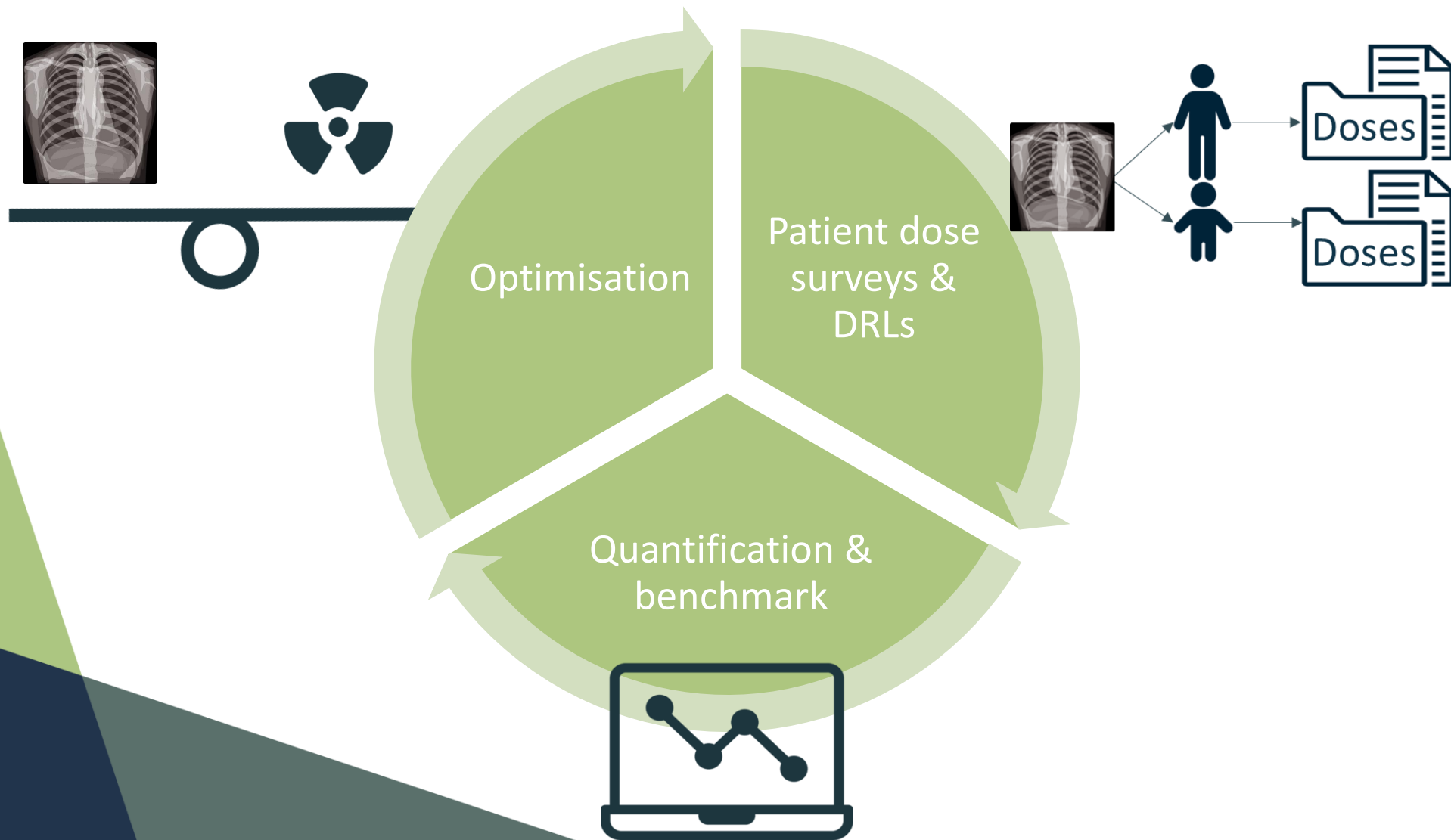


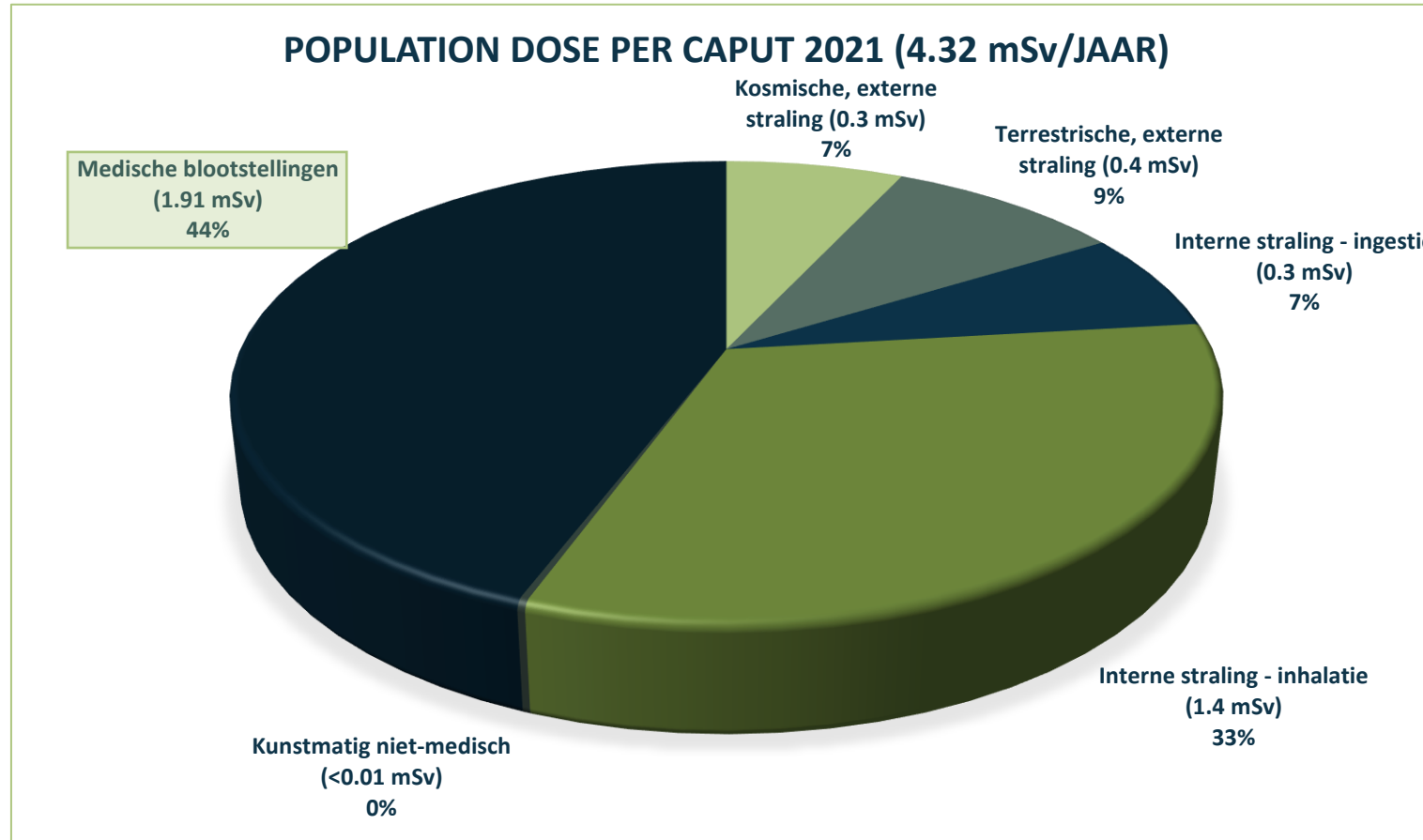
Patient dose surveys & diagnostic reference levels

08/11/2024

Patient dose surveys & DRLs as a tool for optimisation

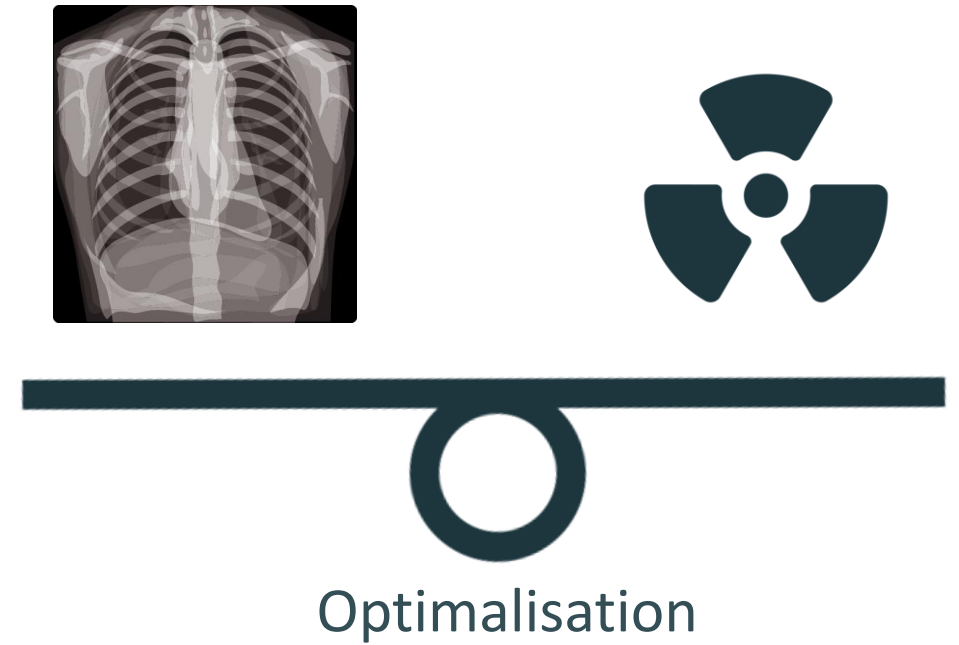
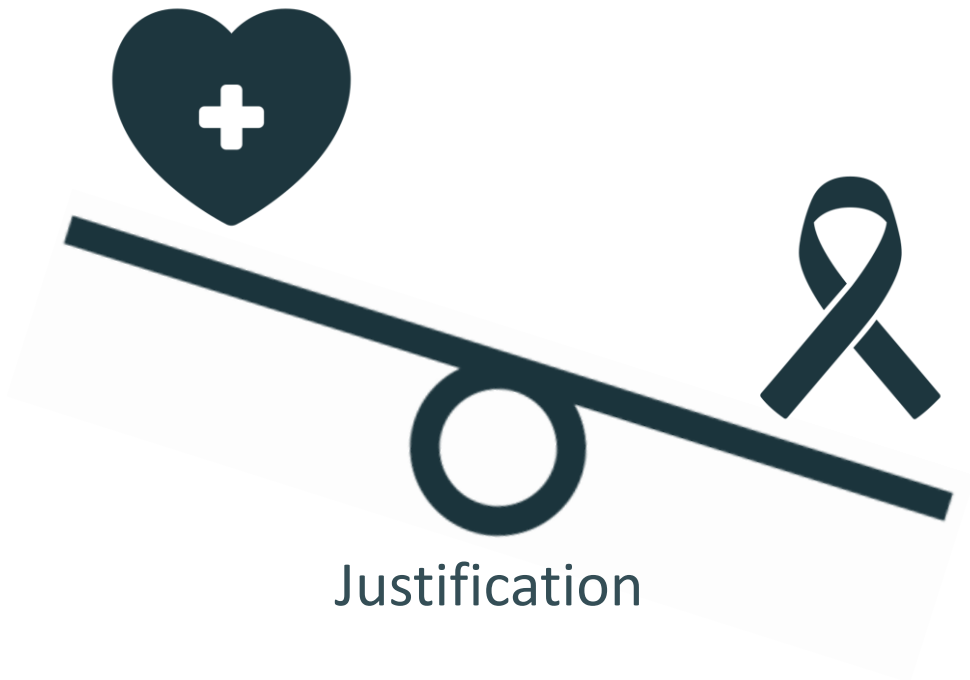


Introduction

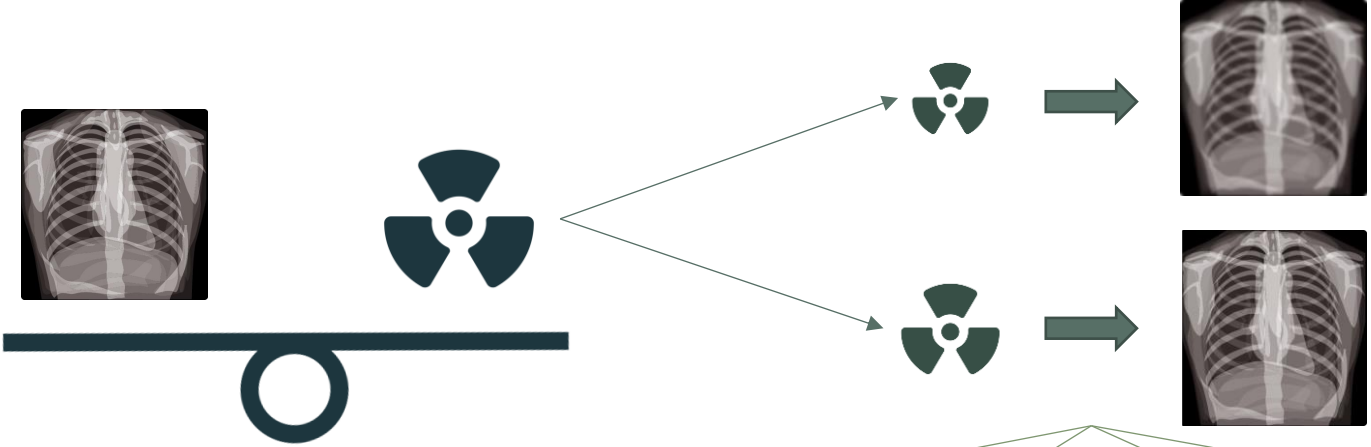


Introduction

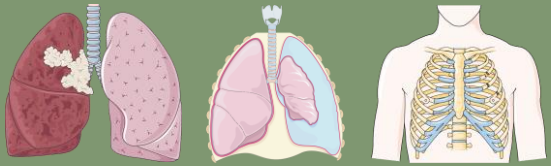
Main principles in radiation protection:



Introduction



Clinical indication



...

Equipment




...

Body part



...

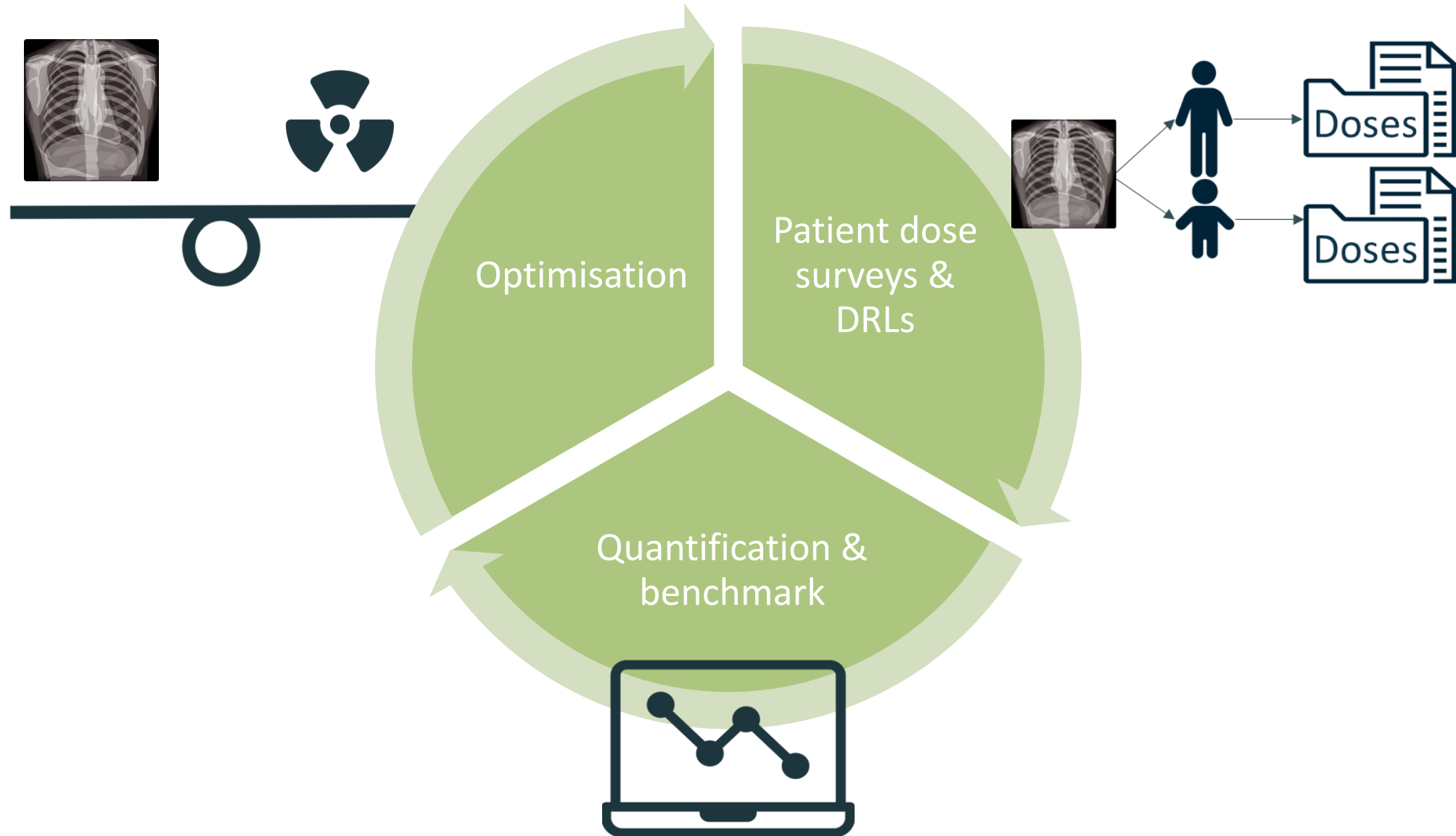
Patient



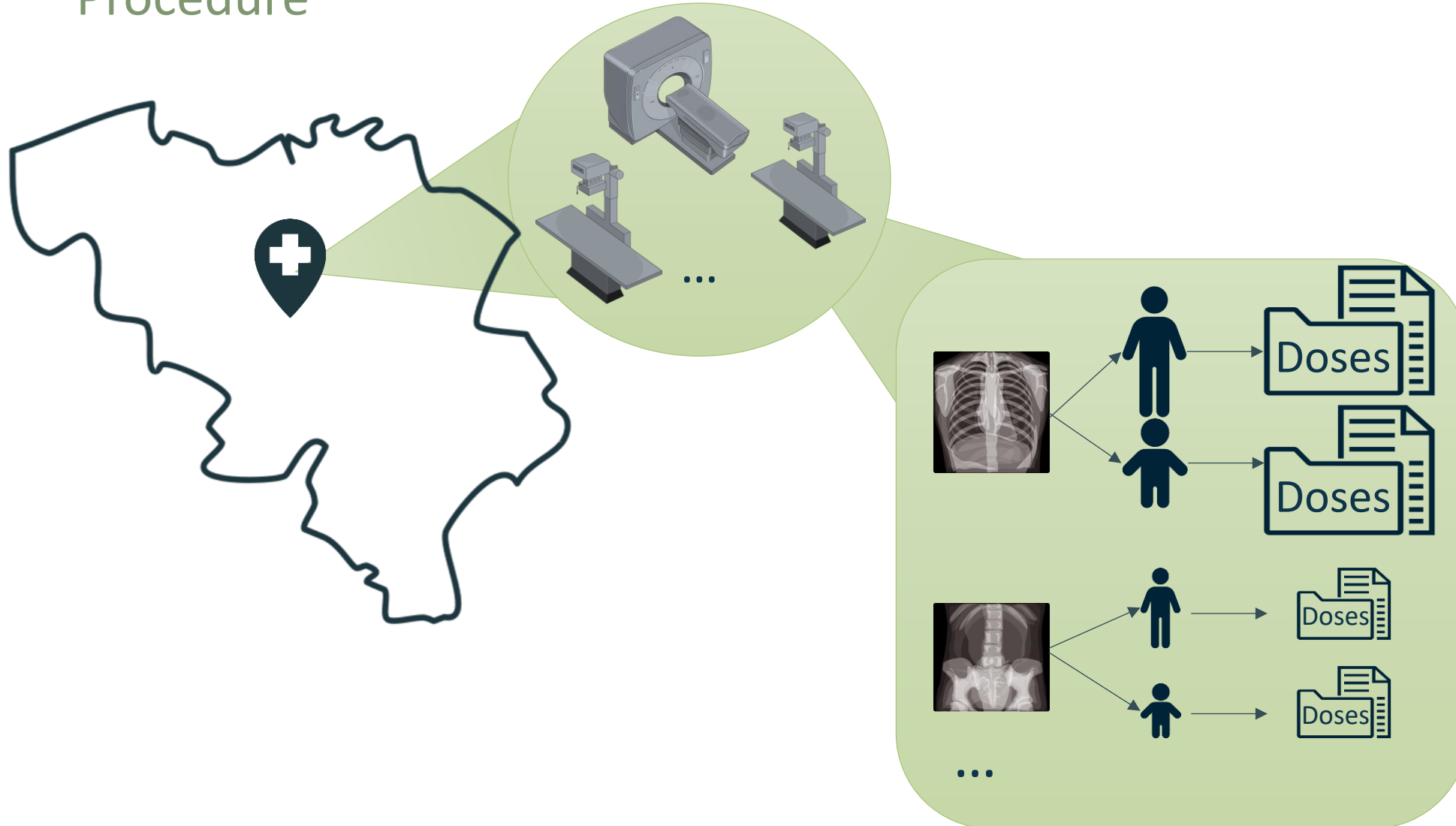
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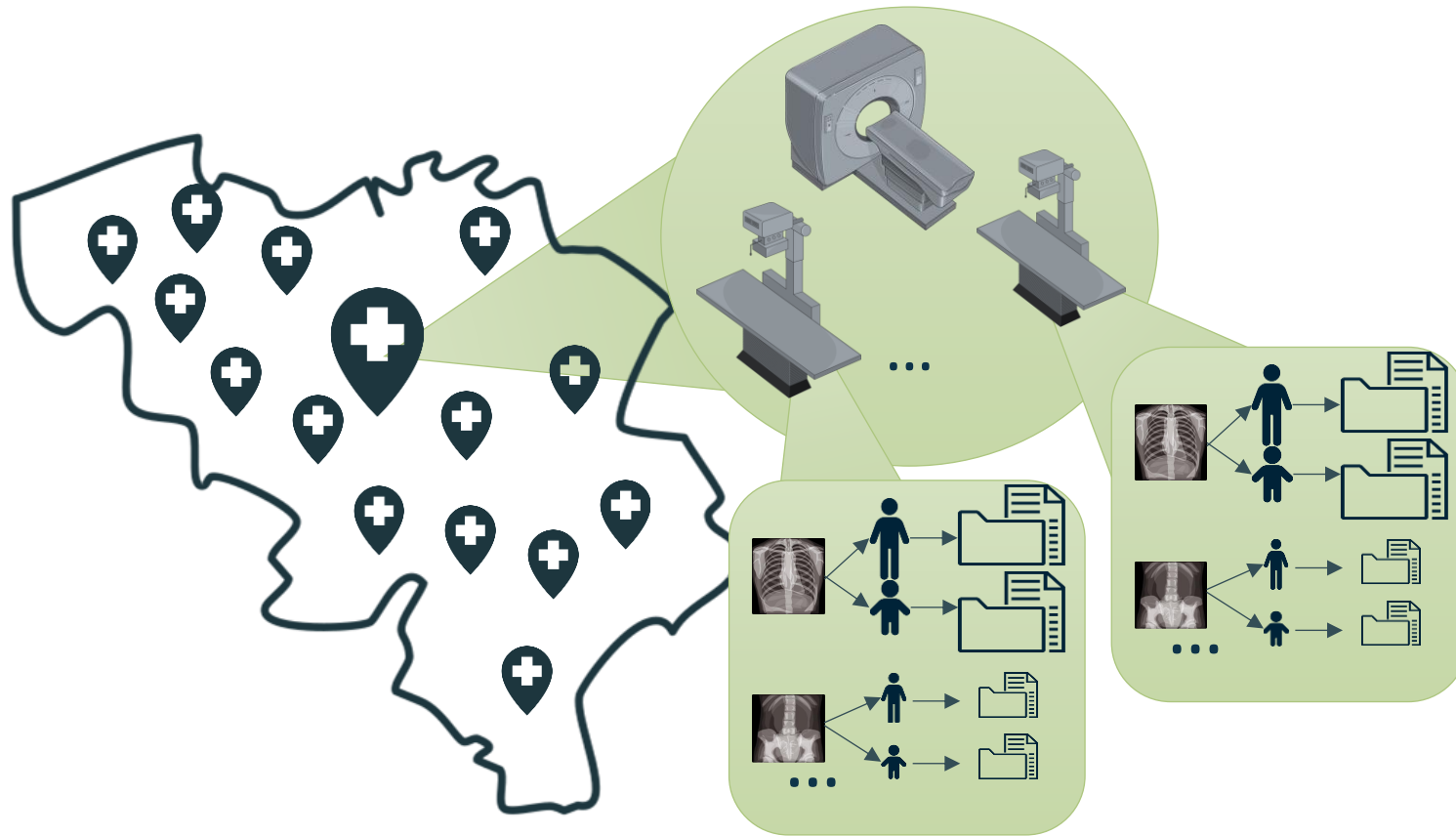
Introduction



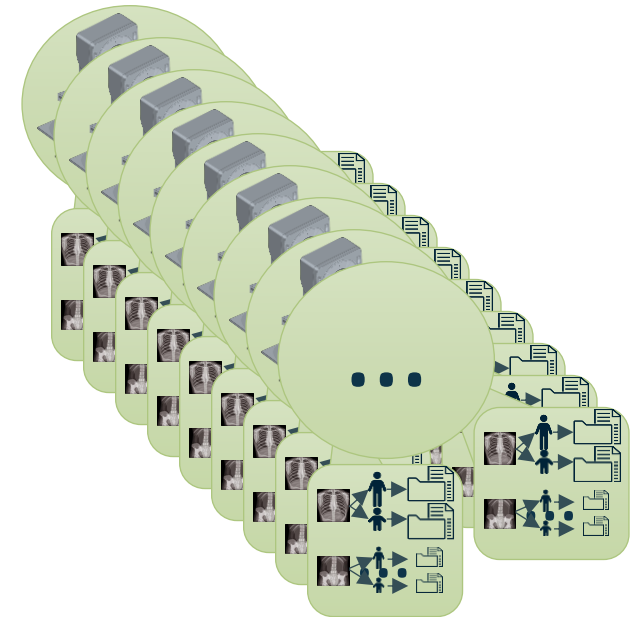
Periodical dose surveys & DRLs Procedure



Periodical dose surveys & DRLs Procedure

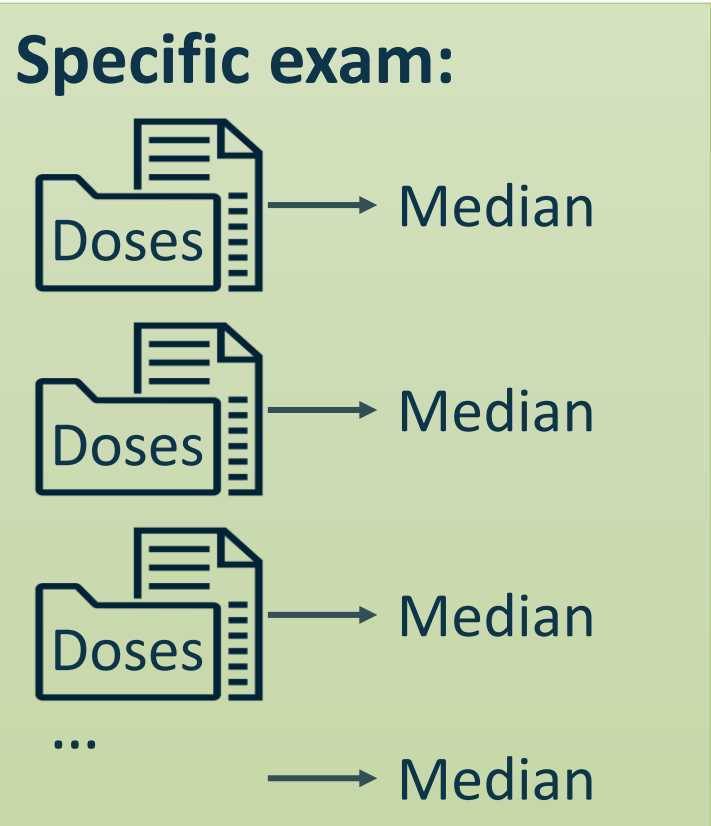


Participation: **Obligation for all**
equipment/departments



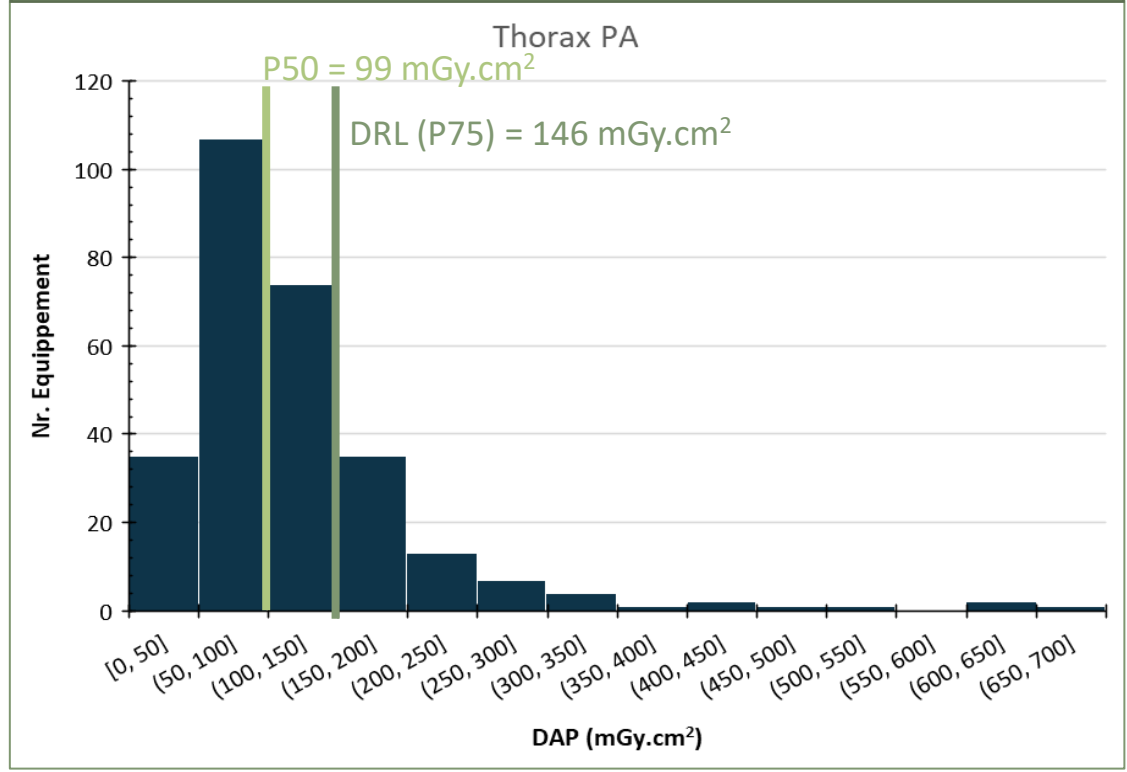
Periodical dose surveys & DRLs

Procedure radiology



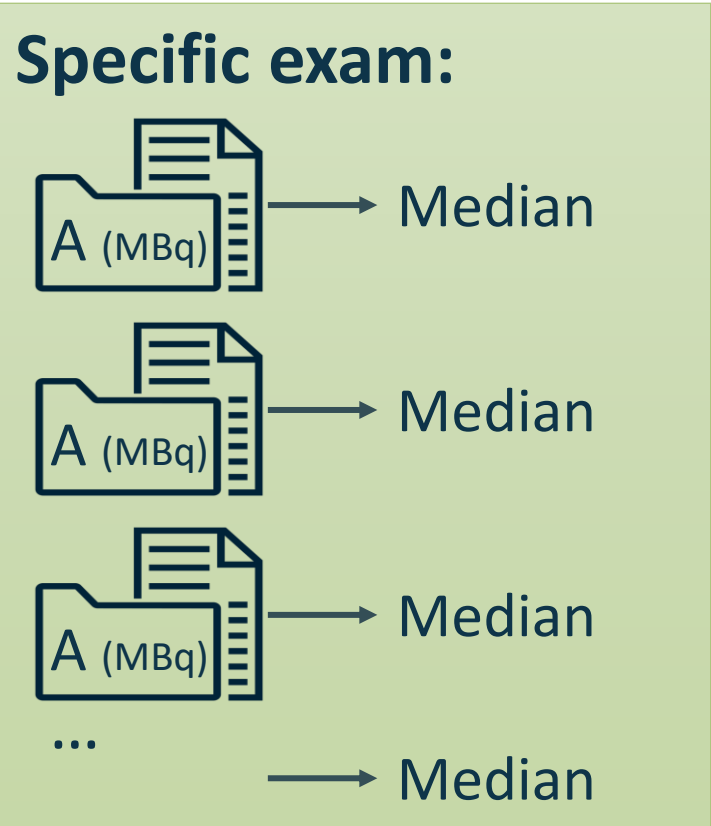
⇒ Diagnostic Reference Level (DRL): 75th percentile (P75)

⇒ Achievable value: 50th percentile (P50)

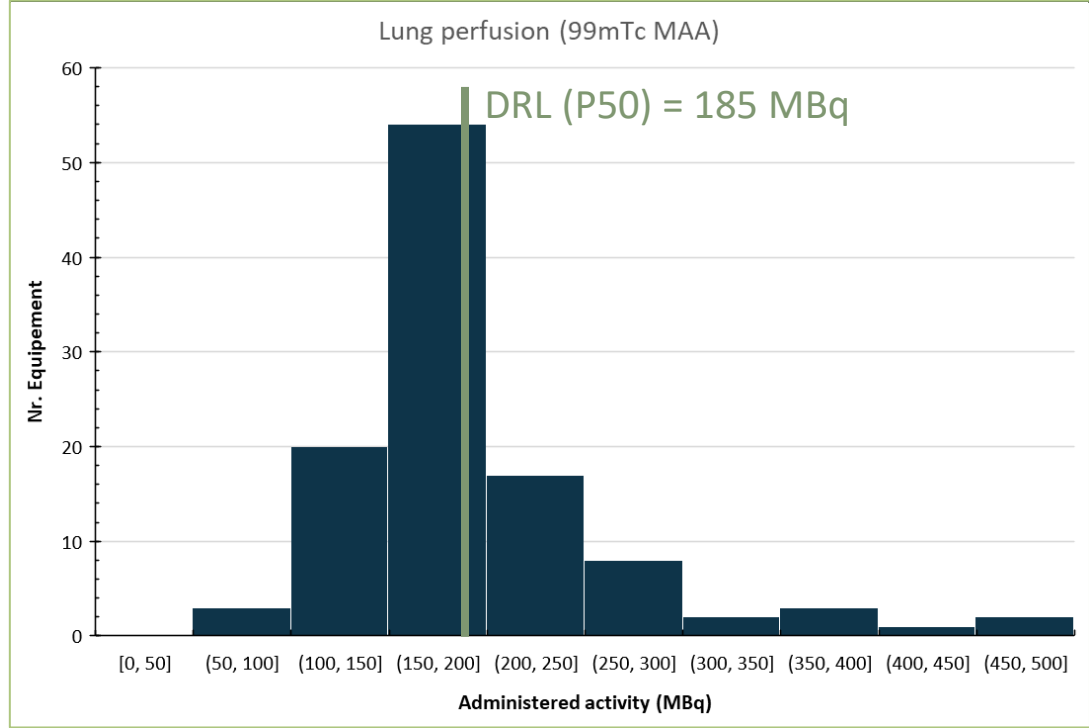


Periodical dose surveys & DRLs

Procedure nuclear medicine

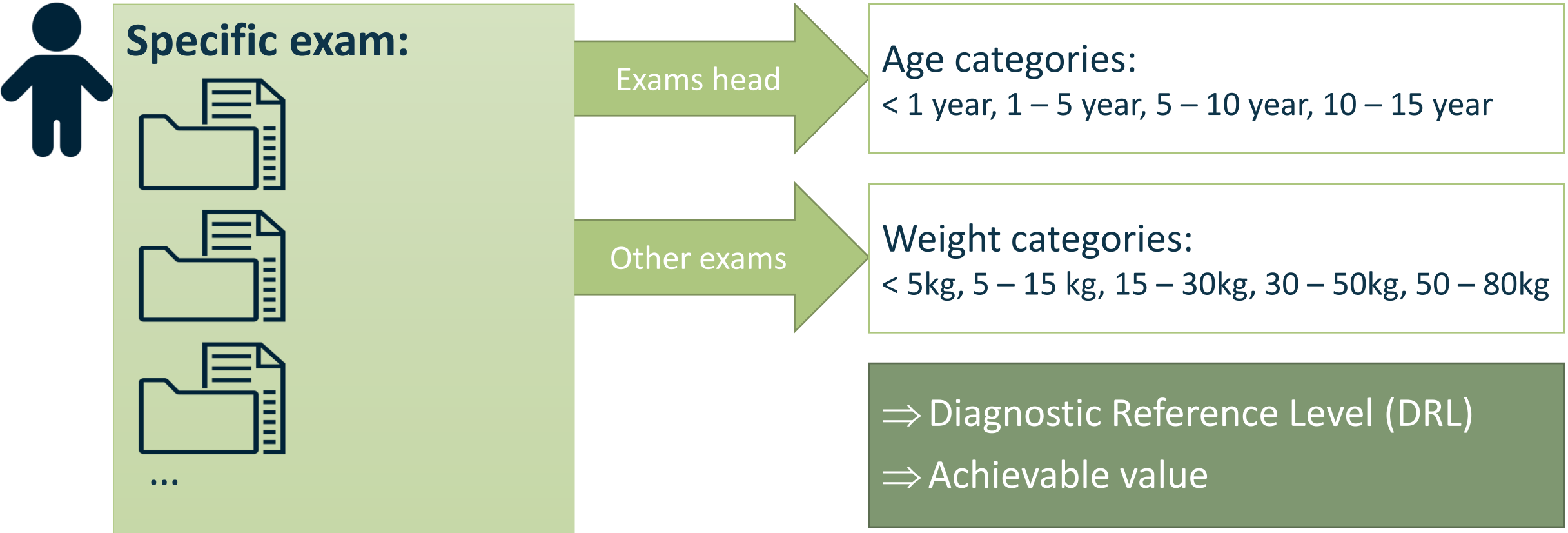


⇒ Diagnostic Reference Level (DRL):
50th percentile (P50)

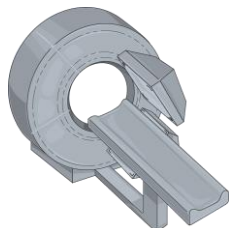
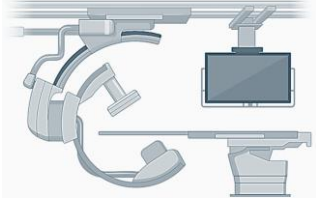
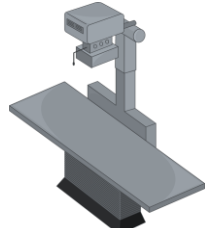


Periodical dose surveys & DRLs

Procedure children



Patient dose surveys

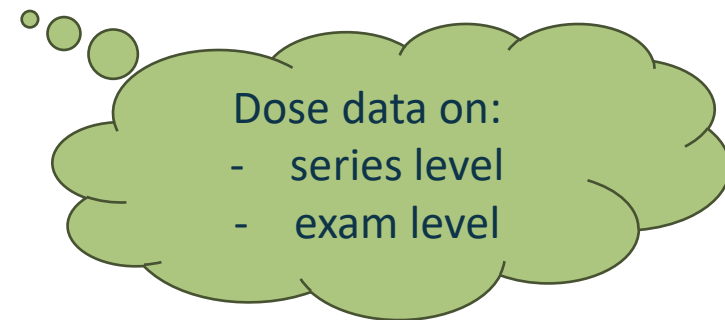


	CT	Conventional radiology	Mammography	Interventional radiology	Nuclear medicine
Metric	CTDI _{vol} (mGy) DLP (mGy.cm)	DAP (mGy.cm ²)	MGD (mGy)	DAP (mGy.cm ²)	A (MBq)
Iterations	11 (2011 – 2021)	5 (2011 – 2023)	5 (2011 – 2023)	5 (2011 – 2023)	2 (2015 – 2019) + 1 (2024 - ...)
Collection time	1 year	3 years	3 years	3 years	3 months
# Exams	10 adult 4 pediatric (*)	5 adult 2 pediatric (*)	1 adult	8 adult	11 adult 5 pediatric (*)
Exam types	Abdomen*, thorax*, skull*, sinus*, thorax abdomen, aortic arch, heart (liver, spleen, pancreas, kidneys), lumbar spine Start new iteration: 1/1/2025 clinical indication based	Abdomen*, thorax single*, thorax complete*, lumbar spine, pelvis	Screening mammography (4 views) Currently on hold & under review with stakeholders	Radiofrequency (RF) ablations, Transjugular Intrahepatic Portosystemic Shunt (TIPS), Cerebral embolizations, Embolizations of the vena spermatica, Chemo- embolizations of the liver, Creation or treatment of AV fistula for hemodialysis, Biliary drainages, Endoscopic retrograde cholangiopancreatography (ERCP)	Bone Imaging*, Brain Perfusion, Brain Metabolism, Gastro Emptying Scintigraphy, Gastro-Oesophageal Reflux Scintigraphy*, Lung perfusion, Myocardial perfusion Imaging, Renal Cortical Scintigraphy*, Renal Function Scintigraphy*, Thyroid scintigraphy, Inflammation & Oncology Imaging*, Oncology Imaging

CT - Iteration 12 (2025)

Adults		
Procedure	Clinical indication	Possible Serie types
1 Head - angiography	stroke/cerebrovascular accident	Localizer / acquisition
2 Head - brain	stroke/cerebrovascular accident	Localizer / acquisition
3 Head - brain	Headache, trauma	Localizer / acquisition
4 Head - sinus	Sinusitis	Localizer / acquisition
5 Coronary angiography	Coronary Artery Disease	Localizer / acquisition
6 Coronary Artery Calcium Scoring	Coronary Artery Disease	Localizer / acquisition
7 Thorax angiography	Pulmonary embolism	Localizer / acquisition
8 Thorax	Hemoptysis, emphysema, Emyema, infection	Localizer / acquisition
9 Thorax	Interstitial Lung Disease	Localizer / acquisition
10 Thorax-abdomen	Lung cancer (staging, follow-up)	Localizer / acquisition
11 Thorax-abdomen-pelvis	Polytrauma	Localizer / acquisition
12 Thorax-abdomen-pelvis	Cancer (staging, follow-up)	Localizer / acquisition
13 Abdomen-pelvis	Abdominal pain (appendicitis, diverticulitis)	Localizer / acquisition
14 Abdomen-pelvis (Kidneys-Ureter-Bladder)	Renal colic/stones	Localizer / acquisition
15 Colonography	Colorectal cancer	Localizer / acquisition prone / acquisition supine
16 Spine - Cervical	Trauma	Localizer / acquisition
17 Spine - Lumbar	Trauma	Localizer / acquisition

Children (<16years)		
Procedure	Clinical indication	Possible Serie types
1 Head - brain	All	Localizer / acquisition
2 Head - sinus	All	Localizer / acquisition
3 Head - Temporal bones	All	Localizer / acquisition
4 thorax	All	Localizer / acquisition
5 Abdomen	All	Localizer / acquisition
6 Spine - cervical	All	Localizer / acquisition
7 Spine - lumbal	All	Localizer / acquisition



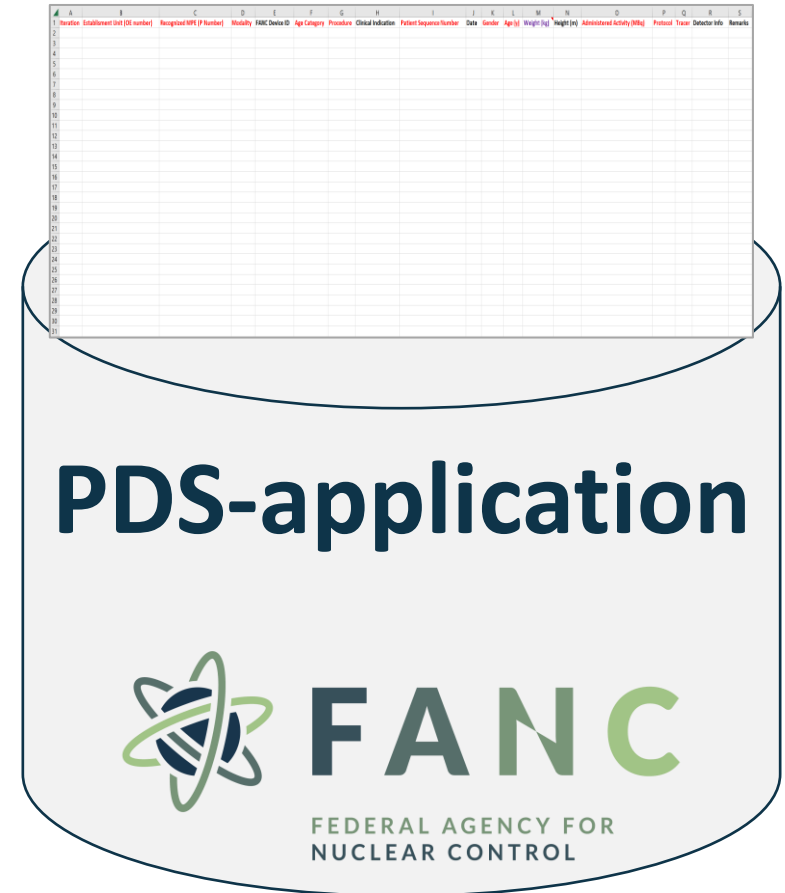
Patient dose surveys – collection method




ANNEXE 2. Formulaire d'enregistrement des données relatives à l'activité administrée aux patients - examens sur 30 patients par procédure ou pendant 3 mois

Centre: [Redacted]
 Adresse: [Redacted]
 Service: [Redacted]
 Marque de l'actimètre: [Redacted]
 Date vérification actimètre: [Redacted]
 Procédure: Scintigraphie de perfusion pulmonaire
 Contact: Nom: [Redacted] Prénom: [Redacted] e-mail: [Redacted]
 Radiophysicien: Nom: [Redacted] Prénom: [Redacted] e-mail: [Redacted]
 Période: Du 04/01/2018 au 28/02/2018

N°	Date	Sexe	Age	Poids	Taille	Activité administrée	Examen	Traceur	Remarque(s)	
	jj/mm/aaaa	(M ou F)	(a)	(kg)	(cm)	(unité)				
17	1	04/01/2018	F	80	48	149	10	mCi	Planaire	99mTc MAA
18	2	10/01/2018	F	79	87	168	10	mCi	Planaire	99mTc MAA
19	3	10/01/2018	M	70	100	170	10	mCi	Planaire	99mTc MAA
20	4	12/01/2018	M	76	109	170	12	mCi	Planaire	99mTc MAA
21	5	15/01/2018	M	86	79	170	13	mCi	Planaire	99mTc MAA
22	6	17/01/2018	M	86	87	170	14	mCi	Planaire	99mTc MAA
23	7	17/01/2018	F	87	55	150	7	mCi	Planaire	99mTc MAA
24	8	19/01/2018	F	65	89	159	13	mCi	Planaire	99mTc MAA
25	9	19/01/2018	F	85	80	166	13	mCi	Planaire	99mTc MAA
26	10	19/01/2018	F	67	60	166	13	mCi	Planaire	99mTc MAA

PDS-application




FANC
FEDERAL AGENCY FOR
NUCLEAR CONTROL

[FANC / AFCN DataExchange Portal](#)

PDS-application

[FANC / AFCN DataExchange Portal](#)

FANC  **AFCN**
FEDERAAL AGENTSCHAP VOOR NUCLEAIRE CONTROLE AGENCE FÉDÉRALE DE CONTRÔLE NUCLEAIRE

Data eXchange Platform Applications ▾

Welcome to the FANC Data Exchange Platform

The FANC DXP is subdivided into different applications (modules). Please choose a module below or from the menu bar.

NDR National Dose Register <i>Consult the help section</i>	PDS Patient Dose Surveys <i>Consult the help section</i>
EDWD Euratom Drinking Water Directive <i>Consult the help section</i>	SRT / NORM Radiologic Surveillance / Naturally Occurring Radiative Material <i>Consult the help section</i>
PHI Physical Inventory <i>Consult the help section</i>	TRIMP Transport / Import

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[Privacy Declaration](#)
Build: 2024.089.1

- Manual
 - NL
 - FR
- Access with CSAM-authentication
 - ⇒ Control of access within the companies/hospitals
 - ⇒ Role: FANC Patient Dose Surveys – Data Management

PDS-application

Data Submission

Select Organisation

 Enterprise

 Establishment Unit

Active Iterations (Click to expand/collapse)

Code	Name	Begin Date	End Date	Modality	Examinations	
IT20240001	NM it 03.01	01/01/2024	31/03/2024	Nuclear Medicine	Children (<16) // Bone Imaging/Bone Scintigraphy // All // [99mTc]Tc-diphosphates Adults (>=16) // Bone Imaging/Bone Scintigraphy // All // [99mTc]Tc-diphosphates	Download Template
IT20240002	NM it 03.02	01/04/2024	30/06/2024	Nuclear Medicine	Adults (>=16) // Brain Perfusion // All // [99mTc]Tc-HMPAO Adults (>=16) // Brain Perfusion // All // [99mTc]Tc-ECD	Download Template

Devices (Click to expand/collapse)

Upload New File

drop files here to upload

Allowed file types: .xlsx, .json, Maximum file size: 10.00 MB

Datafiles Templates

 Color codes: Successfully processed // Warnings during processing // Errors during processing

Refresh Grid

	File Number	Date Submitted	File Name	Size	Status	Status Date
▶	DF202401737	29/03/2024 16:19:25	PDS_IT20240001_NM_Template.xlsx	68.00 kB	Processing finished	29/03/2024 16:19:36
▶	DF202401736	29/03/2024 16:17:03	PDS_IT20240001_NM_Template.xlsx	68.03 kB	Processing finished	29/03/2024 16:17:15

PDS-application

DF202200752 18/11/2022 17:13:23 PDS_FANC_IT2022003_IT2022008_CT_v2.xlsx 39.44 kB Processing finished 18/11/2022 17:14:04

Processing Results SysAdmin

Uploaded by: (ADED) An DEDULLE
 Datafile format: PDS_Excel_v1_0

Click the button below to download a ZIP archive containing your submitted file and processing result and log files:

[Download file package](#)

Processing messages:

Date	Type	Message
18/11/2022 17:13:52	Info	Parsing started
18/11/2022 17:13:56	Info	Worksheet CT contains data. Starting validation.
18/11/2022 17:13:57	Info	Total survey records: 214
18/11/2022 17:13:57	Info	Valid survey records: 0
18/11/2022 17:13:58	Error	Survey records with errors: 214
18/11/2022 17:13:59	Error	The file contains validation errors. No data will be imported in the database ! Please download the file package and consult the data processing results file. If required, submit a new file with corrected data.
18/11/2022 17:13:59	Info	Parsing finished
18/11/2022 17:14:00	Error	No data was imported !



J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Gender	Age (y)	Weight (kg)	Height (m)	Administered Activity (MBq)	Protocol	Tracer	Detector Info	Remarks			
2	1/2018 M	73			181 All	[99mTc]-MAA	noCZT	Combination of specified AgeCategory, Procedure, Protocol and Tracer not valid for this iteration;				
3	1/2018 M	61			200 All	[99mTc]-MAA	noCZT	Combination of specified AgeCategory, Procedure, Protocol and Tracer not valid for this iteration;				
4	1/2018 F	44			200 All	[99mTc]-MAA	noCZT	Combination of specified AgeCategory, Procedure, Protocol and Tracer not valid for this iteration;				
5	1/2018 F	72	55	1.5	733.155 All	[99mTc]Tc-ECD	noCZT					
6	1/2018 M	50	90	1.72	753.653 All	[99mTc]Tc-ECD	noCZT					
7	8/2018 F	71	63	1.6	743.7 All	[99mTc]Tc-ECD	noCZT					
8	4/2018 F	71	95	1.69	314.5 All	[18F]-FDG	noCZT	Combination of specified AgeCategory, Procedure, Protocol and Tracer not valid for this iteration;				
9	4/2018 M	72	73	1.7	240.5 All	[18F]-FDG	noCZT	Combination of specified AgeCategory, Procedure, Protocol and Tracer not valid for this iteration;				
10	4/2018 F	52	82	1.59	262.7 All	[18F]-FDG	noCZT	Combination of specified AgeCategory, Procedure, Protocol and Tracer not valid for this iteration;				
11	7/2018 F	14	48	1.53	415 All	[99mTc]Tc-diphosphates	noCZT					
12	9/2018 M	16	64	1.85	514 All	[99mTc]Tc-diphosphates	noCZT					
13	1/2019 M	3	15	1.08	40.663 All	[99mTc]Tc-DMSA	noCZT					
14	1/2019 M	3	15	1.08	42.92 All	[99mTc]Tc-DMSA	noCZT					
15	2/2019 M	13	72	1.69	113.59 All	[99mTc]Tc-DMSA	noCZT					

PDS-application

Consult Survey Records

Filter Criteria

Enterprise

OE-Number

Data File

Modality


Iteration

Age Category

Procedure

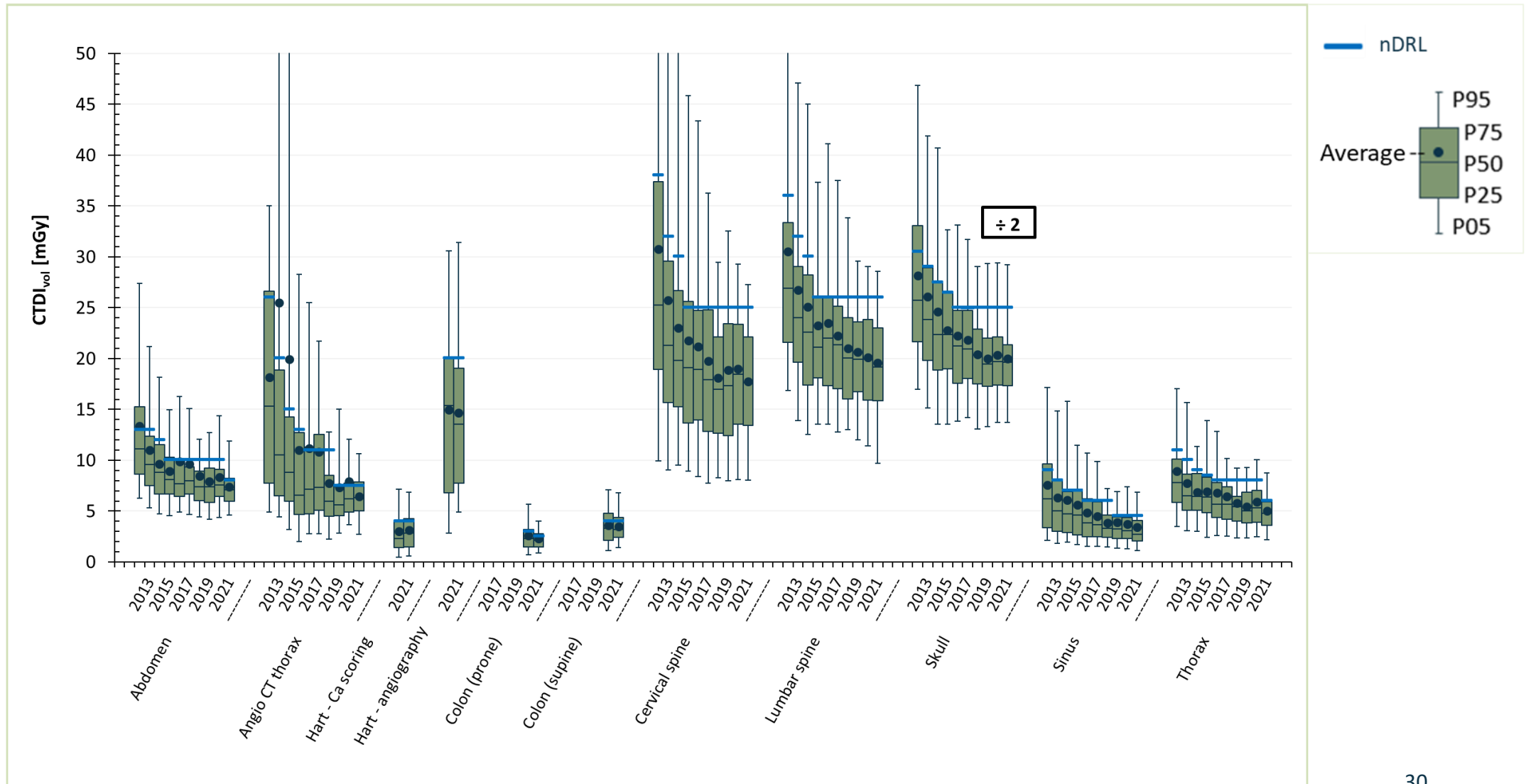
NM Protocol

NM Tracer

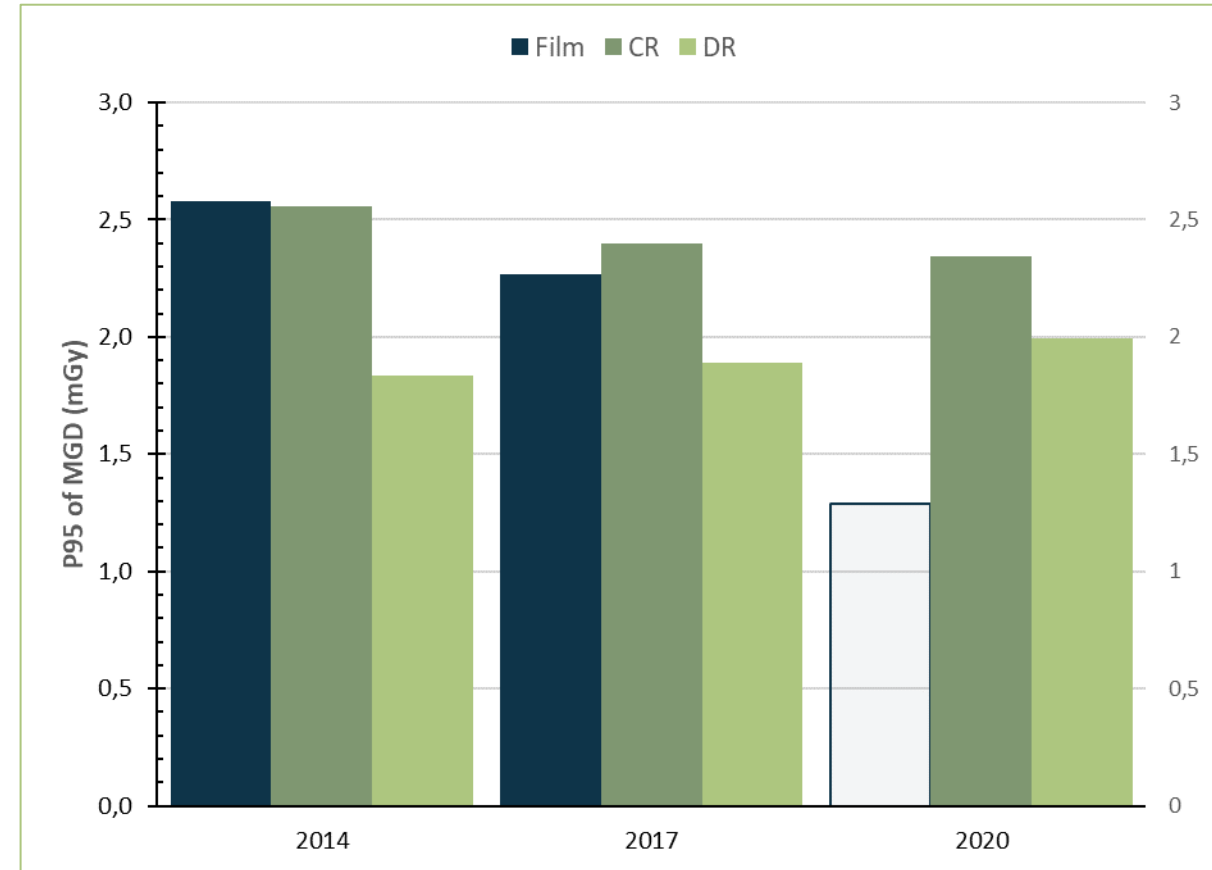
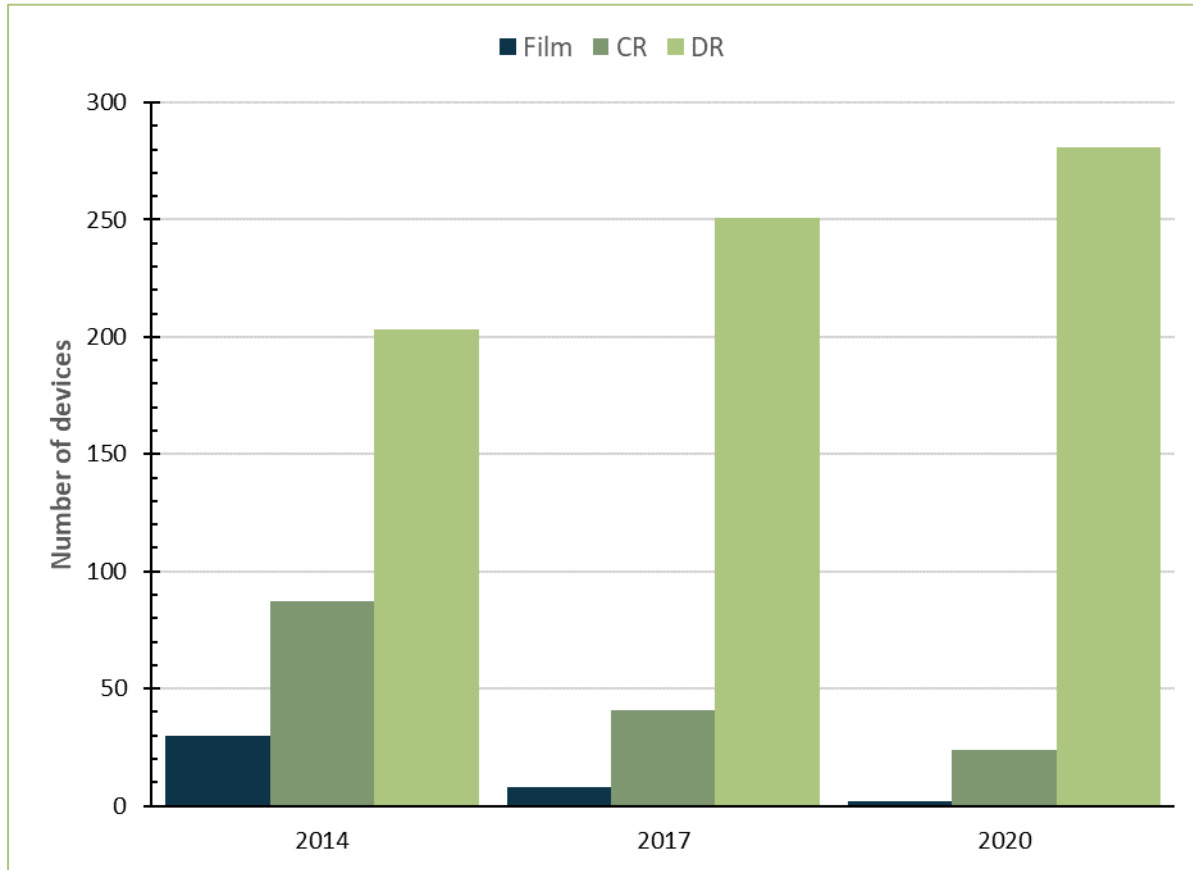
 Export currently filtered data to Excel

Iteration	FANC Device Id	Age Category	Procedure	Modality	OE Number	MPE Person FAN...	Patient Sequence ...	Date	Gender Code	Age_Y	Weight_kg	Height_m	Ac
NM it 03.01	66683	Adults (>=16)	Bone Imaging/Bone Scintigraphy	Nuclear Medicine			8	03/01/2024 00:00:00	F	59	82	1.62	75
NM it 03.01	66683	Adults (>=16)	Bone Imaging/Bone Scintigraphy	Nuclear Medicine			9	03/01/2024 00:00:00	F	61	57	1.55	71
NM it 03.01	66683	Adults (>=16)	Bone Imaging/Bone Scintigraphy	Nuclear Medicine			19	04/01/2024 00:00:00	F	18	60	1.68	69

Diagnostic reference levels – CT adults

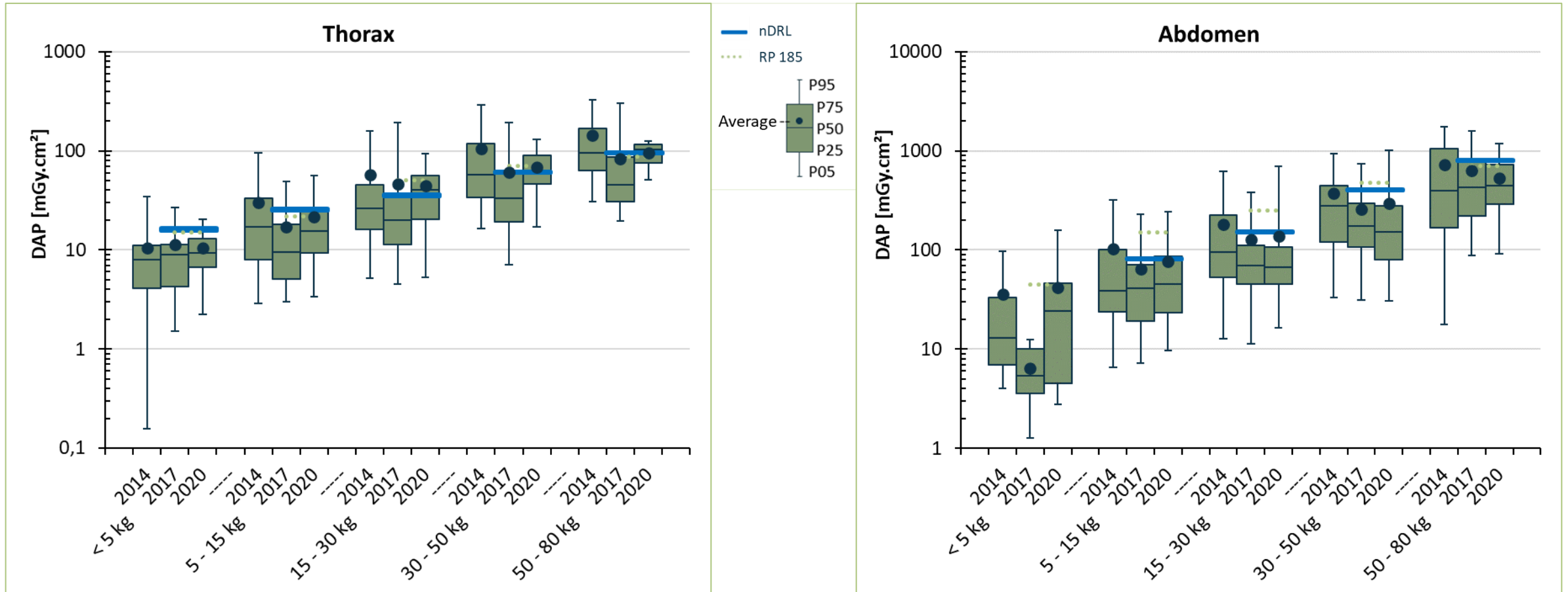


Diagnostic reference levels – Mammography



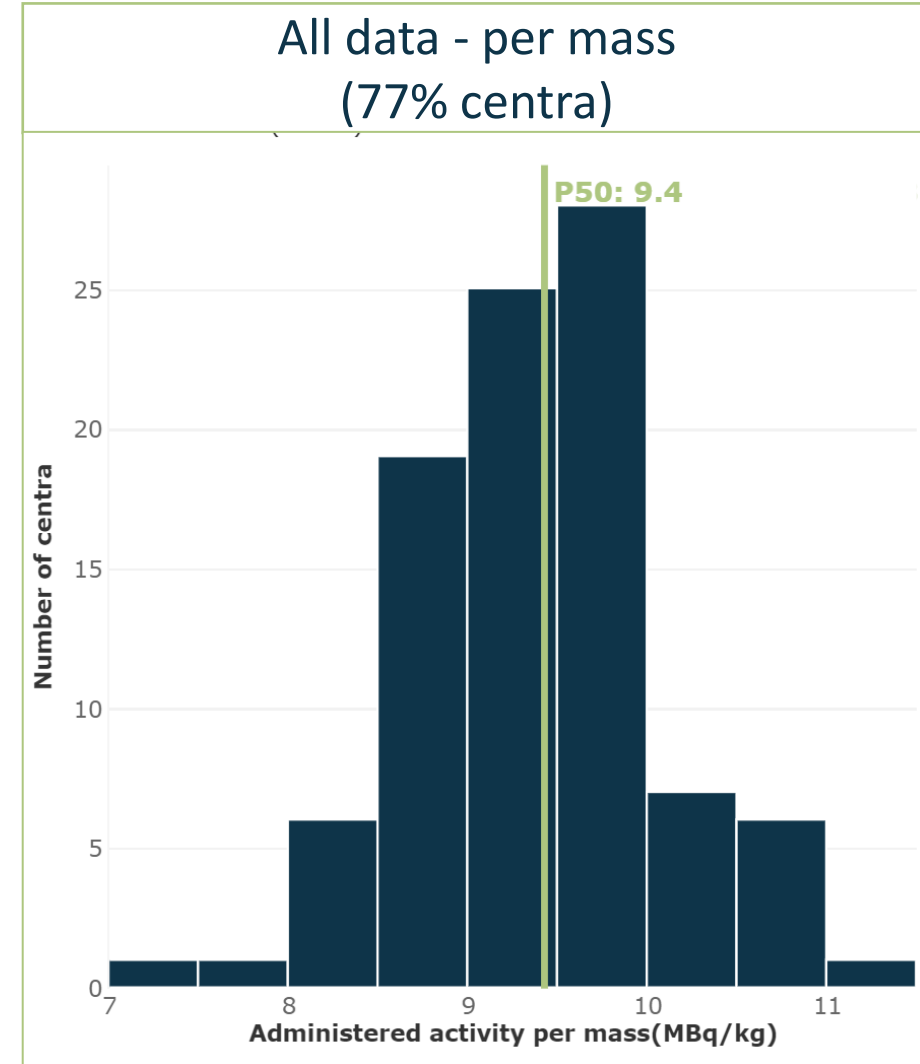
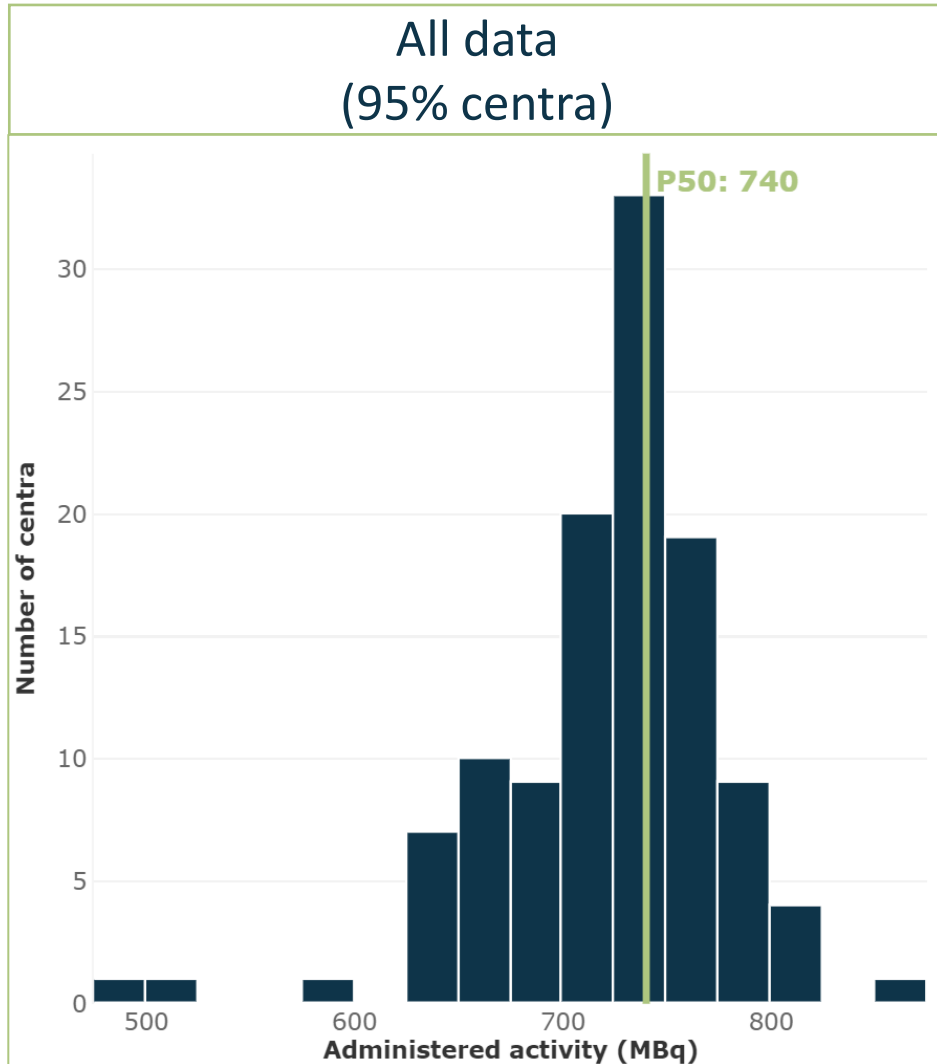
nDRL (2020) = 2mGy

Diagnostic reference levels – RX conv. pediatrics



Diagnostic reference levels – NM adults

Bone scintigraphy 2024 (preliminary results)



Use of DRLs (within FANC)

- Quantification, benchmarking, communication
 - Sensibilisation tool
 - Optimalisation tool
- Inspection campaigns
 - No participation
 - High local/typical values for several procedures/equipment



Use of DRLs Communication & benchmark ⇒ Sensibilisation

Niveaux de référence diagnostiques en radiologie : mammographie

Itération 3 (1/11/2014 - 31/10/2017)

Informations de l'appareil (correspondant aux dernières données envoyées)

Numéro ID du centre : [REDACTED]
 Centre : [REDACTED]
 Adresse : [REDACTED]
 Identification salle : [REDACTED]
 Marque de l'appareil : Siemens
 Type de l'appareil : MAMMOMAT 1000
 Type de détecteur : CR (plaque phosphore)
 Personne de contact : [REDACTED]
 e-mail du contact : [REDACTED]
 Radiophysicien médical (RPM) : [REDACTED]
 e-mail du RPM : [REDACTED]

L'arrêté de l'Agence fédérale de Contrôle nucléaire (AFCN) du 28/09/2011 définit les modalités concernant la dosimétrie des patients dans le cadre de l'utilisation de rayons X à des fins médicales. Cet arrêté instaure une fréquence triennale pour les études périodiques des examens de mammographie. L'AFCN récolte les données après chaque période et en déduit un Niveau de Référence Diagnostique (Diagnostic Reference Level - DRL) national pour les procédures reprises dans l'arrêté. Ces DRL doivent être utilisés par les services de radiologie afin d'optimiser leurs pratiques.

Le DRL pour les examens de mammographie est déterminé en termes d'AGD (Average Glandular Dose)* par cliché, pour tout type de vue (RCC, LCC, RML0 ou LMLO).

Suite à la 3e itération, il a été décidé de déterminer le DRL sur base du 95e percentile (P95) de la distribution des valeurs de l'AGD. En outre, les P25 et P75 peuvent toujours être utilisés à des fins d'optimisation. Le percentile 75 (P75) représente le DRL tel que défini par la Commission Européenne (RP 109). Le percentile 25 (P25) est un indicateur à considérer comme indicateur de bonne pratique pour un examen typique.

Les résultats de ce rapport doivent être analysés et utilisés en concertation avec l'ensemble des personnes impliquées: les **médecins**, les **technologues**, et le **radiophysicien**.

* DGM - Dose Glandulaire Moyenne [mGy]

Mammographie

Tableau 1 - Quantités statistiques pour l'AGD

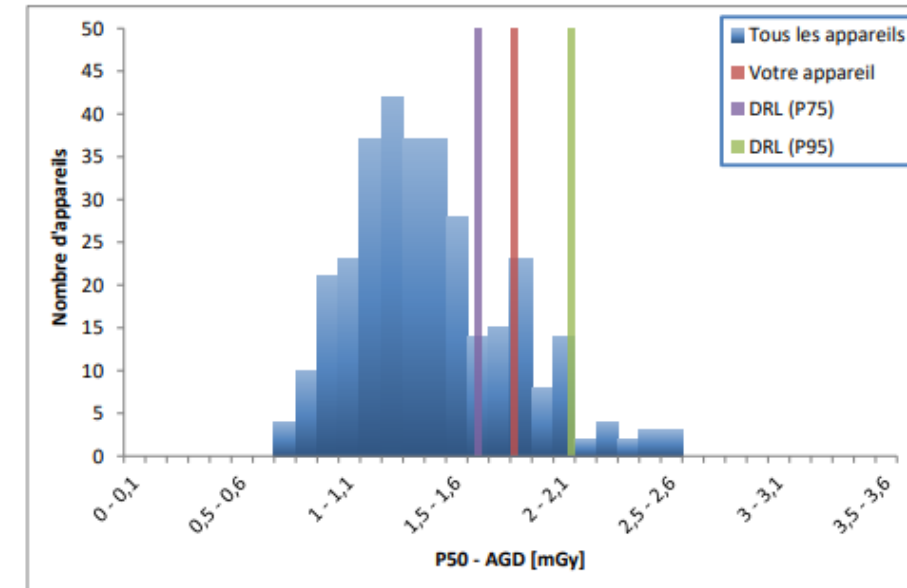
	AGD [mGy] par cliché			
	Votre appareil ⁽¹⁾	Tous les appareils ⁽²⁾	DRL	RP180 ⁽³⁾
P05	0,85	0,91		
P25	1,35	1,17	1,2	
P50	1,88	1,37		
P75	2,59	1,64	1,6	3,0
P95	4,20	2,06	2,0	

⁽¹⁾ Calculé sur 197 données

⁽²⁾ Calculé sur 327 appareils

⁽³⁾ Radiation Protection n°180, European Commission, 2014

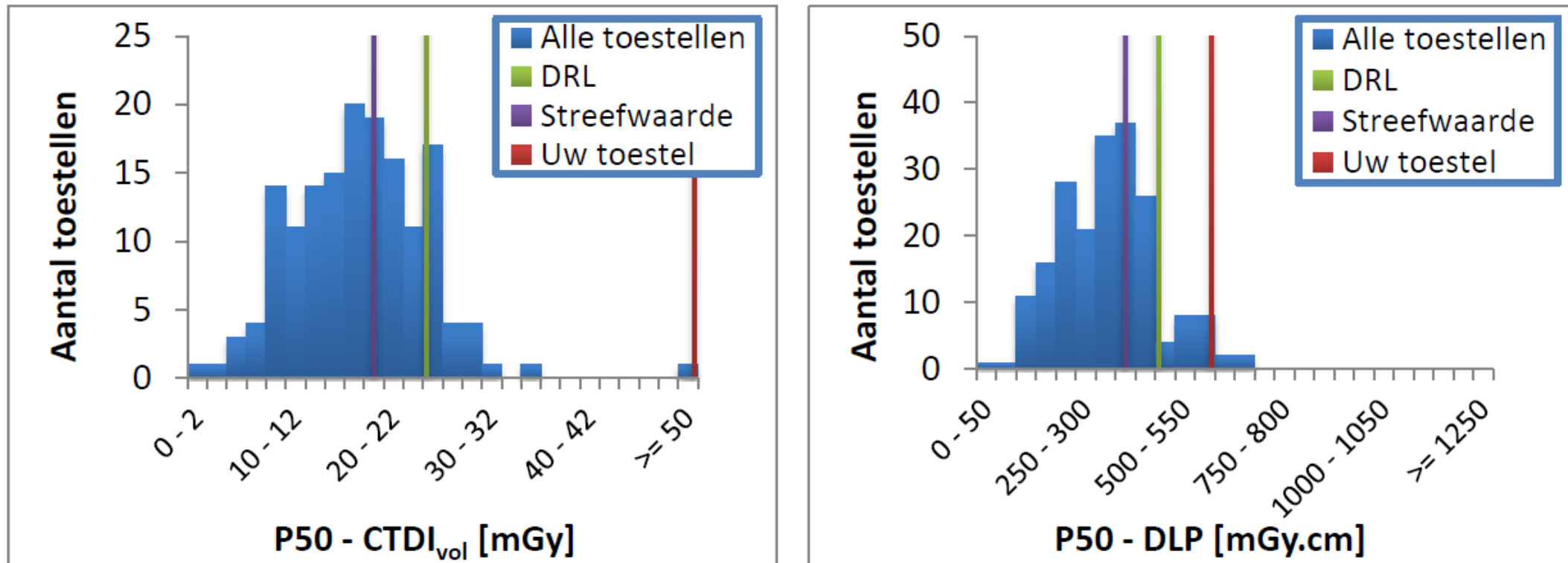
Figure 1 - Distribution sur les médianes par appareil pour l'AGD



Use of DRLs

Inspection campaigns

Figuur 2 - Verdeling van de mediane waarden per toestel voor de CTDI_{vol} en de DLP bij cervicale wervelzuil



Centra with several procedures in top 10% highest doses

Use of DRLs

Inspection campaigns: REX



No cooperation with MPE

- No validation by MPE (wrong data)
- No discussions with MPE



No (standard) procedures

- Often highly dependent on 1 person



Low consciousness

- Individual reports not discussed
- Comments optimisation of MPE ignored

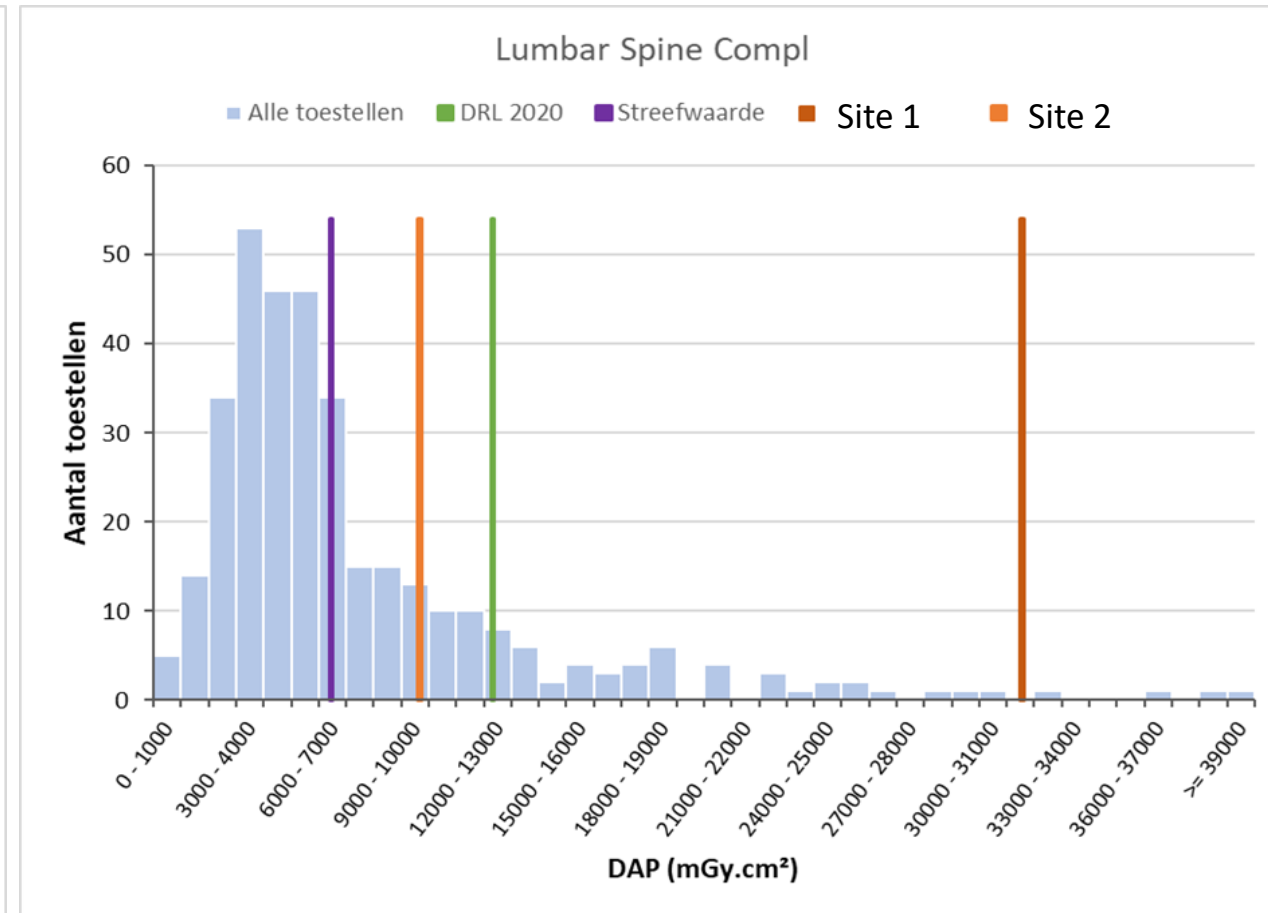
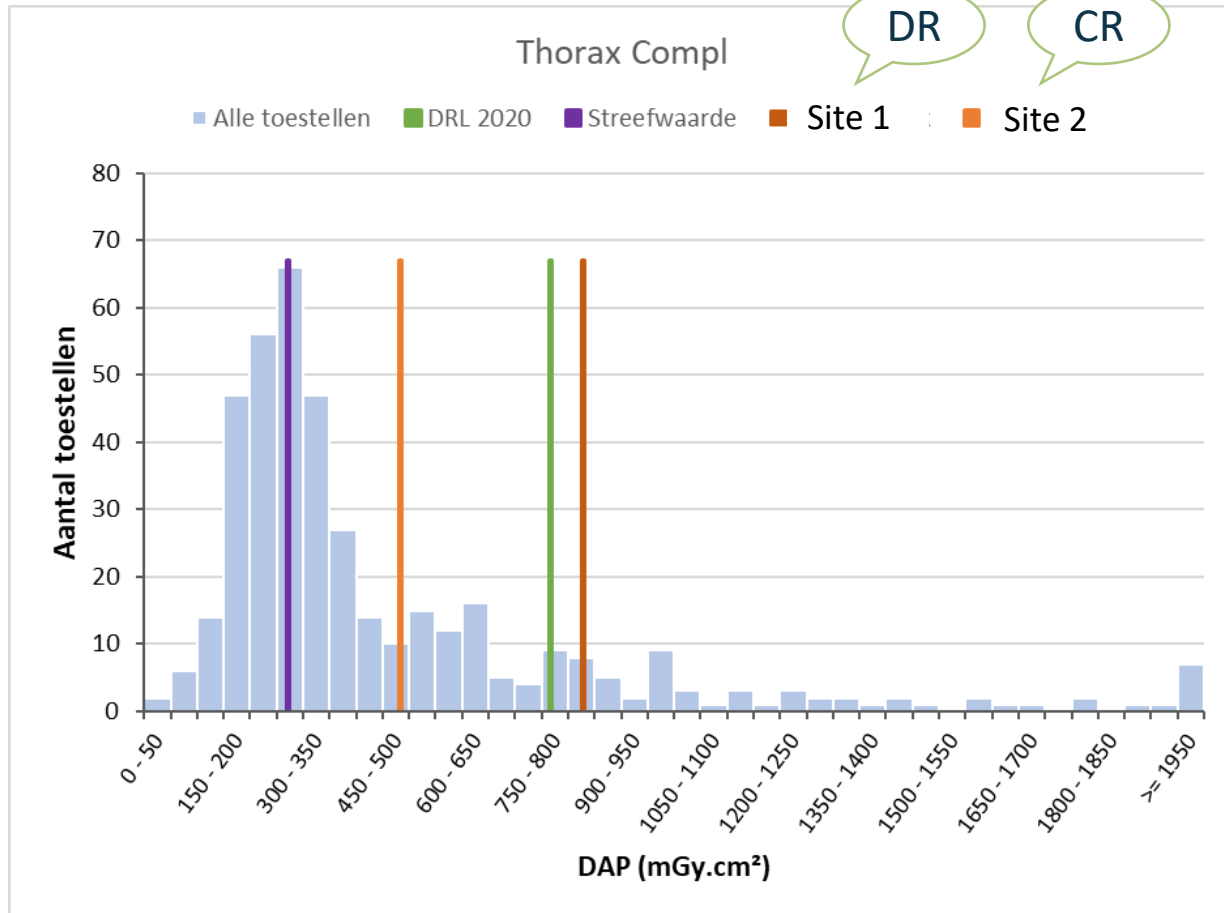


No harmonised medical procedures

- Practitioner-dependent procedures
- Differences in scan length, number of series...

Use of DRLs

Inspection campaigns

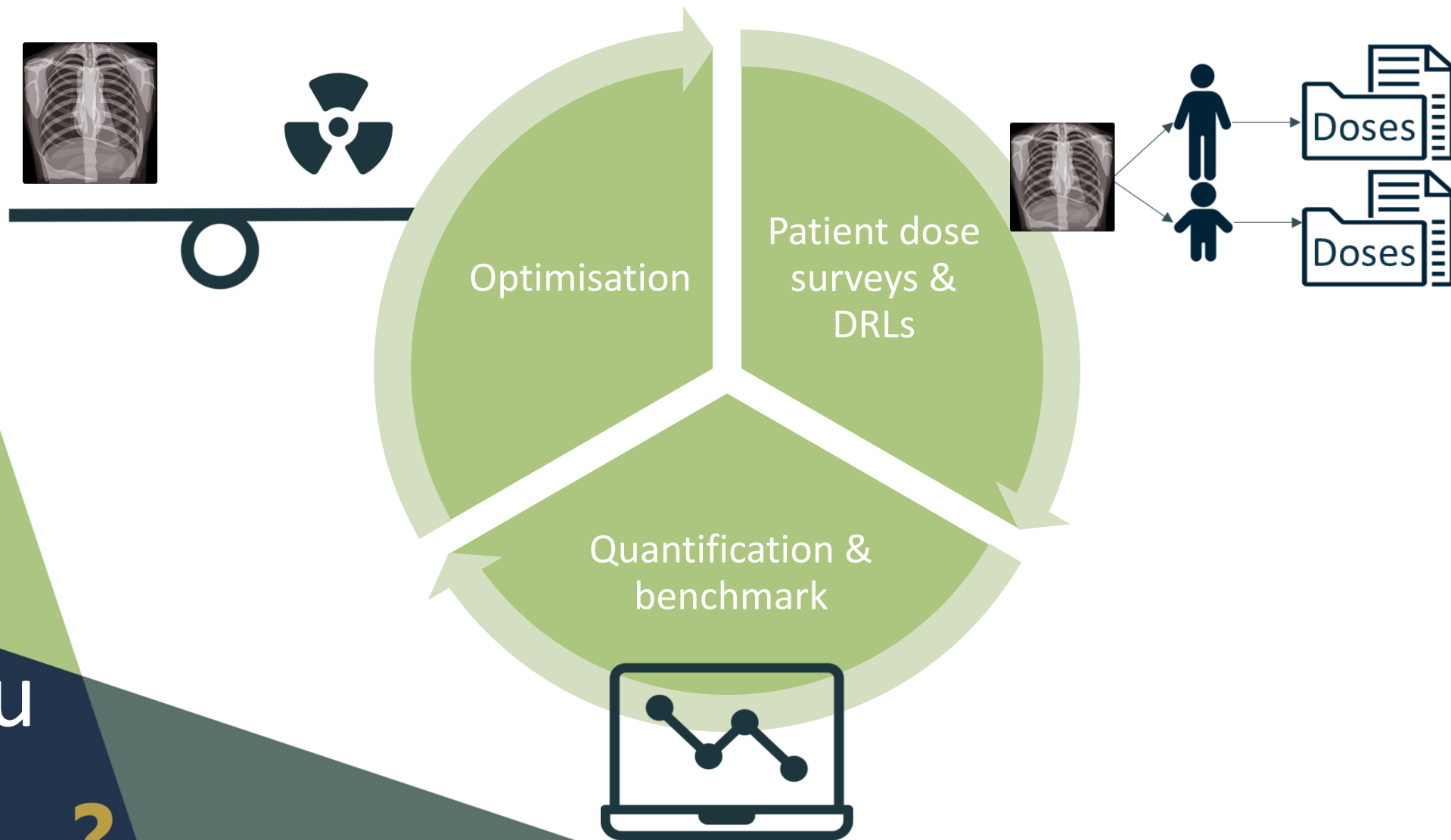


Use of DRLs

Inspection campaigns

CT abdomen-pelvis Clinical indication	# Phases		
	Radiologist A	Radiologist B	Radiologist C
Douleur FID>1sem	2	1	3
Appendicite	2	1	3
Diverticulite	2	1	4
Douleurs abdo diffuses	2	1	4
Coliques néphrétiques	1	1	4
Occlusion intestinale	2	3	3
Calcul biliaire	2	2	3
Douleurs épigastriques	3	3	3
Anémie	3	4	3
Néo de vessie, prostate et utérus	4	4	4
Pyélonéphrite (abcès?)	3	1	3
Hématurie macroscopique	4	3	4
Paroi abdominale	1	1	2
Entéroscanner	1	1	3
Colonoscopie	1	1	1

Patient dose surveys & DRLs as a tool for optimisation



Thank you



An Dedulle, PhD
an.dedulle@fanc.fgov.be