

# Ask EuroSafe Imaging Tips & Tricks



## Paediatric Imaging Working Group

### Paediatric DRLs made easy

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## Introduction

- Establishing quantitative indicators on the value of administered doses allows the comparison between different examination techniques to promote strategies for optimizing patient protection;
- The pediatric DRL's are expected not to be exceeded in the routine procedures when good diagnostic quality practices are applied

# Diagnostic Reference Levels/ICRP

Advisory dose levels to help in optimisation  
of imaging practices

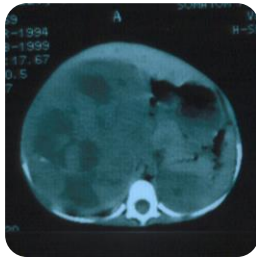
Aim to identify unusually high dose  
levels

Defined for common examinations  
e.g. chest radiography, pelvis  
radiography



# Diagnostic Reference Levels/ICRP

Defined for examinations with potentially high patient exposure  
e.g. CT, fluoroscopy (especially IR)



Should always be considered keeping in mind the balance between the diagnostic value of the medical imaging task (Image quality should not be higher than required for diagnostic purposes)



# DRLs are NOT

- Dose restrictions or limits

DRL's are guiding levels for optimised practices, established for groups of patients, not individual patients.

- To separate good and bad practices

# Reasons to compare your dose levels to DRLs

To optimise imaging protocols

new equipment

any change in imaging practice

need for further optimisation

To know where we stand with our dose levels

curiosity

proof of the level of dose optimisation/  
radiation protection practices

As a part of regular audit/self assessment/quality assessment

Verify the exposure parameters and the image quality



# DRLs to use

## National DRLs

- set by national authoritative bodies
- based on national dose collections

## European DRLs (PiDRL)

- if national DRLs do not exist
- based on existing national DRLs in Europe

## Local DRLs

- based on local/areal dose collections without official involvement of national authoritative body
- should be considered especially in big units with modern equipment or if the national DRLs are outdated

# Child specifics in the use of DRLs



- Patient size has to be accounted for
  - weight is recommended by EC and ICRP
  - if age is used, the number of patients should be considerably higher
  - PiDRL report includes conversion tables for age groups - weight groups
- DRLs are usually given for specific weight groups  
(or as a continuous curve: Finland)
- There is variation of the use of 32 cm or 16 cm phantom for the calculation of dose quantities in paediatric body protocols



# Paediatric categorisation

- ✓ Rare publications quoting patient age + weight;
- ✓ Only a few with patient weight;
- ✓ The majority used patient age;
- ✓ Most common appears to be:

<1  
1-5  
5-10  
10-15 y.o.

Järvinen et al., 2011, 2014  
Roch & Aubert, 2013

# Categorisation recommendations

Body  
examinations

Head CT  
examinations

< 5 kg  
5 -< 15kg  
15-< 30 kg  
30-<50 kg  
50-<80 kg

0 - < 4 weeks  
4 weeks -< 1y  
1 -< 6 y  
≥ 6 y



PiDRL

EUROPEAN DIAGNOSTIC  
REFERENCE LEVELS FOR  
PAEDIATRIC IMAGING

European Guidelines on DRLs for Paediatric Imaging

Final complete draft for PiDRL Workshop  
30 September 2015

# Age equivalent group



Description	Weight group	Age group based on charts	Most common age on NDRLs
Neonate	< 5 kg	< 1 m	0 y
Infant, toddler and early childhood	5 -< 15kg	1 m - < 4 y	1 y
Middle Childhood	15-< 30 kg	4 y - < 10 y	5 y
Early adolescence	30-<50 kg	10 y - < 14 y	10 y
Late adolescence	50-<80 kg	14 y - < 18 y	15 y

# How to collect the doses for comparison

Design an easy form/table for dose collections and make sure every user understands it

Record dose quantities as they appear on your console.

They can be converted later to the quantity used in DRLs (Any conversion of quantities in between the daily practice is a sure source of mistakes)

Collect dose values from every room/equipment separately

Collect dose values from minimum of 10 patients for each weight group

# How to compare own dose level to the DRLs

Convert your dose values to the one used in the DRLs

Calculate the median of your own dose values for each weight group

Compare the median dose for each group to the given DRL

# How to read the result



- If your median dose is higher than the DRL, the DRL is exceeded
- Analysis of the reasons
  - survey methodology
  - equipment performance
  - protocol design
  - operator performance (right protocol for the right patient/indication)
- Consider corrective actions to improve the practice
  - protocol optimisation
  - operator education
  - equipment QC

# Conclusions

- Analyse the results of dose collections and take actions, if needed!
- DRL's are a practical tool to promote optimisation.
- Optimisation of patient protection in radiology requires application of specific imaging protocols adapted to the age, volume, anatomic region and clinical indication, in order to ensure that patient doses are as low as reasonably possible for the imaging task.

# References

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