

# ESTABLISHING DIAGNOSTIC REFERENCE LEVELS FOR CT IN THE REPUBLIC OF BELARUS

SCIENTIFIC SESSION of the BELARUSIAN STATE MEDICAL UNIVERSITY, 2025

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State Institution «Republican Center for  
Hygiene, Epidemiology and Public Health»





# **The Ministry of Health (state sanitary supervision)**

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one of the regulators in the field of radiation safety and protection

**functional authority of the Ministry of Health in accordance with the Law "On Radiation Security" (2019)**

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establish the procedure for establishing and applying dose limits and reference levels



МИНИСТЕРСТВО  
ЗДРАВООХРАНЕНИЯ  
РЕСПУБЛИКИ БЕЛАРУСЬ





## RESPONSIBLE ORGANIZATIONS:

- Aleksandrov N. center – head organization in the field of development of medical technologies and diagnostics
- State Institution «Republican Center for Hygiene, Epidemiology and Public Health» – organization of technical support for the Ministry of Health, provides consulting and expert assistance, participates in the development of regulatory legal and technical regulatory legal acts
- Belarusian Society of Radiologists - promoting the development of science, practice and satisfying the professional interests of its members in the field of radiation diagnostics
- Regional (Minsk) oncology centers and - development of diagnostic and treatment methods
- Chief specialists of the Ministry of Health—according to radiation therapy, on radiation diagnostics, according to radiation hygiene



ГОСУДАРСТВЕННОЕ УЧРЕЖДЕНИЕ  
**РЕСПУБЛИКАНСКИЙ НАУЧНО-ПРАКТИЧЕСКИЙ ЦЕНТР  
ОНКОЛОГИИ И МЕДИЦИНСКОЙ РАДИОЛОГИИ  
ИМ. Н.Н.АЛЕКСАНДРОВА**

Республика Беларусь, Минский район, аг. Лесной



РЕСПУБЛИКАНСКОЕ УНИТАРНОЕ ПРЕДПРИЯТИЕ  
**НАУЧНО-ПРАКТИЧЕСКИЙ ЦЕНТР ГИГИЕНЫ**



Министерство здравоохранения Республики Беларусь  
Комитет по здравоохранению Мингорисполкома  
Учреждение здравоохранения

**Минский городской клинический  
онкологический центр**

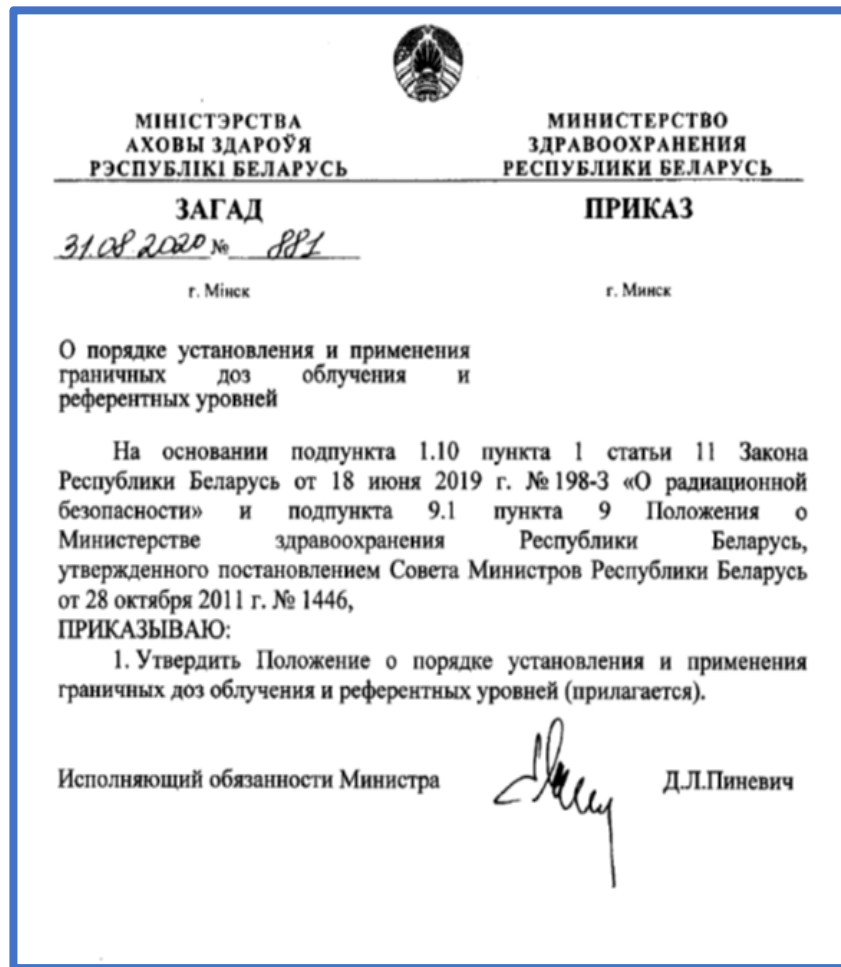
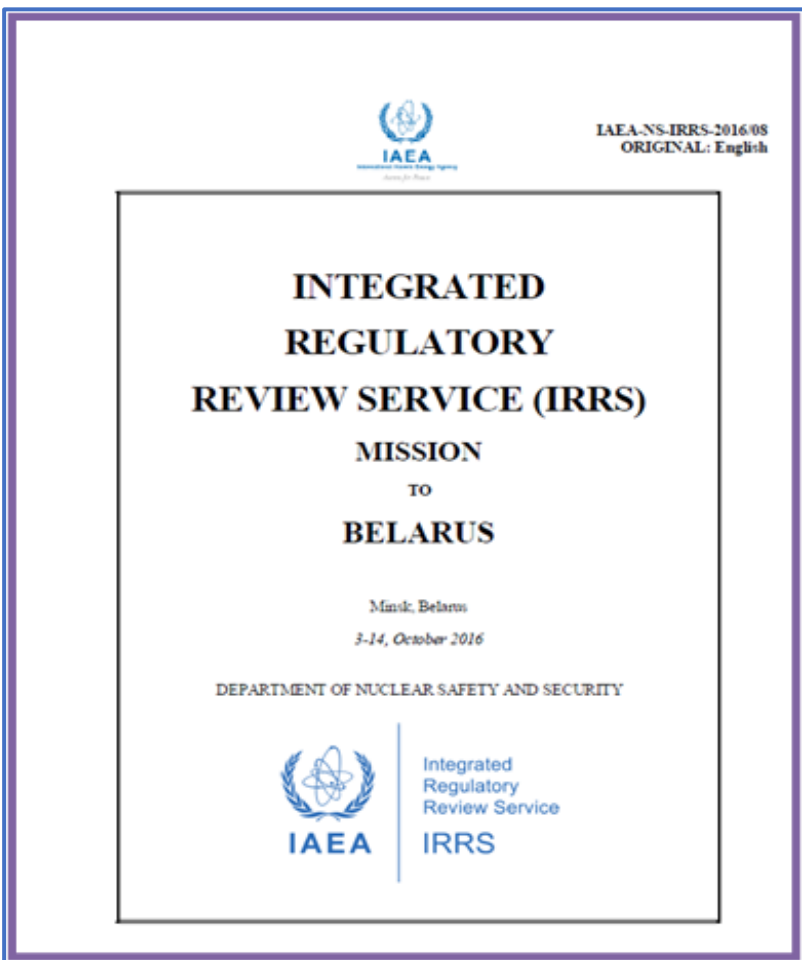


**Белорусское  
Общество  
Радиологов** 3



# Diagnostic reference levels -

parameter showing under normal conditions whether the patient is an irradiation dose or the activity of the introduced radiopharmaceutical preparations unusually high or unusually low for this procedure





# IAEA REQUIREMENTS:

- The DRL for a selected study is the established value of the selected dose value, numerically equal to a certain percentile of the distribution of X-ray rooms for a given dose value for a particular region or country
- The DRL is a comparative measure for assessing whether the patient's radiation exposure in a given room (on a given machine) is abnormally high or low for the examination or procedure under consideration.
- DRLs are ESTABLISHED IN MEASURED DOSE VALUES!
- Exceeding the DRLs – excess  $+2 \delta$  from the typical dose or activity for a given institution

## IAEA Safety Standards

for protecting people and the environment

### Radiation Protection and Safety in Medical Uses of Ionizing Radiation

Jointly sponsored by



#### Specific Safety Guide

No. SSG-46





# DOSIMETRIC QUANTITIES IN RADIODIAGNOSIS ARE MEASURED AUTOMATICALLY!

## RADIOGRAPHY AND RADIOSCOPE:

**DAP** – product of kerma (air dose) and field area,  $\text{Gy}\cdot\text{m}^2$   
( $\Gamma\text{p} \times \text{m}^2$ )

**NOTA BENE!**

CTDI и DLP are not radiation doses for a specific patient, they are merely an indicator of the scanner's radiation output and a parameter for determining the organ dose

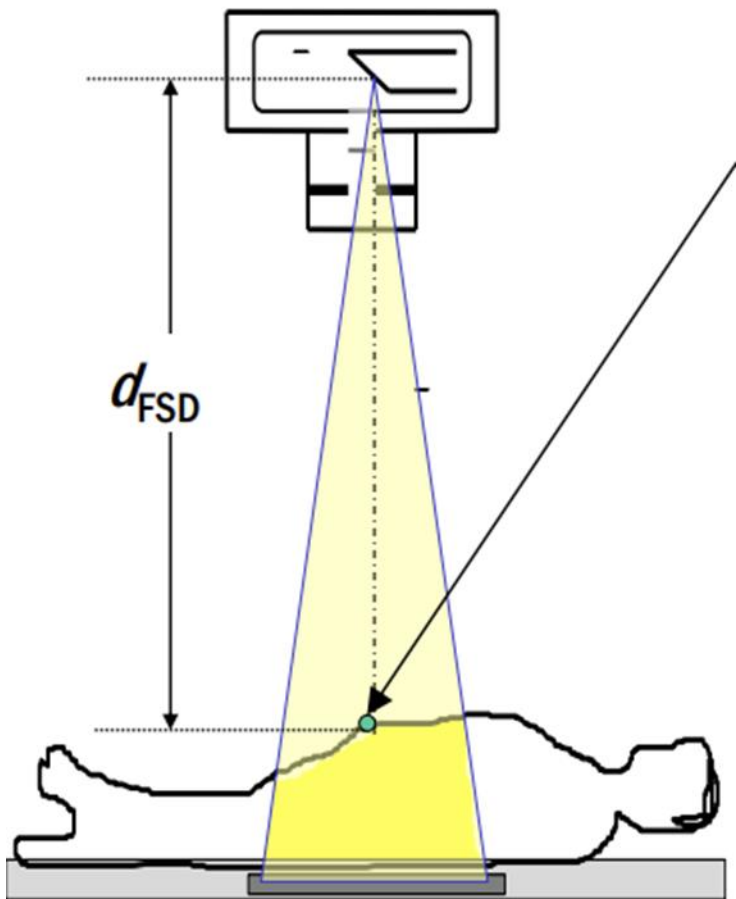
## KT:

**CTDI**, mGy (a measure of the absorbed dose of radiation per revolution of an x-ray tube)

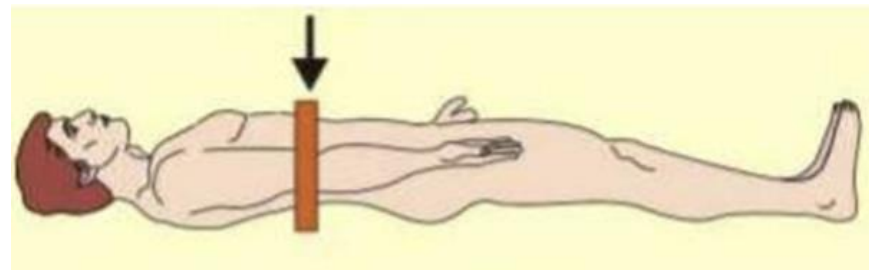
**DLP**, mGy.cm (absorbed dose for all CT scans, taking into account the length of the scan area and the number of repeat scans)



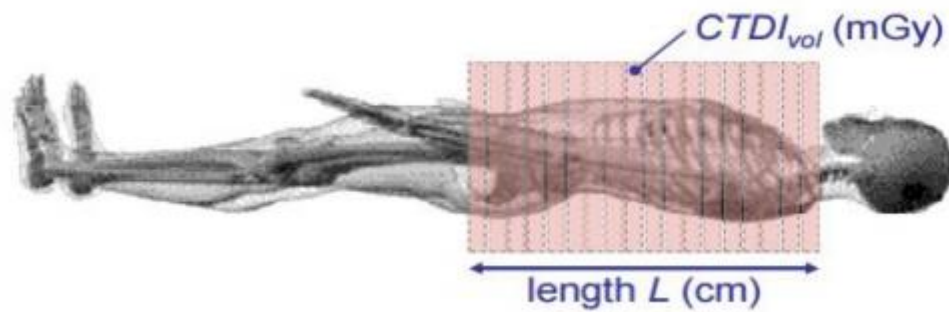
## DAP



## CTDI

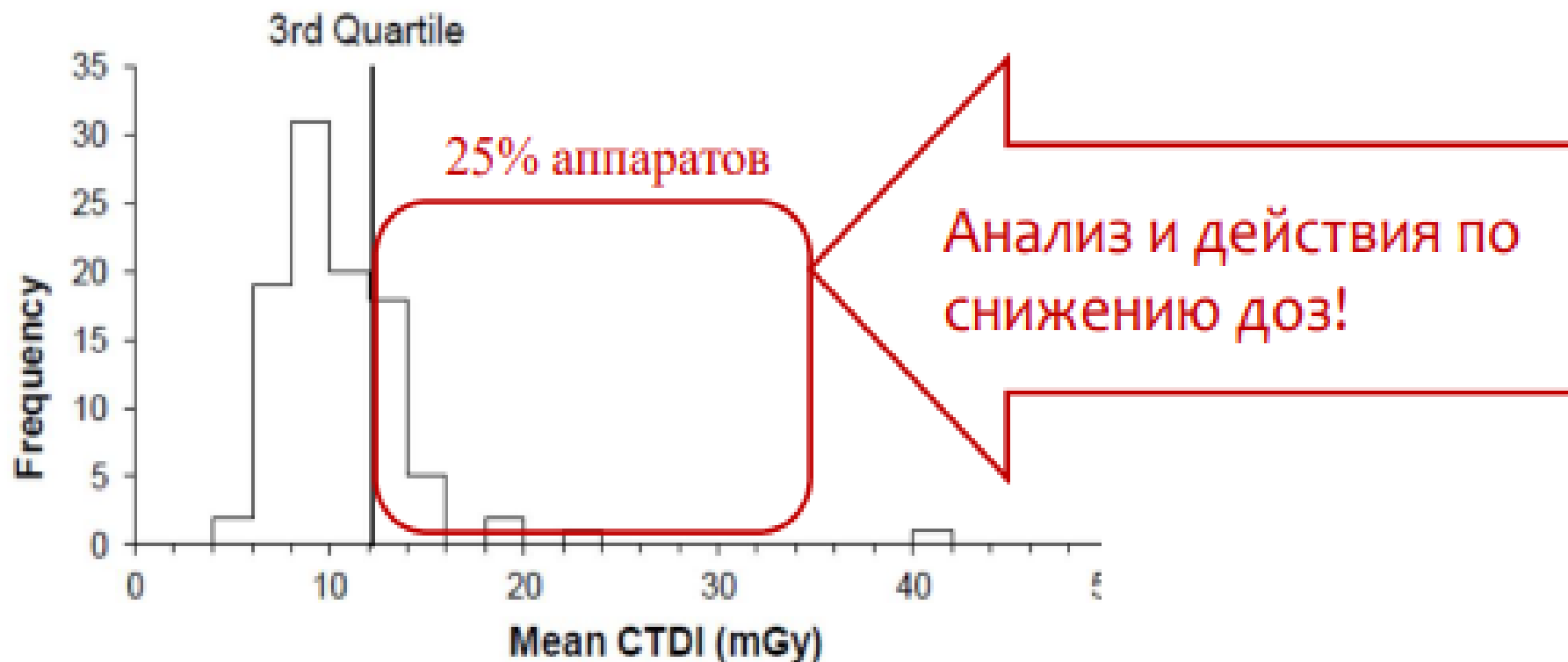


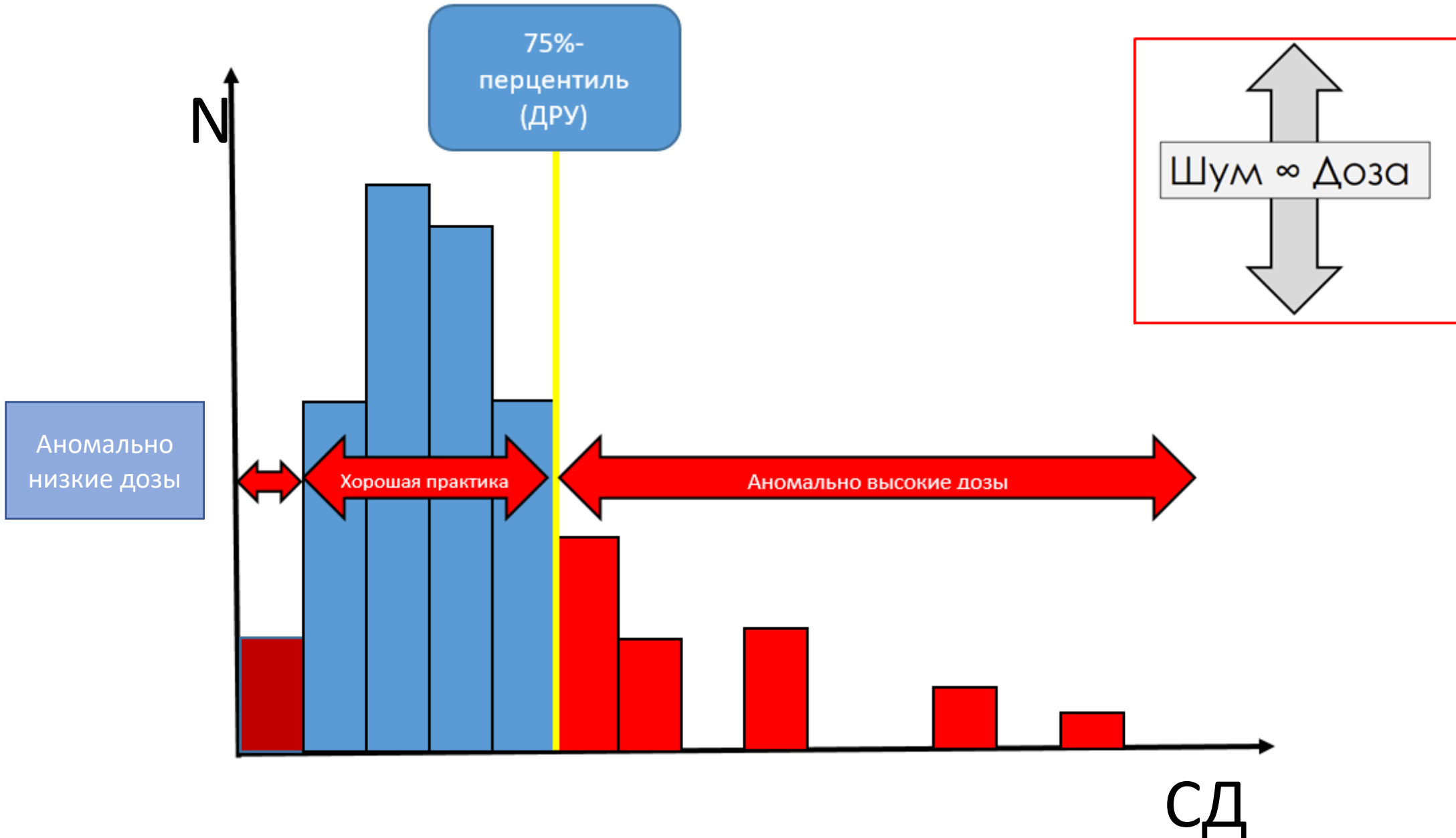
## DLP





# Principals of establishment







# SCHEME FOR DETERMINING THE DRLs

- median value of the selected dose value for a sample of 10-20 patients with a body weight of  $70 \pm 5$  kg (for a standard patient)

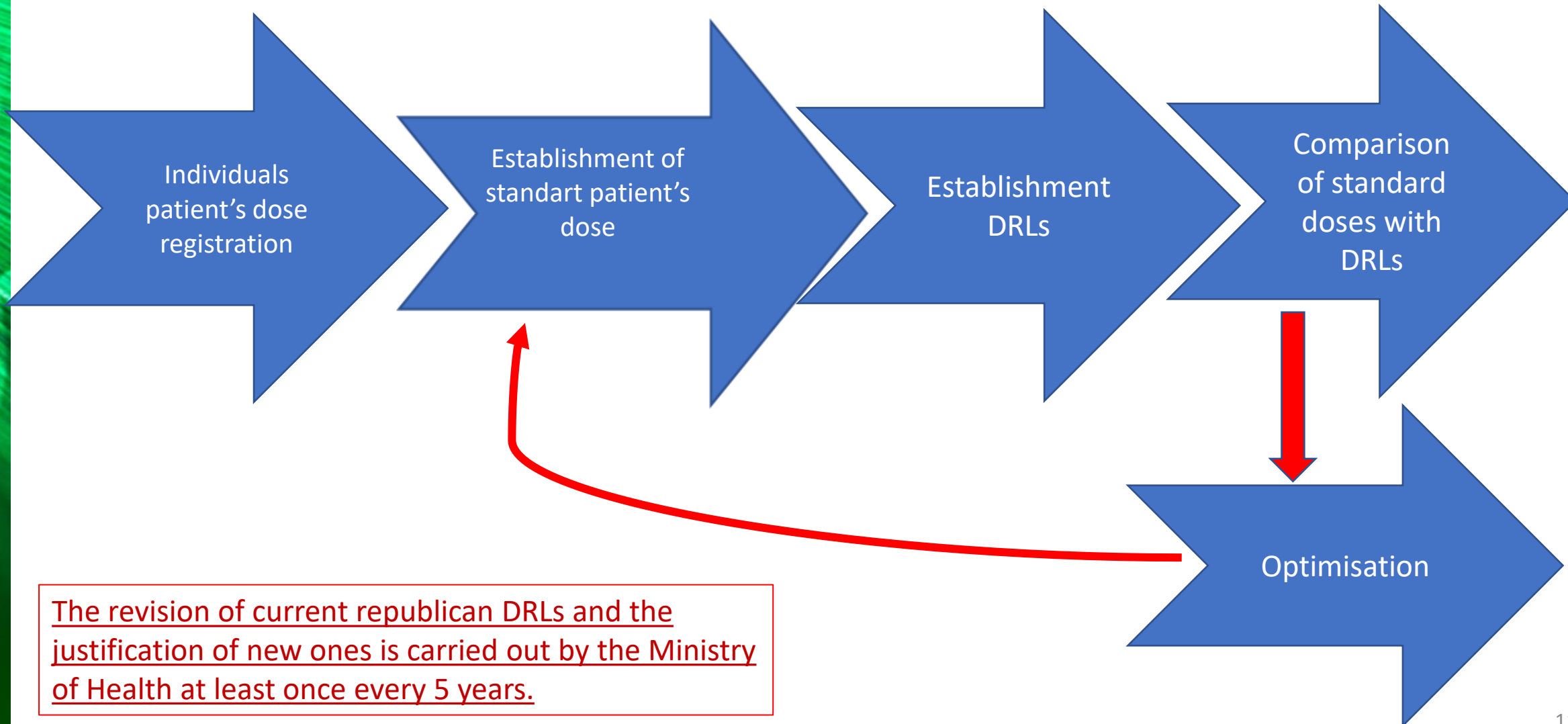
Exception: body weight is not taken into account in CT scans of the brain

Or

- the median value of the selected dose value for a sample of 50-100 patients without taking into account individual anthropometric characteristics
- for children - separate pediatric DRUs are established



# Optimization process



The revision of current republican DRLs and the justification of new ones is carried out by the Ministry of Health at least once every 5 years.

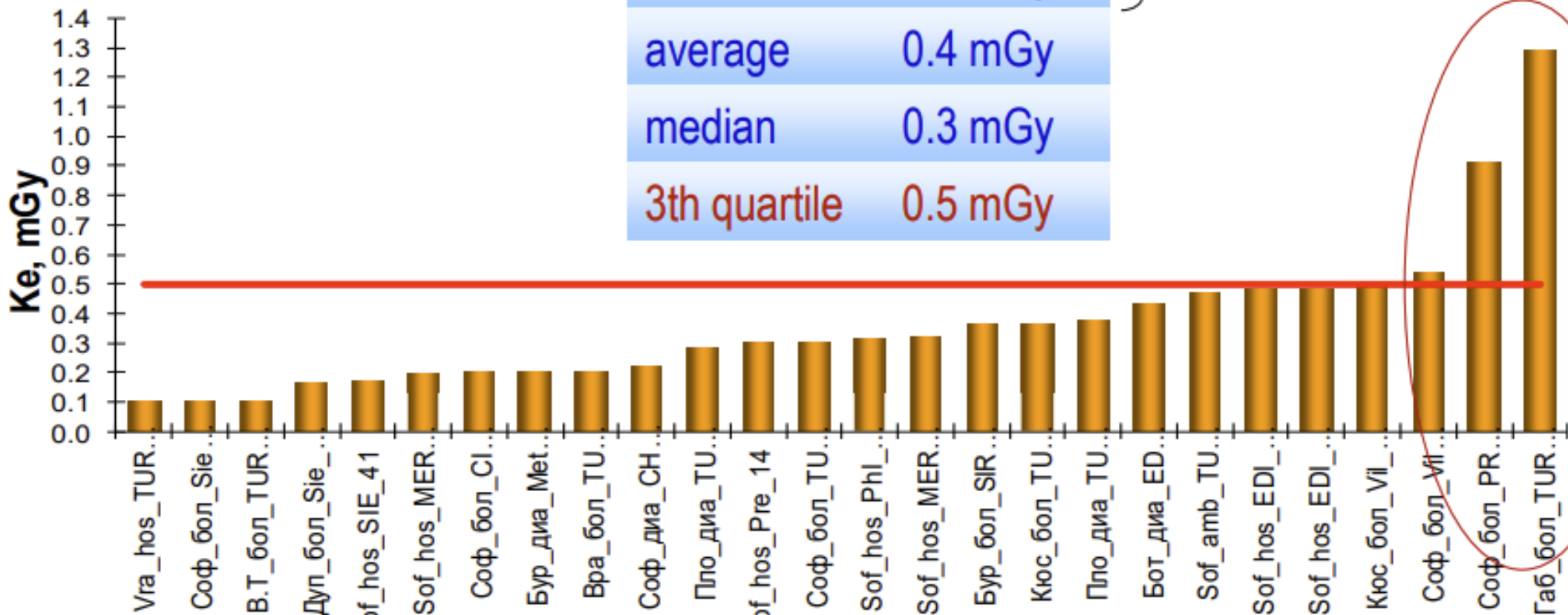


# OPTIMIZATION IN BULGARIA

Графикя лежких  
26 аппаратов

min	0.1 mGy
max	1.3 mGy
average	0.4 mGy
median	0.3 mGy
3th quartile	0.5 mGy

13 раз





# IAEA EXPERT MISSION TO ESTABLISH NATIONAL DRLs IN CT

- An online survey was conducted, in which 67 radiologists from all over the republic took part.
- The most common localizations were selected - a total of 7 CT studies:
  - Brain
  - Chest
  - Abdominal cavity
  - Chest + abdominal cavity
  - Abdominal cavity + pelvis
  - Lumbar spine
  - Chest + abdominal cavity + pelvis



# INSTRUCTIONS ON THE PROCEDURE FOR CONDUCTING CT AND MRI

- New form of X-ray doses for patients during CT scans approved
- In addition to the effective radiation dose, a requirement is introduced to include in the dose load accounting form and CT description the **Total DLP indicator** from the CT scanner dosimetric report for the examination of each specific patient
- The effective dose for each CT examination is calculated by multiplying the total DLP by a conversion factor
- There is no need to include the effective dose in the description of the CT examination

*Национальный правовой Интернет-портал Республики Беларусь, 17.05.2023, 8/39976*

ПОСТАНОВЛЕНИЕ МИНИСТЕРСТВА ЗДРАВООХРАНЕНИЯ  
РЕСПУБЛИКИ БЕЛАРУСЬ  
21 апреля 2023 г. № 58

## **О порядке проведения рентгеновской компьютерной томографии и магнитно-резонансной томографии**

На основании части первой статьи 14 Закона Республики Беларусь от 18 июня 1993 г. № 2435-ХП «О здравоохранении», подпункта 8.2<sup>1</sup> пункта 8 и подпункта 9.1 пункта 9 Положения о Министерстве здравоохранения Республики Беларусь, утвержденного постановлением Совета Министров Республики Беларусь от 28 октября 2011 г. № 1446, Министерство здравоохранения Республики Беларусь ПОСТАНОВЛЯЕТ:

1. Утвердить Инструкцию о порядке проведения рентгеновской компьютерной томографии и магнитно-резонансной томографии в организациях здравоохранения (прилагается).
2. Настоящее постановление вступает в силу после его официального опубликования.

Министр

Д.Л.Пиневич



# Effective dose

## Used:

- To compare between different types of studies
- To select a study from several possible ones
- To explain risks
- To estimate the contribution of medical radiation to the collective dose

## Flaws:

- Calculated using average coefficients
- Does not take into account the dependence on age, gender, individual sensitivity, anthropometric characteristics
- **CAN NOT BE USED TO ESTABLISH DRU!**



# Conclusion

1. DRLs are not guideline values and/or dose limits
2. Dose to an individual patient should not be compared with DRLs
3. DRLs do not represent a boundary between good and bad practice
4. DRLs are typical dose values for a “standard size” patient in a given X-ray examination
5. DRLs are stated in measurable dosimetric quantities
6. DRLs cannot be stated in terms of effective dose
7. DRLs are representative of practice at a national level
8. Comparison of typical doses on a given machine with DRLs is an objective tool for optimizing radiological practice
9. The examinations selected for establishing DRLs should be the most frequently performed in the country for which dose assessment is practicable



# THANK YOU FOR YOUR ATTENTION!



graduatestudentthoughts



Me: And that's my presentation... any questions "



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