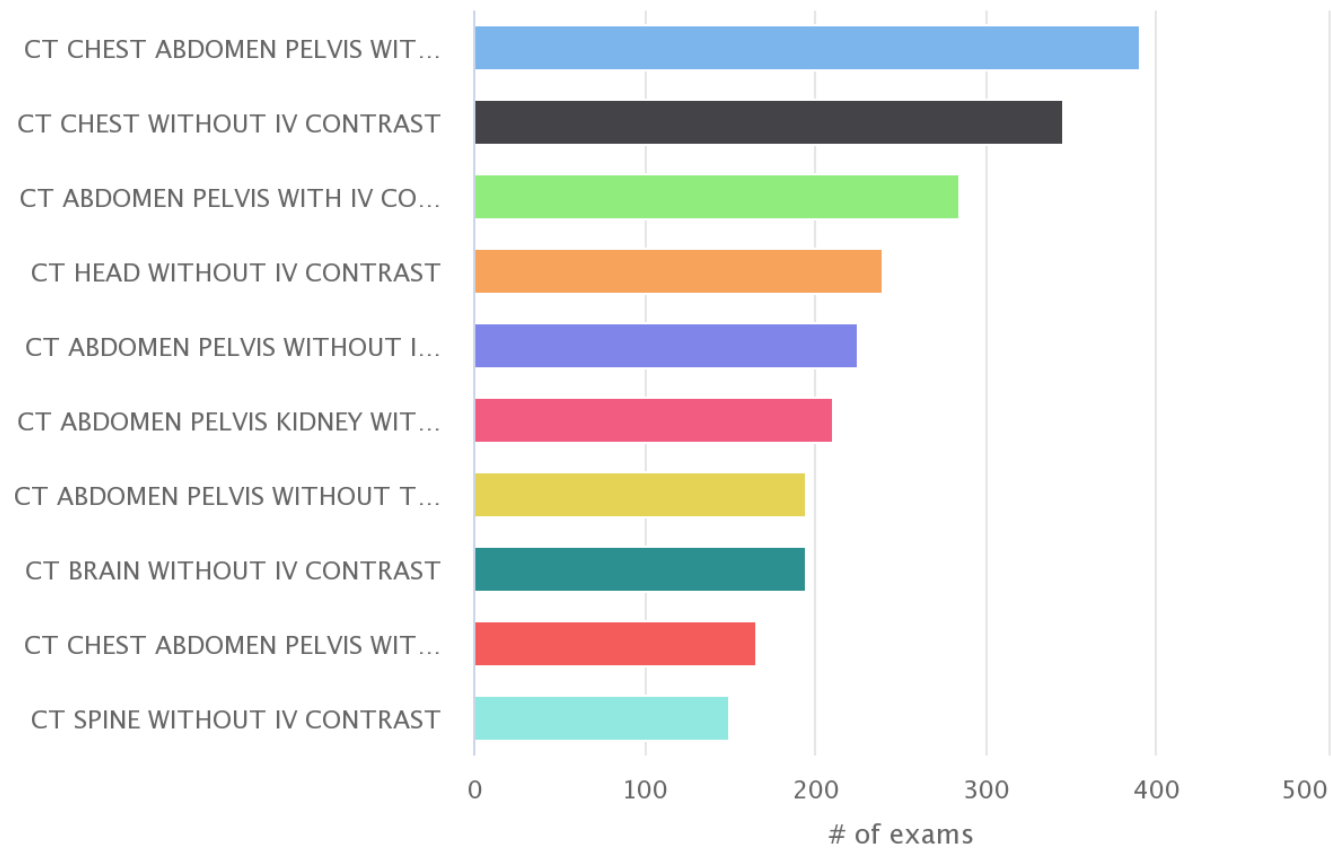
Table 2: Summary of Alerts to date

Total Number of Exams	11,924
Total Number of Alerts	989
% of Alerts	8.29%





Top Ten CT Protocols by Volume





DLP Dose Distribution, Outliers, and Comparison to External Benchmarks of Top Ten CT Protocols

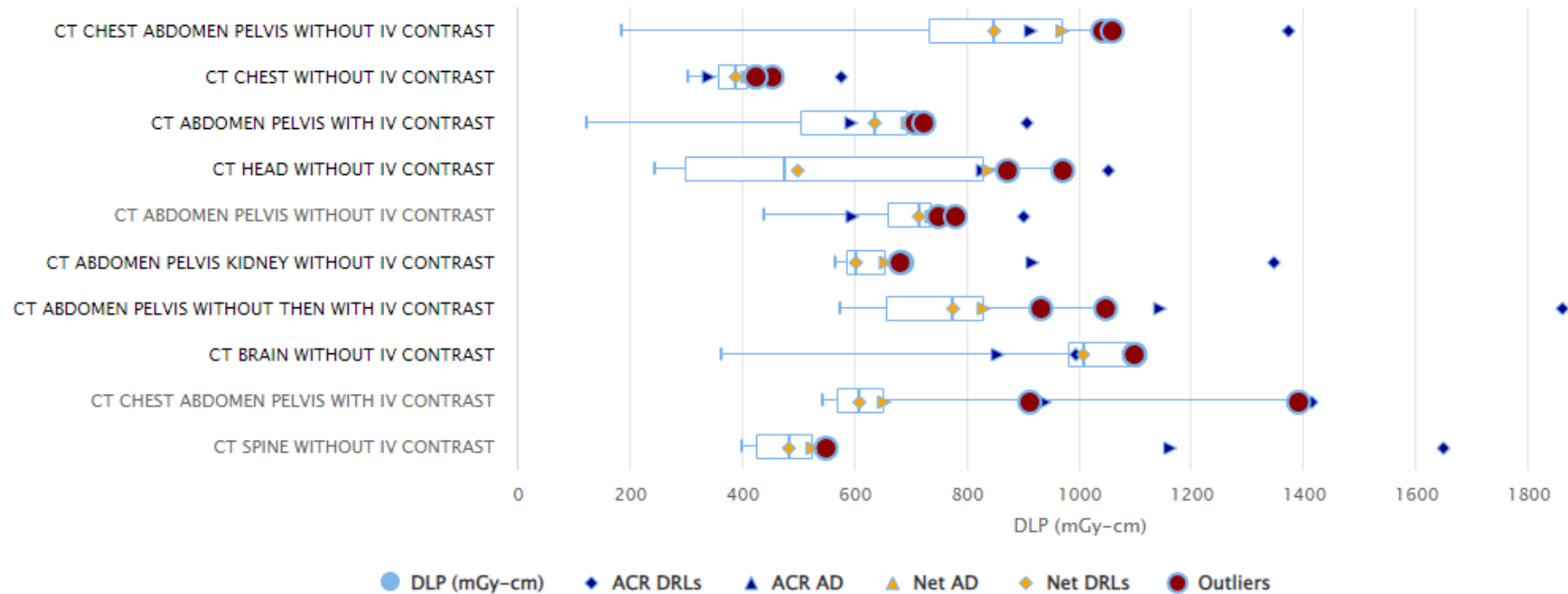




Table 3: Quartile Analysis and Comparison of Radiation Dose Length Product (DLP) to external benchmarks for Top Ten CT Protocols

Category	Exams	DLP (mGy-cm)					National Benchmark		Local Benchmark		Outliers
		low	q1	median	q3	high	75 th %tile	50 th %tile	75 th %tile	50 th %tile	
CAP Chest WO	390	182.00	731.41	847.59	969.21	1057.57	1372.00	913.00	969.21	847.59	1057.57
Abd Pel W	345	300.77	356.45	387.08	408.60	452.24	575.00	339.00	408.60	387.08	452.24
Head WO	285	121.26	504.65	634.83	693.74	723.54	906.00	593.00	693.74	634.83	706.98
Abd Pel WO	240	241.00	296.50	473.37	828.87	969.74	1051.00	827.00	837.68	497.74	871.29
Abd Pel Kidney WO	225	436.00	659.30	712.95	735.94	777.16	900.00	595.00	735.94	712.95	748.15
Abd Pel WWO	210	563.60	584.40	601.31	654.42	682.90	1346.00	916.00	654.42	601.31	682.90
Brain WO	195	570.97	655.17	774.28	828.94	1046.10	1860.00	1143.00	828.94	774.28	1046.10
CAP W	195	358.60	979.80	1006.10	1098.00	1098.00	993.00	854.00	1098.00	1006.10	1098.00
C-Spine WO	165	540.05	568.32	607.50	651.38	1389.70	1413.00	938.00	651.38	607.50	1389.70
WO	150	395.39	424.46	481.71	524.14	548.01	1648.00	1161.00	524.14	481.71	548.01

*Values in red indicate a protocol has exceeded an external benchmark





CTDIvol Dose Distribution, Outliers, and Comparison to External Benchmarks of Top Ten CT Protocols

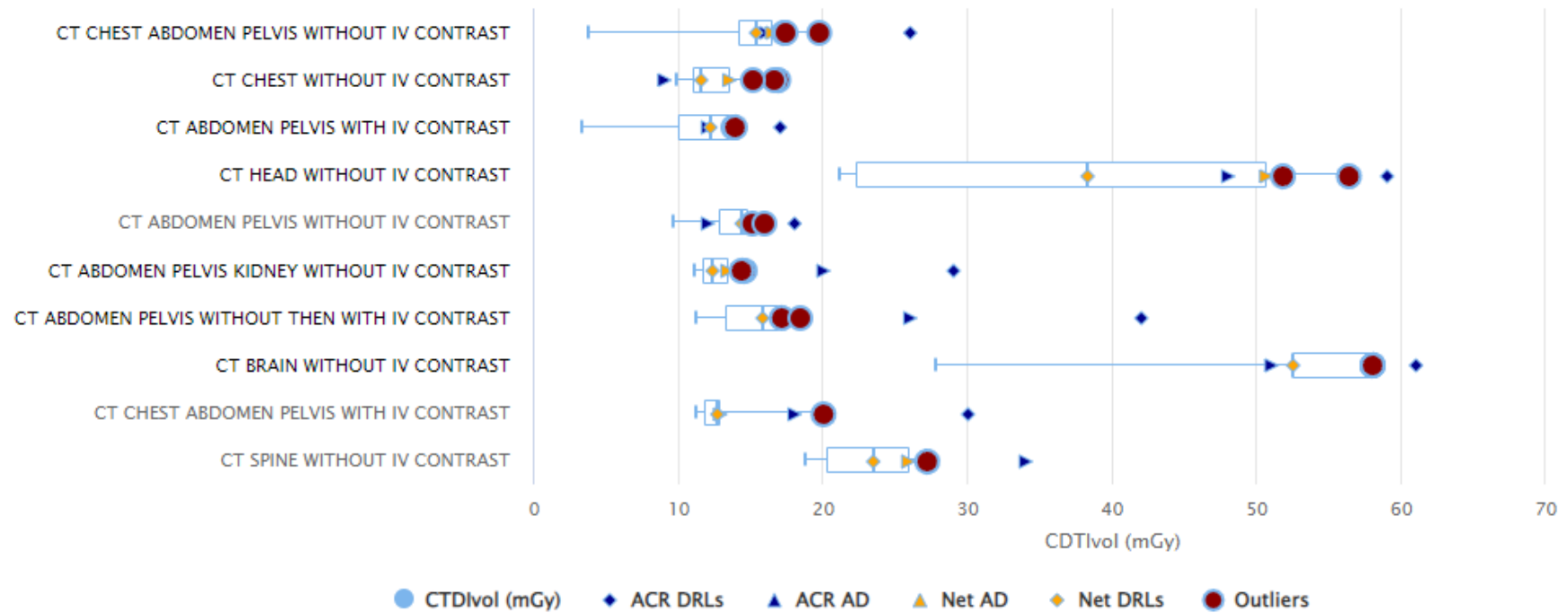




Table 4: Quartile Analysis and Comparison of CTDIvol to External Benchmarks for Top Ten Protocols

	Exams	CTDIvol (mGy)					National Benchmark		Local Benchmark		Outliers
		low	q1	median	q3	high	75 th %tile	50 th %tile	75 th %tile	50 th %tile	
CAP	390	3.69	14.12	15.34	16.46	19.71	26.00	16.00	16.46	15.34	19
Chest WO	345	9.72	11.03	11.54	13.49	16.87	16.00	9.00	13.49	11.54	16
Abd Pel W	285	3.26	10.03	12.17	13.53	13.92	17.00	12.00	13.53	12.17	13
Head WO	240	21.01	22.29	38.28	50.64	56.36	59.00	48.00	50.64	38.28	15
Abd Pel WO	225	9.58	12.83	14.34	14.77	15.92	18.00	12.00	14.77	14.34	15
Abd Pel Kidney WO	210	11.03	11.71	12.33	13.36	14.55	29.00	20.00	13.36	12.33	14
Abd Pel WWO	195	11.10	13.30	15.79	16.92	18.34	42.00	26.00	16.92	15.79	17
Brain WO	195	27.70	52.50	52.50	58.00	58.00	61.00	51.00	58.00	52.50	18
CAP W	165	11.08	11.74	12.66	12.85	20.00	30.00	18.00	12.85	12.66	10
C-Spine WO	150	18.69	20.20	23.44	25.87	27.18	75.00	34.00	25.87	23.44	7

*Values in red indicate a protocol has exceeded an external benchmark





CT Protocols with the Highest & Lowest Radiation Dose Index Relative to National Benchmarks

	DLP (mGy-cm)				CTDIvol (mGy)		
	Exams	Median	National Benchmark	% Diff	Median	National Benchmark	% Diff
Abd Pel WO	225	712.95	595	19.82%	14.34	12	19.50%
Brain WO	195	1006.1	854	17.81%	52.5	51	2.94%
Chest WO	390	387.08	339	14.18%	11.54	9	28.22%
Abd Pel W	285	634.83	593	7.05%	12.17	12	1.42%
CAP	390	847.59	913	-7.16%	15.34	16	-4.13%
				-			-
Abd Pel WWO	195	774.28	1143	32.26%	15.79	26	39.27%
Abd Pel Kidney				-			-
WO	210	601.31	916	34.35%	12.33	20	38.35%
				-			-
CAP W	165	607.5	938	35.23%	12.66	18	29.67%
				-			-
Head WO	240	473.37	827	42.76%	38.28	48	20.25%
				-			-
C-Spine WO	150	481.71	1161	58.51%	23.44	34	31.06%





Temporal Trending of CT Dose Performance

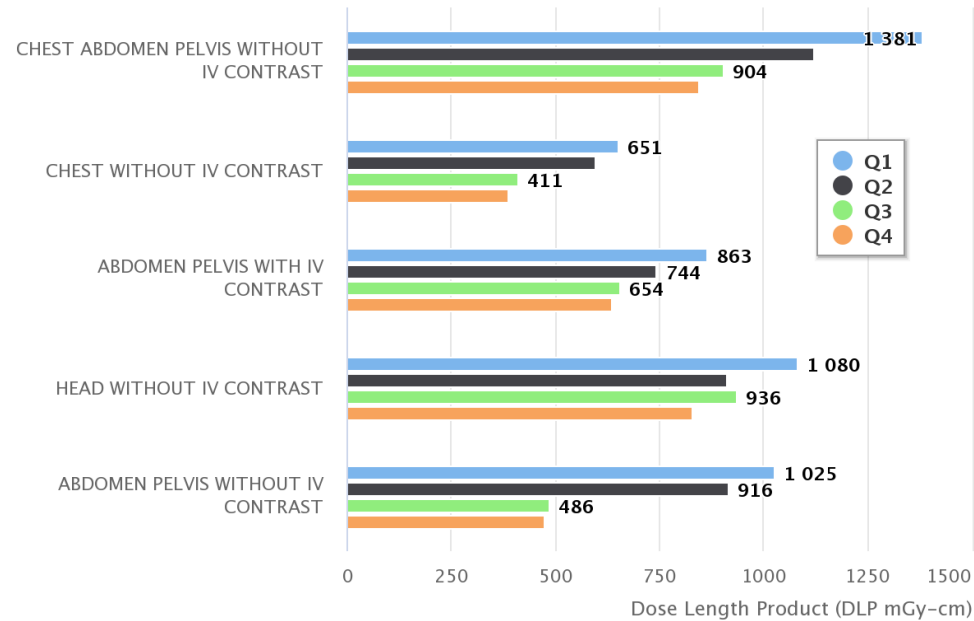


Table 5: Temporal Trending of top CT protocols

	Q1	Q2	Q3	Q4	% change since last Quarter
CHEST ABDOMEN PELVIS WITHOUT IV CONTRAST	1381	1123	904	845	6.53%
CHEST WITHOUT IV CONTRAST	651	598	411	387.1	5.82%
ABDOMEN PELVIS WITH IV CONTRAST	863	744	654	634.8	2.94%
HEAD WITHOUT IV CONTRAST	1080	910	936	828.9	11.44%
ABDOMEN PELVIS WITHOUT IV CONTRAST	1025	916	486	473.4	2.59%





Temporal Trending of CT Abdomen Protocols Stratified by Body Habitus

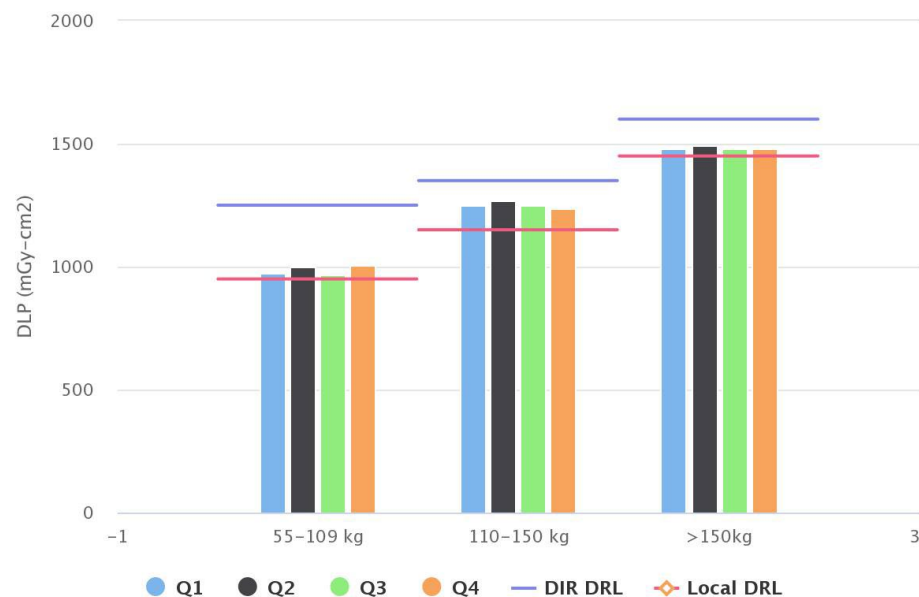


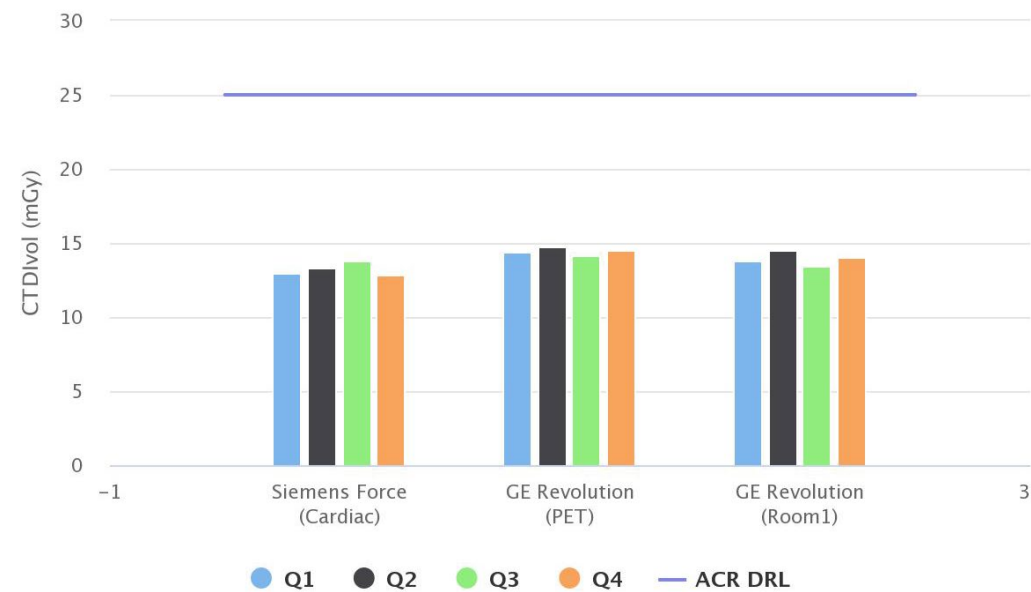
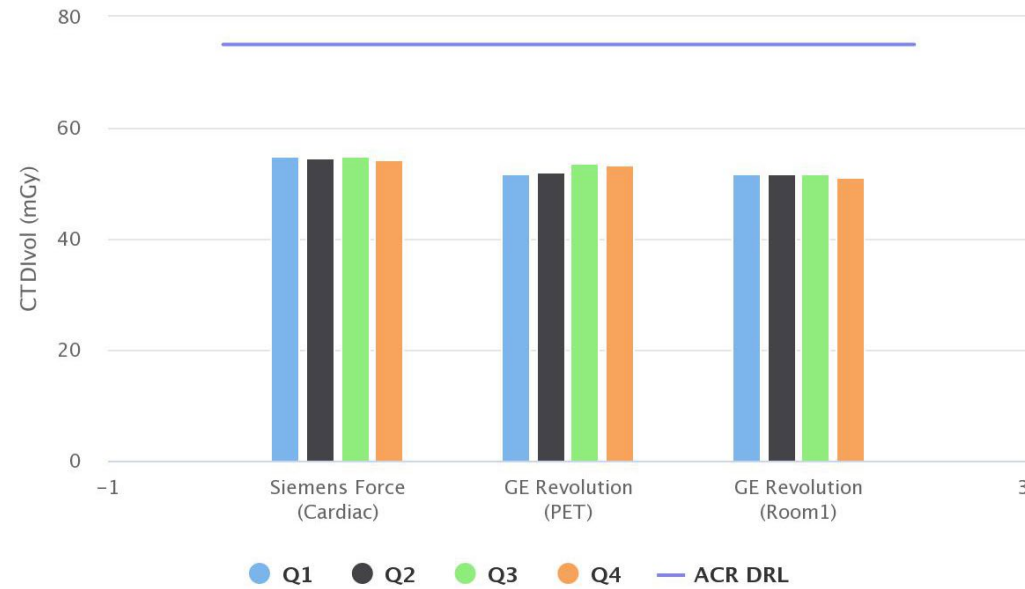
Table 6: Temporal Trending of Top CT Protocols by Body Habitus

Body Part	Body Habitus	Q3						Q4					
		N	25th %'ile	Median	75th %'ile	90th %'ile	95th %'ile	N	25th %'ile	Median	75th %'ile	95th %'ile	
ABDOMEN	55-109 kg	21	743.28	978.00	1232.28	1454.09	1526.79	13.00	750.88	988.00	1244.88	1542.41	
PELVIS													
ABDOMEN	110-150 kg	14	940.88	1238.00	1559.88	1840.66	1932.69	10.00	859.56	1131.00	1425.06	1765.65	
PELVIS				0						0			
ABDOMEN	>150 kg	24	1134.68	1493.00	1881.18	2219.79	2330.78	29.00	1081.48	1423.00	1792.98	2221.50	
PELVIS				0						0			





CT Dose Performance Comparison for Adult Head & Adult Abdomen by Scanner





Fluoroscopy Dose Alerts Summary

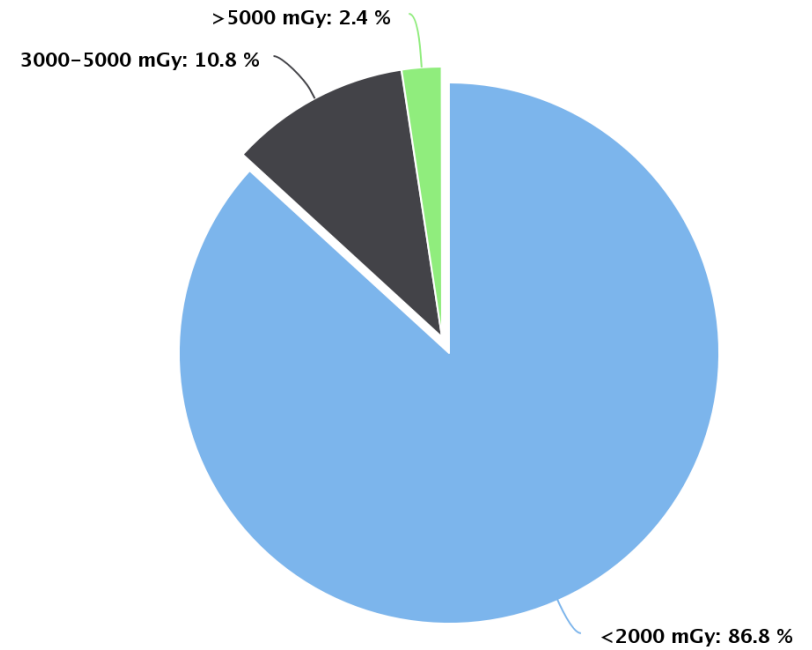
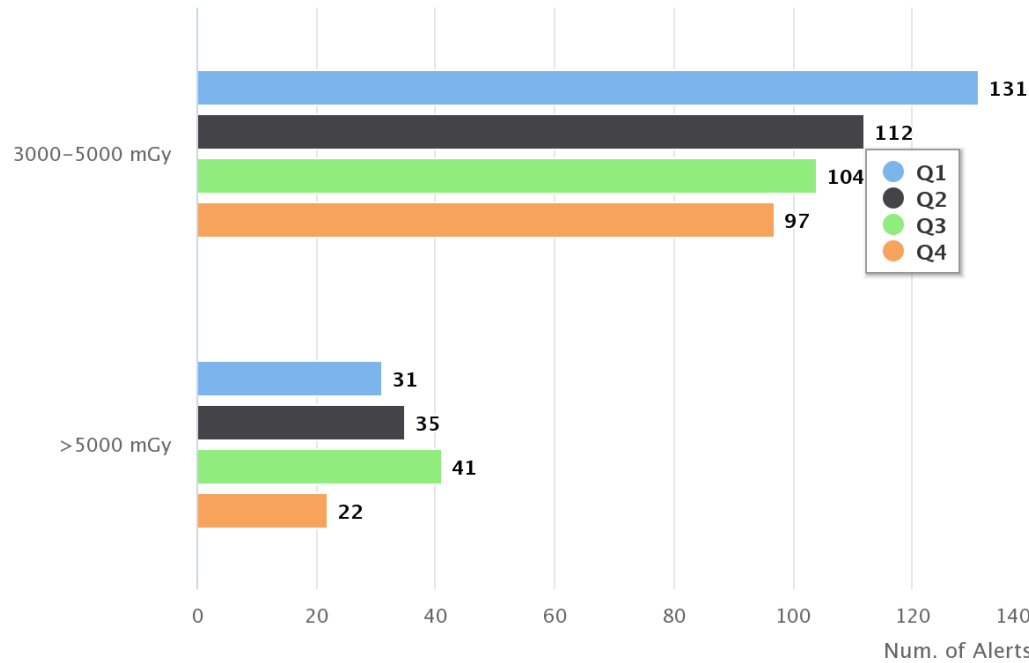


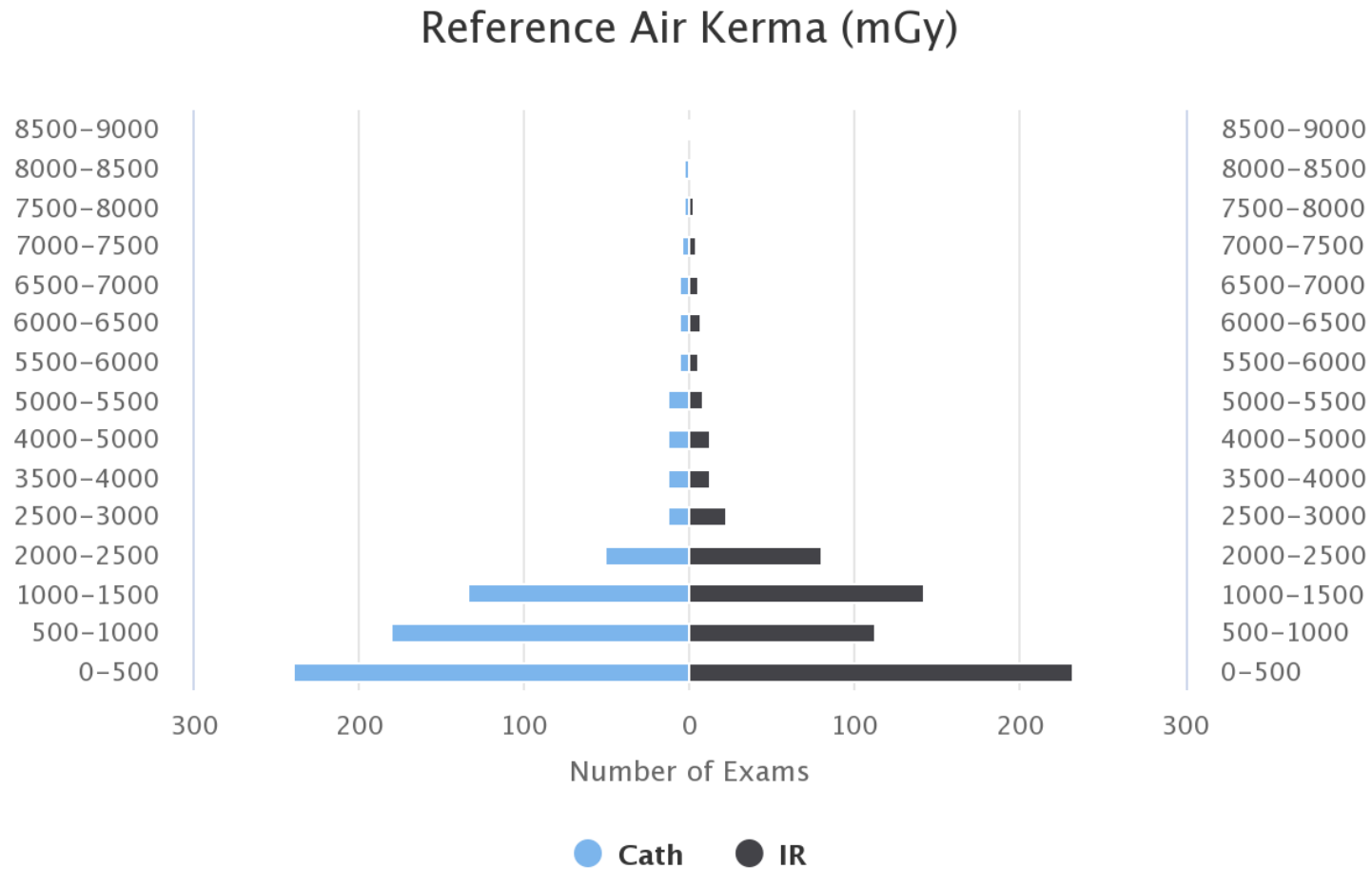
Table 7: Fluoroscopy Dose Alerts Q4

Total Number of FL Exams	894
FL Exams 3000- 5000 mGy	97
FL Exams >5000 mGy*	22



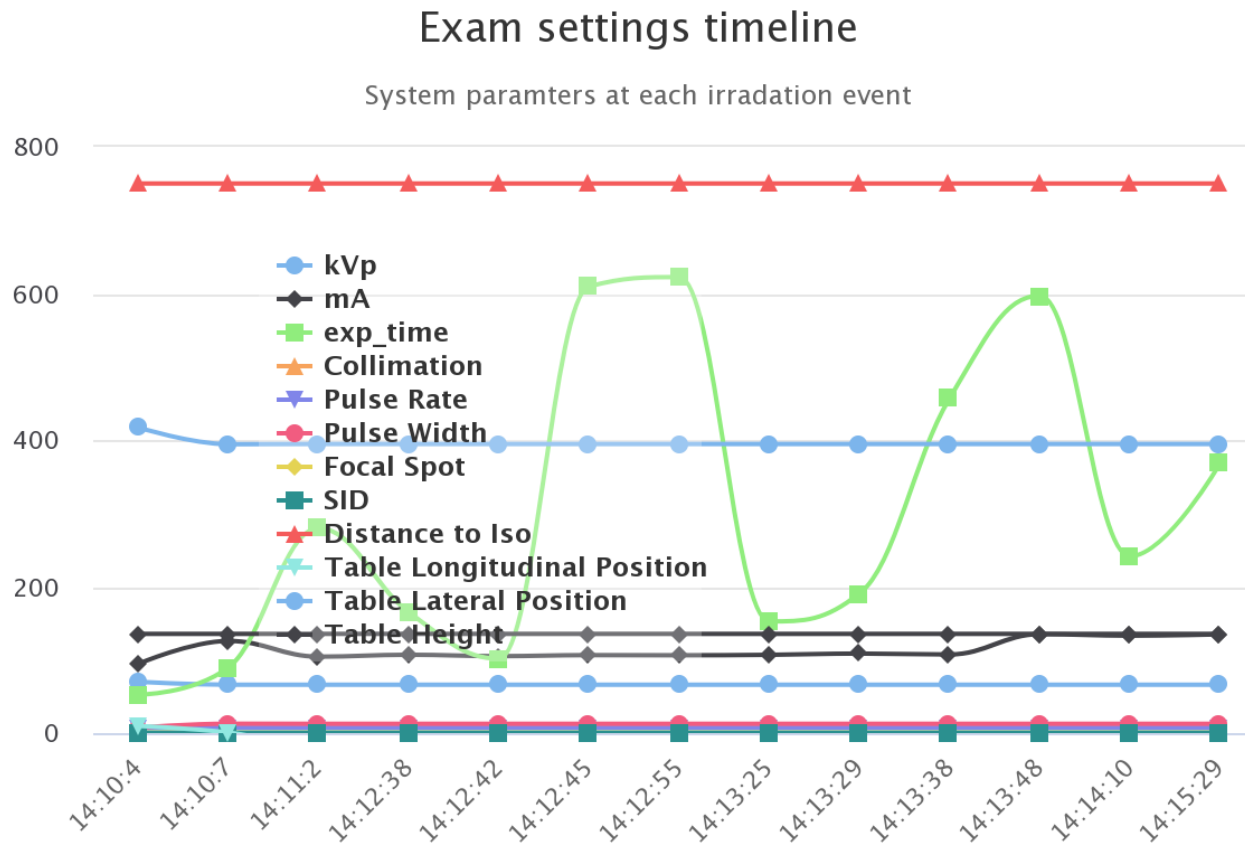


Reference Air Kerma Fluoroscopy Dose Distribution





Review of Highest Fluoroscopy Dose Events



This is a timeline of each fluoro dose events for the exam with the highest Air Kerma.





Appendix A: Summary of CT Protocol Mapping

Study Description at your facility	Short name assigned by facility	Short name to look for in report
AbdomenABD_PELVIS_55_to_109KG (Adult)	CT ABD PELVIS	CT ABDOMEN PELVIS
AbdomenABD_PELVIS_OVER_110KG (Adult)	CT ABD PELVIS	CT ABDOMEN PELVIS
AbdomenCAP_55_to_109KG (Adult)	CT CHST ABD/PEL	CT CHEST ABDOMEN PELVIS
AbdomenCAP_OVER_110KG (Adult)	CT CHST ABD/PEL	CT CHEST ABDOMEN PELVIS
AbdomenCTA_ABDOMEN_55_TO_109KG (Adult)	CT ABD PELVIS ANGIO	CT ABDOMEN PELVIS ANGIO
AbdomenCTV_ABDOMEN_55_TO_109KG (Adult)	CT ABD PELVIS VENO	CT ABDOMEN PELVIS VENOGRAPHY
AbdomenNCAP_55_to_109KG (Adult)	CT NECK CHST ABD/PEL W IVCON	CT NECK CHEST ABDOMEN PELVIS W IVCON
AbdomenNCAP_OVER_110KG (Adult)	CT NECK CHST ABD/PEL W IVCON	CT NECK CHEST ABDOMEN PELVIS W IVCON
AbdomenRENAL_STONE_55_TO_109KG (Adult)	CT ABD KIDNEY	CT ABDOMEN PELVIS KIDNEY
CT ABD AND PELVIS W WO	CT ABD PELVIS WO & W IVCON	CT ABDOMEN PELVIS WO THEN W IVCON
CT ABD AND PELVIS W WO CO	CT ABD PELVIS	CT ABDOMEN PELVIS
CT ABD AND PELVIS WO C	CT ABD PELVIS	CT ABDOMEN PELVIS
CT ABD AND PELVIS WO CONTRAST	CT ABD PELVIS	CT ABDOMEN PELVIS
CT ABDOMEN AND CTA ABD	CT ABD PELVIS ANGIO	CT ABDOMEN PELVIS ANGIO
CT ABDOMEN AND PELVIS	CT ABD PELVIS	CT ABDOMEN PELVIS
CT ABDOMEN AND PELVIS W CONTR	CT ABD PELVIS	CT ABDOMEN PELVIS
CT ABDOMEN W AND WO CO	CT ABD WO & W IVCON	CT ABDOMEN WO THEN W IVCON





CT ABDOMEN W CONTRAST	CT ABD PELVIS	CT ABDOMEN PELVIS
CT ABDOMEN WO CONTRAST	CT ABD WO IVCON	CT ABDOMEN WO IVCON
CT APPENDICITIS	CT ABD PELVIS	CT ABDOMEN PELVIS
CT CHEST ABD PELVIS	CT CHST ABD/PEL	CT CHEST ABDOMEN PELVIS
CT CHEST ABD PELVIS W CONTRAST	CT CHST ABD/PEL	CT CHEST ABDOMEN PELVIS
CT CHEST ABD PELVIS W	CT CHST ABD/PEL	CT CHEST ABDOMEN PELVIS
CT CHEST ABD PELVIS W AND WO CONTRAST	CT ABD PELVIS	CT ABDOMEN PELVIS
CT CHEST ABD PELVIS W CONTRAST	CT CHST ABD/PEL	CT CHEST ABDOMEN PELVIS
CT CHEST AND ABDOMEN W	CT CHST ABD/PEL	CT CHEST ABDOMEN PELVIS
CT CHEST W AND WO CONTRAST	CT CHST	CT CHEST
CT CHEST W CONTRAST	CT CHST	CT CHEST
CT CHEST WO CONTRAST	CT CHST	CT CHEST
CT CHEST WO CONTRAST AND 3D IMAGES	CT CHST	CT CHEST
CT CRANIOFACIAL COMPLE	CT HEAD FACL BNS	CT HEAD FACIAL BONES
CT CRANIOFACIAL COMPLETE W CONTRAST	CT HEAD FACL BNS	CT HEAD FACIAL BONES
CT CRANIOFACIAL LIMITE	CT HEAD FACL BNS	CT HEAD FACIAL BONES
CT CTA ABDOMEN	CT ABD PELVIS ANGIO	CT ABDOMEN PELVIS ANGIO
CT CTA ABDOMEN PELVIS	CT ABD PELVIS ANGIO	CT ABDOMEN PELVIS ANGIO
CT CTA LOWER EXTREMITY	CT LE ANGIO BILAT	CT LE ANGIO
CT FACIAL BONES W AND	CT HEAD FACL BNS	CT HEAD FACIAL BONES
CT FACIAL BONES W CONT	CT HEAD FACL BNS W IVCON	CT HEAD W IVCON
CT FACIAL BONES W CONTRAST	CT HEAD FACL BNS	CT HEAD FACIAL BONES
CT FACIAL BONES WO CON	CT HEAD FACL BNS	CT HEAD FACIAL BONES
CT FACIAL BONES WO CONTRAST	CT HEAD FACL BNS	CT HEAD FACIAL BONES
CT HEAD AND CT VENOGRA	CT HEAD VENO	CT HEAD VENOGRAPHY





CT HEAD AND ORBIT W CO	CT HEAD ORBITS	CT HEAD
CT HEAD AND ORBIT WO/W	CT HEAD ORBITS	CT HEAD
CT HEAD VENTRICLES	CT HEAD BRN	CT HEAD BRAIN
CT HEAD W AND WO CONTR	CT HEAD BRN	CT HEAD BRAIN
CT HEAD W AND WO CONTRAST	CT HEAD BRN	CT HEAD BRAIN
CT HEAD W CONTRAST	CT HEAD BRN	CT HEAD BRAIN
CT HEAD WO	CT HEAD BRN WO IVCON	CT HEAD BRAIN WO IVCON
CT HEAD WO CONT	CT HEAD BRN WO IVCON	CT HEAD BRAIN WO IVCON
CT HEAD WO CONTRAST	CT HEAD BRN	CT HEAD BRAIN
CT HEART CONGENITAL HEART DISEASE	CT PEDS CHST HEART	CT CHEST HEART
CT HIP WO CONTRAST	CT PELVIS	CT PELVIS
CT HIP WO CONTRAST AND	CT PELVIS	CT PELVIS
CT HIPS WO CONTRAST AND 3D BILATERAL	CT PELVIS	CT PELVIS
CT LOWER EXTREM W CONT	CT LE	CT LE
CT LOWER EXTREM WO CON	CT LE	CT LE
CT MASTOID WITH CONTRA	CT HEAD MASTOID	CT HEAD
CT NECK CHST ABD PE	CT NECK CHST ABD/PEL W IVCON	CT NECK CHEST ABDOMEN PELVIS W IVCON
CT NECK CHST ABD PEL W CONTRAST	CT NECK CHST ABD/PEL W IVCON	CT NECK CHEST ABDOMEN PELVIS W IVCON
CT NECK AND CHEST W CO	CT NECK CHST ABD/PEL W IVCON	CT NECK CHEST ABDOMEN PELVIS W IVCON
CT NECK AND CTA NECK	CT NECK	CT NECK
CT NECK BODY W CONTRAS	CT NECK CHST ABD/PEL W IVCON	CT NECK CHEST ABDOMEN PELVIS W IVCON
CT NECK NEURO W CONTRA	CT NECK	CT NECK
CT NECK NEURO W CONTRAST	CT NECK	CT NECK
CT NECK NEURO WO CONTRAST	CT NECK	CT NECK





CT ORBIT POST FOSSA	CT HEAD ORBITS	CT HEAD
CT ORBITS WO CONTRAST	CT HEAD ORBITS	CT HEAD
CT Orbits W Cont	CT HEAD ORBITS W IVCON	CT HEAD ORBITS W IVCON
CT PELVIS W CONTRAST	CT PELVIS W IVCON	CT PELVIS W IVCON
CT PELVIS WO CONTRAST	CT PELVIS WO IVCON	CT PELVIS WO IVCON
CT SINUS W/WO CONTRAST	CT HEAD SINUSES	CT HEAD PARANASAL SINUSES
CT SINUS WITH CONTRAST	CT HEAD SINUSES	CT HEAD PARANASAL SINUSES
CT SINUSES	CT HEAD SINUSES	CT HEAD PARANASAL SINUSES
CT SPINE CERV BODY WO	CT C SPINE	CT C SPINE





Appendix B: Glossary

“ACR” stands for the American College of Radiology

“AD” stands for achievable dose and is represented by the mean of a dose distribution

“reference Air Kerma” measured in mGy is the number of photons emitted from the fluoroscopy x-ray tube at the reference point.

"Automatic exposure control" means a device that automatically controls one or more technique factors in order to obtain at a preselected location or locations a required quantity of radiation (see "Phototimer").

"Beam axis" (see "Central axis of the beam")

"Central axis of the beam" means the line passing through the source of the beam and the center of the plane formed by the edge of the first beam-limiting device. "Charged particle beam" (see "Beam").

"Coefficient of variation" means the ratio of the standard deviation to the mean value of a population of observations. "Collimator" means a device or mechanism by which the x-ray beam is restricted in size (see "Beam-limiting device").

"Computed tomography" or "CT" means the production of a tomogram by the acquisition and computer processing of x-ray transmission data.

“DAP” Dose area product typically measured in mGy-cm² is the radiation emitted in a radiation field.

“DRL” stands for dose reference level. This is the 75th percentile of a dose distribution

“DIR” stands for the Dose Index Registry





"Computed tomography dose index" or "CTDI" means the integral of the dose profile along a line perpendicular to the tomographic plane divided by the product of the nominal tomographic section thickness and the number of tomograms produced in a single scan.

"Isocenter" means a fixed point in space located at the center of the smallest sphere through which the central axis of the useful beam passes at any beam orientation.

"Scan" means the complete process of collecting x-ray transmission data for the production of a tomogram. Data can be collected simultaneously during a single scan for the production of one or more tomograms.

"Scan increment" means the amount of relative displacement of the patient support device with respect to the CT x-ray system between successive scans measured along the direction of such displacement.

"Scatter radiation" means radiation that, during passage through matter, has been deviated in direction.

"SSDE" stands for Size Specific Dose Equivalent-measured in mGy, is a method of estimating CT radiation dose that takes a patient's size into account.

"Technique factors" means the electrical potential (kilovolts), current (milliamperes), exposure time parameters (seconds or pulses) or a combination thereof, selectable at the control panel of an x-ray system (see "Control panel").

"Tomogram" means the depiction of the x-ray attenuation properties of a section through the body. "Tomographic plane" means that geometric plane that is identified as corresponding to the output tomogram. "Tomographic section" means the volume of an object whose x-ray attenuation properties are imaged in a tomogram.

