Imaging Education Symposium

Estimating Radiation Dose in CT

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Radiation dose from CT exams has been identified as the largest contributor to medical radiation dose and has been the subject of intense discussion over the past few years. Several unfortunate and highly publicized radiation dose overexposure events have been reported. This has heightened the awareness of radiation dose among radiologists, technologists, patient populations, regulators and international agencies. All parties want to know the radiation dose due to CT exams.

However, the only available dose metrics available are CTDIvol and DLP, ***which are not patient dose, but measures of scanner output***. Even these metrics have been widely criticized as not being "accurate" representations of dose. One limitation is that there are currently scanners whose nominal beam width is wider than the extent of both the common measuring device (the 100 mm pencil ionization chamber) and the standard dosimetry phantom (150 mm long CTDI phantom), which leads to a breakdown of the assumptions under which CTDI measurements and calculations are valid and to a significant underreporting of the dose. This has led to efforts by AAPM Task Groups (TG 111 and now TG 200) to develop new methodologies and phantoms that will more accurately reflect scanner output. In addition, the International Electrotechnical Commission (IEC) has proposed adjustments to the CTDI methodology for those wider beam scanners.

Therefore, this symposium will describe both current (CTDI) and proposed future CT dose metrics (TG 111/ TG 200 and IEC) as well as the phantoms used (or being proposed in TG 200) for each. It will also describe the limitations of each of these approaches in estimating patient dose and some of the efforts (TG 204) to adjust scanner reported values (CTDI) for patient size.

The learning objectives of this symposium include the following:

1. To understand current radiation dose metrics reported on CT scanners (e.g. CTDIvol, DLP) and included in scanner generated dose reports, which are measured in standard cylindrical phantoms and reflect CT scanner output.
2. To understand current methods to estimate radiation dose to patients.
3. To understand the limitations of both phantom and patient dose estimates.
4. To understand proposed methods to estimate radiation dose in phantom that will overcome some of the limitations of current methods (specifically AAPM TG 111 report and the ongoing work of TG 200).
5. To understand some of the proposed methods to estimate patient radiation dose that account for patient size (AAPM TG 204).