

10 THINGS TO KNOW ABOUT CT DOSE

1. ALARA = As Low As Reasonably Achievable

- ALARA: The Guiding Principle of Clinical Radiation Use
- Purpose: Balance the potential risk of radiation exposure with the clinical benefit.

2. It's not possible to measure true radiation dose to a patient, but there are some helpful guidelines.

- True radiation dose depends on many factors that cannot be easily quantified, such as the size and distribution of the patient's anatomy.

3. Three Dose Metrics Commonly Used in CT

- CTDI, DLP, and Effective Dose
- These dose metrics are generally based on measurements in either a 16 cm or 32 cm diameter cylindrical phantom.

4. CT Dose Index (CTDI)

- CTDI is a proxy for absorbed dose in a phantom at the center of the scan.
- CTDI is useful for measuring scanner output.
- CTDI does not account for scan length.
- CTDI is measured in milligray (mGy).

5. Dose Length Product (DLP)

- DLP is a proxy for the total absorbed dose in a phantom over the length of a scan.
- DLP is useful for comparing exam doses if scan lengths are equivalent.
- DLP is measured in milligray-centimeter (mGy-cm).

6. CTDI and DLP are not patient dose.

- CTDI and DLP do not include patient specifics such as patient size, and organ radiosensitivity.

7. Effective Dose is a parameter used to estimate biologic risk of a non-uniform exposure (like that of CT) compared with a whole body exposure.

- Effective Dose is based on population models and may not be applicable for risk comparisons of individual patients.
- Effective Dose is calculated as the sum of dose absorbed by each organ weighted by the radiosensitivity of the organ.
- Common practice: Effective Dose is generally estimated in CT using DLP and dose conversion coefficients:
 - $\text{Effective Dose} = \text{DLP} \times \text{dose conversion coefficient}$
- Dose conversion coefficients (a.k.a. "k-factors") account for radiosensitivity of organs in the scan region and patient age for pediatrics.
- As it is estimated in CT, Effective Dose does not account for differences in patient size.
- Effective dose is reported in millisievert (mSv).

8. All vendors can quote dose reductions.

- It is important to understand: dose reduction compared to what?
- Also, what is the effect on image quality?

9. Comparing the dose between different scanners is impossible without equalizing the image quality.

- Low contrast resolution is a good indicator of overall CT system dose efficiency because dose and image quality are combined in the same metric.

10. The low dose goal is to achieve diagnostic image quality, not spectacular image quality.

- The dose used in a given exam must be enough to deliver sufficient image quality to answer the clinical question, but as low as possible to minimize the risk to the patient.
- This is the fundamental concept behind the ALARA Principle (As Low As Reasonably Achievable).

