

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 centre 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:
 - Effective Dose = DLP x dose conversion coefficient
- Dose conversion coefficients (a.k.a. "k-factors") account for radiosensitivity of organs in the scan region and patient age for paediatrics
- As it is estimated in Low-Dose CT, Effective Dose does not account for differences in patient size
- Effective dose is reported in millisievert (mSv)

8. All imaging providers 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 minimise the risk to the patient
- This is the fundamental concept behind the ALARA Principle (As Low As Reasonably Achievable)