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Diagnostic Reference Levels (DRLs) in Radiology

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Definition of DRLs

ICRP Definition: Diagnostic reference levels (DRLs) are used to measure doses in simple phantoms or patients to determine if corrective action is needed.

Optimization Tool: DRLs indicate the expected radiation dose for an average patient during imaging.

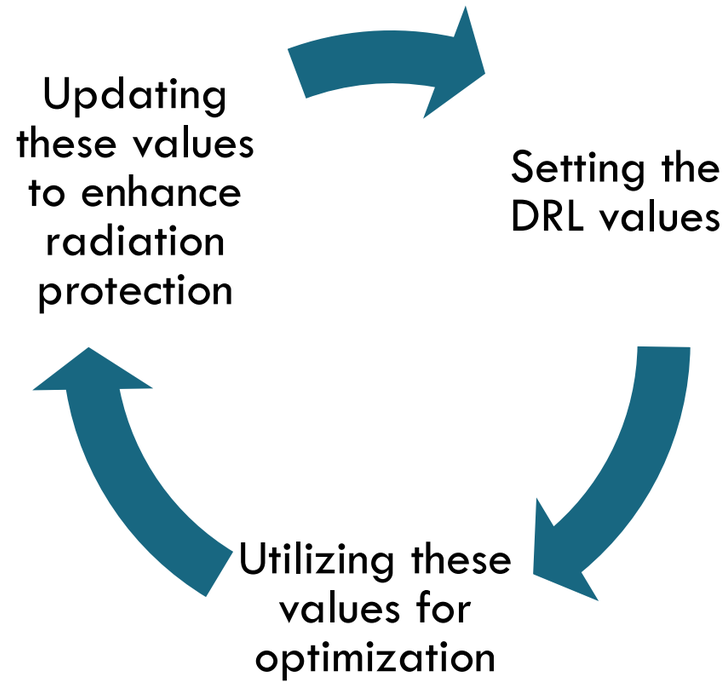
EU Council Directive Definition: DRLs are standard dose levels for typical imaging, which should not be exceeded when good practices are followed.

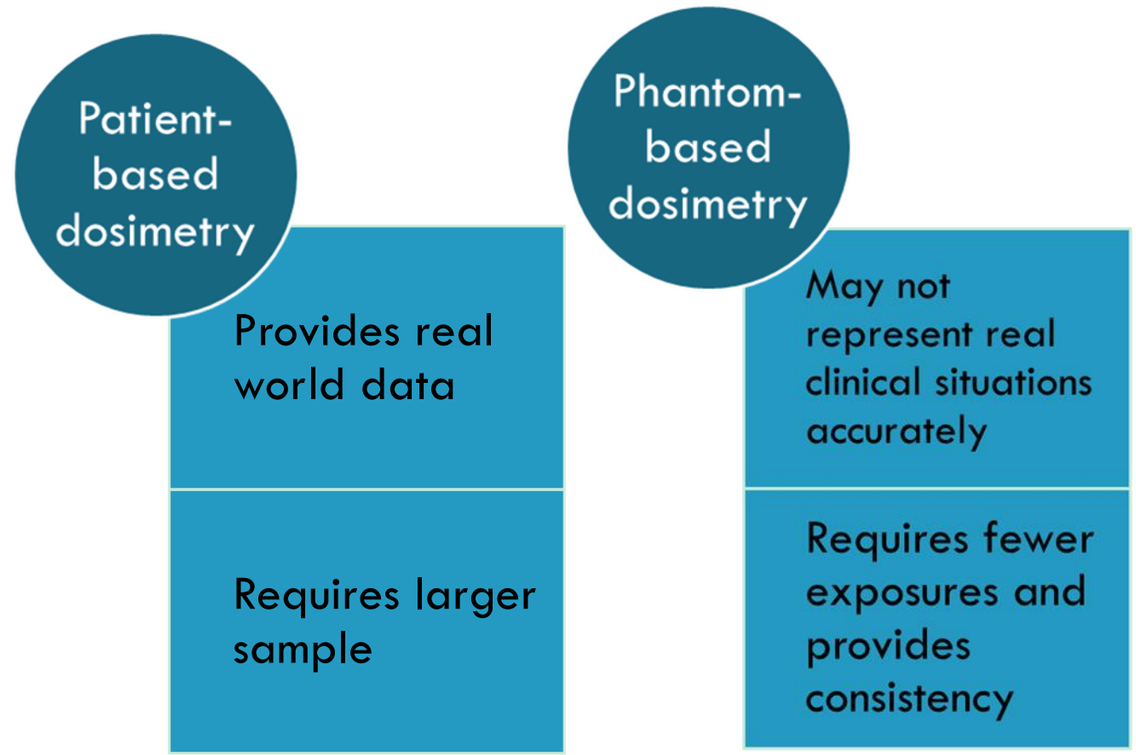
Importance & Aim of DRLs

- Minimizing Health Risks: Triggering actions to prevent harmful radiation exposure, ensuring patient safety.
- Optimizing Radiation Exposure: Set limits to keep radiation doses within safe and practical boundaries.
- Standardizing Practices: Enable comparison of doses across departments to promote best imaging practices.
- Promoting Dose Optimization: Serve as benchmarks to continuously refine imaging protocols.
- Facilitating Quality Improvement: Act as tools for corrective actions, improving patient care and outcomes.

Setting DRL values

“DRL process” is a continuous cycle :

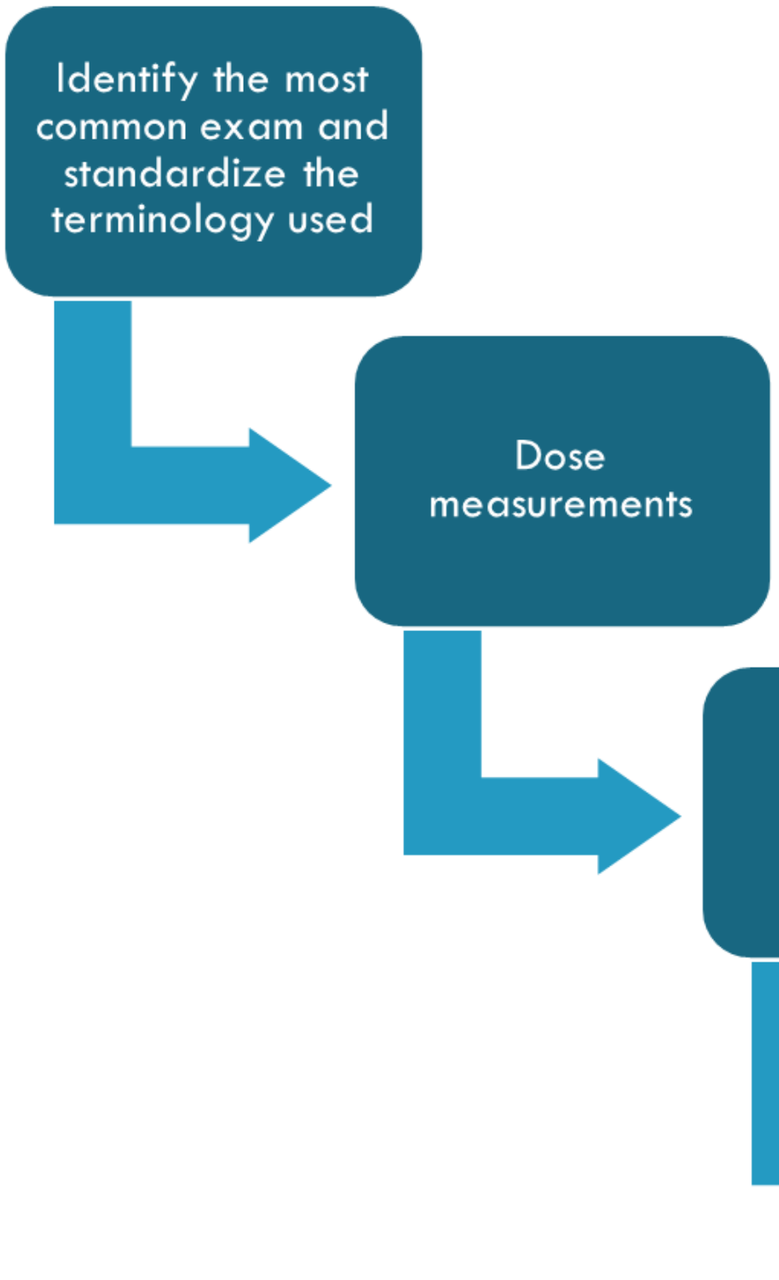




NCRP: “Optimization must take into account both patient dose and clinical utility, based on image quality”

ICRP: *“The appropriate image quality or diagnostic information needed for the clinical task should be a priority when setting DRL values.”*

The DRL process



Median dose of patient sample is referred as "typical dose"

ICRP Recommendations:

- DRLs should be tied to specific clinical and technical requirements for the medical imaging task
- Priority is to achieve appropriate image quality and clinical information for diagnostic purposes
- National DRLs are defined as the 75th percentile of the median dose values observed across healthcare facilities

DRL are set as the 75% percentile of the distribution of the typical doses.

Importance of DRLs in Radiation Safety

Minimizing Health Risks:	**Standardizing Radiology Practices:**	**Optimization of Radiation Doses:**
1) DRLs help to prevent unnecessary radiation exposure.	1) DRLs facilitate comparison of patient doses across departments and regions.	1) By serving as benchmarks, DRLs encourage continuous evaluation and improvement of imaging protocols.
2) Exceeding DRLs prompts an investigation to ensure patient doses remain within safe limits.	2) They ensure that medical imaging adheres to best practices, enhancing overall patient safety and care.	2) DRLs guide departments toward optimizing radiation exposure without compromising diagnostic quality.

Monitoring DRLs

Continuous DRL Process:

- The DRL process involves setting values, utilizing them for dose optimization, and updating them regularly.
- The National DRLs are set at the **75th percentile** of median dose values observed across healthcare facilities.

Approaches to Setting DRLs:

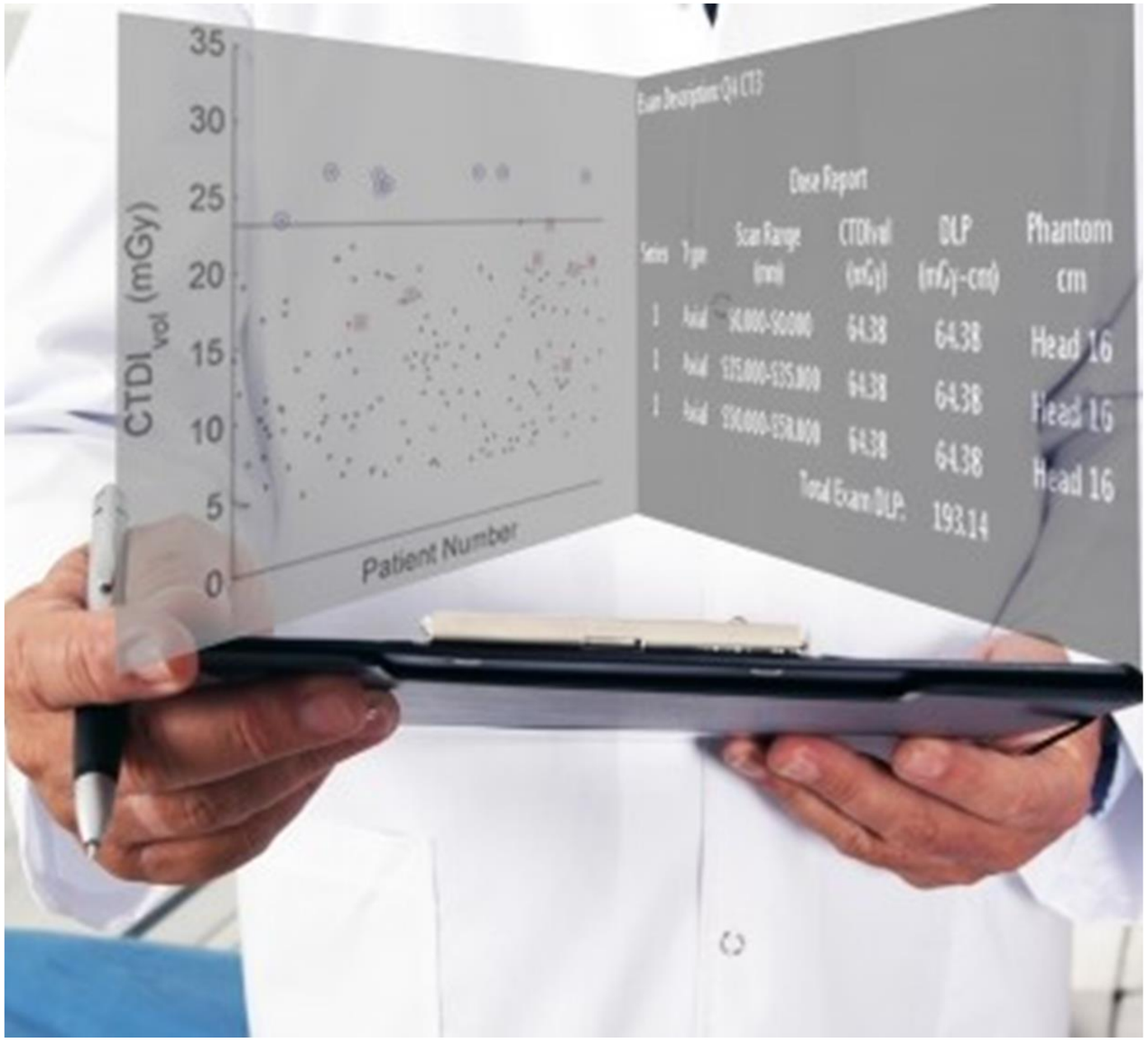
- **Patient-based dosimetry**: Provides real-world data but requires larger sample sizes.
- **Phantom-based dosimetry:** More consistent, though less representative of clinical situations.

DRL for Pediatrics:

- Pediatric DRLs are more complex due to the wide variability in body size.
- Different DRLs are required for various age or weight groups to ensure precise dose management.

Conclusion

The establishment and implementation of Diagnostic Reference Levels (DRLs) play a critical role in optimizing patient radiation doses in diagnostic radiology. DRLs, developed through extensive collaboration, offer a benchmark that keeps radiation exposure within safe, reasonable limits while maintaining diagnostic quality. As medical technology evolves, the regular review and update of DRLs are essential to ensure continued protection of patient health and safety. By adhering to DRLs, radiology departments can minimize unnecessary radiation risks, promote dose optimization, and ultimately enhance the quality of medical imaging practices globally.



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