Continuous education and training through a dose management platform

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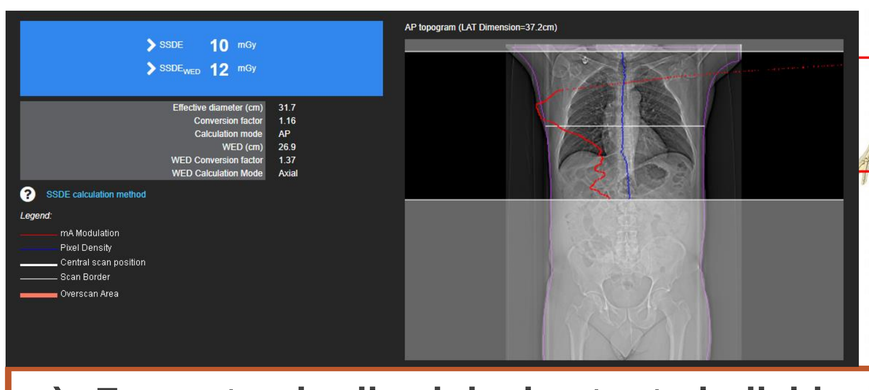
1. Introduction

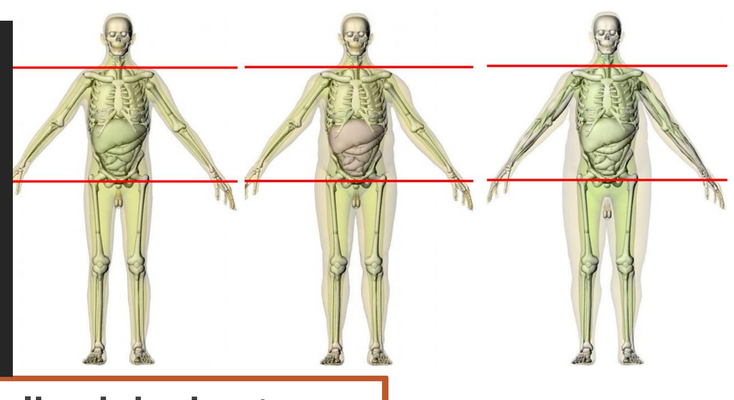
In recent years, dose management systems (DMSs) have become invaluable tools of imaging departments to monitor and manage big data resulting from the increased number of imaging exams.
Through a DMS, a large quantity of potentially very interesting dose and quality related parameters become easily available to the user.
Besides monitoring dose and quality, a DMS can be a powerful tool for continuous training of health professionals on optimization and radiation protection.

2. Materials & Method

Using actual data and examples from the department is always more stimulating for the attendees. In the next paragraph, some interesting teaching points extracted by DOSE (Qaelum, Belgium), the dose management system installed at the hospital, are presented.

3. Teaching Points



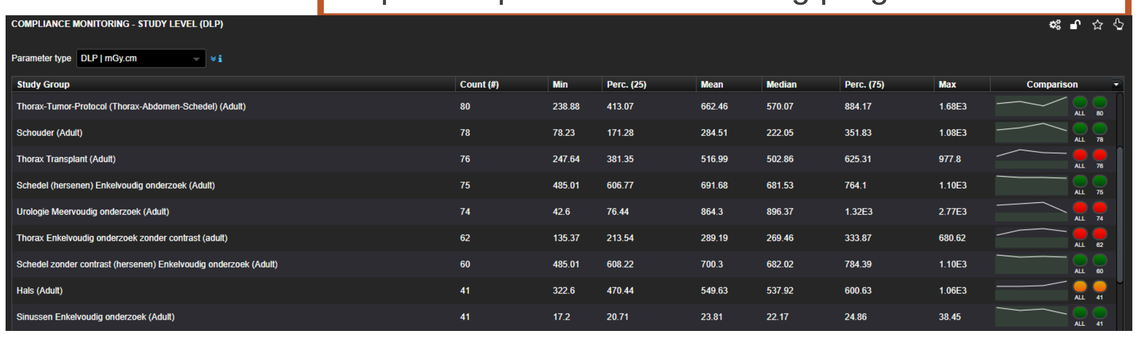


a) From standardized dosimetry to individualized dosimetry:

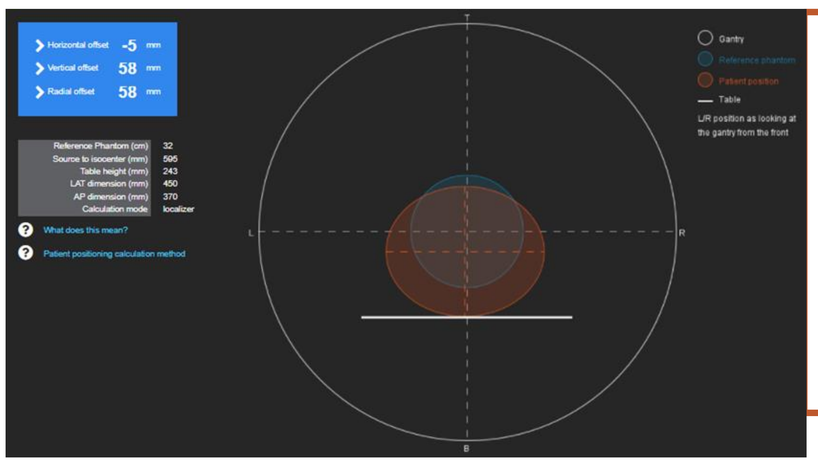
Phantom dose and patient dose are different. In the case of CT, the CTDIvol is dose on a standard PMMA phantom. When the size of the patient is included (in terms of effective diameter or water equivalent diameter), then Size Specific Dose Estimate is calculated, which is a step closer to what the patient actually received. Furthermore, effective and organ doses are calculated on anthropomorphic phantoms that match the patient habitus.

d) Compliance with Diagnostic Reference Levels

Through DOSE, we can monitor protocols and evaluate the compliance with national and international regulations in a larger scale than previously performed. In an easy way with traffic lights colors, protocols that need to be optimized are immediately visible. Creating awareness of the importance of protocol optimization is an important point of our teaching program.



Study Group	Count (#)	Min	Perc. (25)	Mean	Median	Perc. (75)	Max	Comparison
Thorax-Tumor-Protocol (Thorax-Abdomen-Schedel) (Adult)	80	238.88	413.07	662.46	570.07	884.17	1.68E3	
Schouder (Adult)	78	78.23	171.28	284.51	222.05	351.83	1.08E3	
Thorax Transplant (Adult)	76	247.64	381.35	516.99	502.86	625.31	977.8	
Schedel (hersenen) Enkelvoudig onderzoek (Adult)	75	485.01	606.77	691.68	681.53	764.1	1.10E3	
Urologie Meervoudig onderzoek (Adult)	74	42.6	76.44	864.3	896.37	1.32E3	2.77E3	
Thorax Enkelvoudig onderzoek zonder contrast (adult)	62	135.37	213.54	289.19	269.46	333.87	680.62	
Schedel zonder contrast (hersenen) Enkelvoudig onderzoek (Adult)	60	485.01	608.22	700.3	682.02	784.39	1.10E3	
Hals (Adult)	41	322.6	470.44	549.63	537.92	600.63	1.06E3	
Sinussen Enkelvoudig onderzoek (Adult)	41	17.2	20.71	23.81	22.17	24.86	38.45	



b) Value of correct positioning in CT

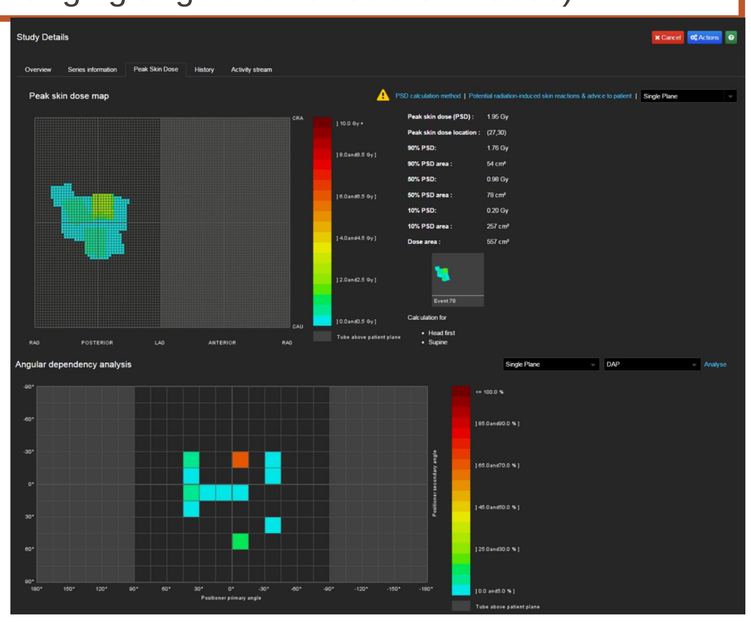
A patient closer to the tube during the localizer view will be considered larger and receive higher dose. In the case of horizontal offset, the bowtie filter will not shape the beam correctly, leading to a non-uniform image quality. This is a good teaching point for technologists to highlight the importance of correct positioning.

e) Skin dose awareness in interventional radiology

It is important to establish a protocol for tracking and following up patients who receive high skin doses with expected skin reactions. In our teaching program we identify outliers, i.e. exams with peak skin dose above 5Gy. Cases can be analyzed and evaluated for follow up and technique optimization purposes (e.g. how changing angulation affects skin dose).

c) Compression force in mammography

Compression force of a specific range (around 100N) allows for a good quality image; the compression makes the breast more symmetrical and thinner in thickness resulting in a lower radiation burden. It also reduces superimposition of breast structures and increases geometric and motion sharpness. In the attached example, different operators use different ranges of compression force.



4. Conclusion

With a DMS, health professional teachers are given a unique opportunity with valuable information right at their fingertips for different specialities (technologists, radiologists, cardiologists, surgeons)!
Setting up a program of continuous education and training can save time and help to avoid mistakes. Identifying practical examples and use in house cases improves user engagement and allows for better understanding of quality, optimization and radiation protection.

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