

Διαγνωστικά Επίπεδα Αναφοράς

στην Επεμβατική Ακτινολογία και
Καρδιολογία

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Γενική Γραμματέας ΙΟΜΡ





1

Θέμα 1

Οι νέοι διεθνείς και Ευρωπαϊκοί κανόνες ακτινοπροστασίας επιβάλλουν μεγάλη προσοχή και έμφαση στις επεμβατικές πράξεις

2

Θέμα 2

Τα αποτελέσματα από την ακτινοβολία μπορεί να είναι καταστροφικά.

3

Θέμα 3

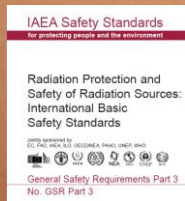
Κάθε χρόνο εκδικάζονται εκατοντάδες περιστατικά με καταστροφικά αποτελέσματα διεθνώς με πρώτη στη λίστα την Αμερική

4

Θέμα 4

Ακόμα και ένα μηχάνημα τελευταίας τεχνολογίας μικρής δόσης μπορεί να επίφερε περισσότερη ακτινοβολία στον ασθενή ακόμα και παραπάνω από μία συνεδρία ακτινοθεραπείας

(a) A 42-year-old man.11 months after angioplasty. Painful ulcer, causing insomnia (right subscapular area). (b) Surgical debridement with the index of bleeding from the edge was performed. (c) 20 days after initial debridement, granulation was poor, and extension of tissue necrosis was observed. Insomnia with pain continued. (d) Further surgical debridement was done, and the adjacent skin flap was raised. (e) Into the wound floor and edges, bm-PRP was injected. (f) Eight months after the reconstructive surgery, there was no pain complaint.



A

IAEA 2014

The government shall ensure that as a result of consultation between the health authority, **relevant professional bodies** and the regulatory body, a set of diagnostic reference levels is established for medical exposures incurred in medical imaging, including image guided interventional procedures



B

Eur Dir 59/2013

Article 61
Special practices

Member States shall ensure that appropriate medical radiological equipment, practical techniques and ancillary equipment is used in involving high doses to the patient, which may be the case in interventional radiology, nuclear medicine, computed tomography or radiotherapy.



C

ICRP 135, 2017

Προτεινόμενα μεγέθη
ως ΔΕΑ στην
επεμβατική ακτινολογία
και καρδιολογία:

- DAP/KAP**
- Fluoroscopy time**
- Total number of images**
- Total number of series**

**I HATE WHEN PEOPLE SAY
"ACT LIKE AN ADULT"**



**HAVE YOU SEEN ADULTS LATELY?
THAT'S HORRIBLE ADVICE!**

Europe



DIMOND European project, 2003

- Το πρώτο Ευρωπαϊκό ερευνητικό πρόγραμμα που επιχείρησε να προτείνει ΔΕΑ σε Ευρωπαϊκό επίπεδο.
- 6 χώρες
- Preliminary reference levels in interventional cardiology. Neofotistou V, Vano E, Padovani R, Kotre J, Dowling A, Toivonen M, Kottou S, Tsapaki V, Willis S, Bernardi G, Faulkner K. Eur Radiol. 2003 Oct;13(10):2259-63.

Είδος πράξης	DAP (Gycm ²)	T (min)	I
Στεφανιογραφία	45	7,5	1250
Αγγειοπλαστική	75	17	1300

Sentinel European project, 2008

- Εξέλιξη του DIMOND project
- 9 χώρες
- 2000 επεμβατικές πράξεις
- Reference levels at European level for cardiac interventional procedures. Padovani R, Vano E, Trianni A, Bokou C, Bosmans H, Bor D, Jankowski J, Torbica P, Kepler K, Dowling A, Milu C, Tsapaki V, Salat D, Vassileva J, Faulkner. Radiat Prot Dosimetry. 2008;129(1-3):104-7.

Είδος πράξης	DAP (Gycm ²)	T (min)	I
Στεφανιογραφία	45	6,5	700
Αγγειοπλαστική	85	15,5	1000
Ηλεκτροφυσιολογική μελέτη	35	21	

DoseDataMed II project, 2014

- ΔΕΑ σε 36 Ευρωπαϊκές χώρες
- Επεμβατικές πράξεις:καρδιολογία και ακτινολογία
- Radiation protection report 180: <http://ddmed.eu/>

Country	Procedure & quantity					
	Cerebral embolisation	PTCA	PTCA	PCI+CA	PTA	Embolisation bronchial arteries
	DAP, Gy*cm2	DAP, Gy*cm2	Fluoroscopy time, min	DAP, Gy*cm2	DAP, Gy*cm2	DAP, Gy*cm2
AT		130 (with stent)				
BG				140		
CH	350	100			350 (cerebral PTA, lower limbs PTA) 200 (renal PTA, iliacal PTA)	150
DE		60			50	
FI		100	20			
IE		62				
LU		44			50	

Country	Procedure & quantity						
	Bile duct drainage/dilatation	TIPS (liver)	Hepatic embolisation	Vertebroplasty	Embolisation pelvic arteries	Upper limbs embolisation	All IV lines, Hickman line
	DAP, Gy*cm2	DAP, Gy*cm2	DAP, Gy*cm2	DAP, Gy*cm2	DAP, Gy*cm2	DAP, Gy*cm2	DAP, Gy*cm2
CH	250	350	300	15	300	150	
IE		144,4					2,76

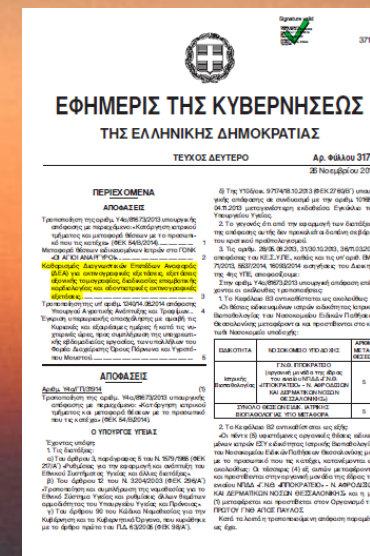
Country	Procedure & quantity						
	Cerebral procedures	All thoracic procedures	All abdominal procedures	All pelvic procedures	All peripheral procedures	Cardiac studies	Pacemaker insertion
	DAP, Gy*cm2	DAP, Gy*cm2	DAP, Gy*cm2	DAP, Gy*cm2	DAP, Gy*cm2	DAP, Gy*cm2	DAP, Gy*cm2
IE	56	7,8	51,6	79	29,1	53,1	2,76

EURADOS Working Group 12 –Dosimetry in Medical Imaging, 2018

- 13 χώρες
- 14922 interventional cardiology procedures
- Siiskonen T et al. Establishing the European diagnostic reference levels for interventional cardiology. Phys Med. 2018 Oct;54:42-48.

Είδος πράξης	DAP (Gycm ²)
Στεφανιογραφία	35
Αγγειοπλαστική	85
TAVI	130
Ηλεκτροφυσιολογική μελέτη	12
Βηματοδότης	2.5-3.5
cardiac resynchronization therapy pacemaker	18

Τι συμβαίνει στην Ελλάδα? ΦΕΚ 3176, 2014



Είδος πράξης	DAP (Gycm2)	T (min)
Στεφανιογραφία	55	6
Αγγειοπλαστική	130	18
Βηματοδότης	35	7
Ablation	145	40



IAEA Guidance level, 2009

- Chile, Italy, Spain and Uruguay
- **INTERNATIONAL ATOMIC ENERGY AGENCY, Establishing Guidance Levels in X Ray Guided Medical Interventional Procedures: A Pilot Study, Safety Reports Series No. 59, IAEA, Vienna (2009).** <https://www-pub.iaea.org/books/iaeabooks/7941/Establishing-Guidance-Levels-in-X-Ray-Guided-Medical-Interventional-Procedures-A-Pilot-Study>

Είδος πράξης	DAP (Gycm ²)	T (min)	I
Στεφανιογραφία	50	9	1000
Αγγειοπλαστική	125	22	1700

USA, 2009

- Miller DL, Kwon D, Bonavia GH. Reference levels for patient radiation doses in interventional radiology: proposed initial values for U.S. practice. *Radiology*. 2009;253(3):753-64.

Table 3

Proposed Patient Reference Levels, Not Corrected for Body Habitus, for Certain Interventional Radiologic Procedures

Procedure	Reference Dose (Gy)	KAP (Gy · cm ²)	Fluoroscopy Time (min)	No. of Images
Transjugular intrahepatic portosystemic shunt creation	3.00	525	60	300
Biliary drainage	1.40	100	30	20
Nephrostomy				
For obstruction	0.40	40	15	12
For stone access	0.70	60	25	14
Pulmonary angiography	0.50	110	10	215
Inferior vena cava filter placement	0.25	60	4	40
Renal or visceral angioplasty				
Without stent	2.00	200	20	210
With stent	2.30	250	30	200
Iliac angioplasty				
Without stent	1.25	250	20	300
With stent	1.90	300	25	350
Bronchial artery embolization	2.00	240	50	450
Hepatic chemoembolization	1.90	400	25	300
Uterine fibroid embolization	3.60	450	36	450
Other tumor embolization	2.60	390	35	325
Gastrointestinal hemorrhage localization and treatment	3.80	520	35	425
Embolization in the head				
For AVM	6.00	550	135	1500
For aneurysm	4.75	360	90	1350
For tumor	6.20	550	200	1700
Vertebroplasty	2.00	120	21	120
Pelvic artery embolization for trauma or tumor	2.50	550	35	550
Embolization in the spine for AVM or tumor	8.00	950	130	1500

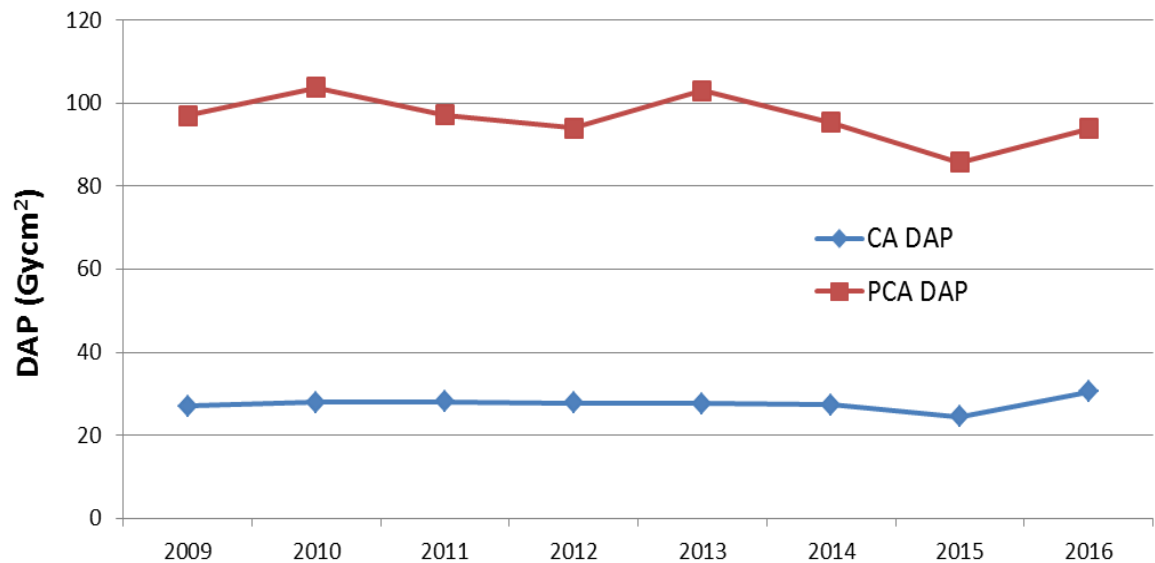


PiDRL European project, 2018

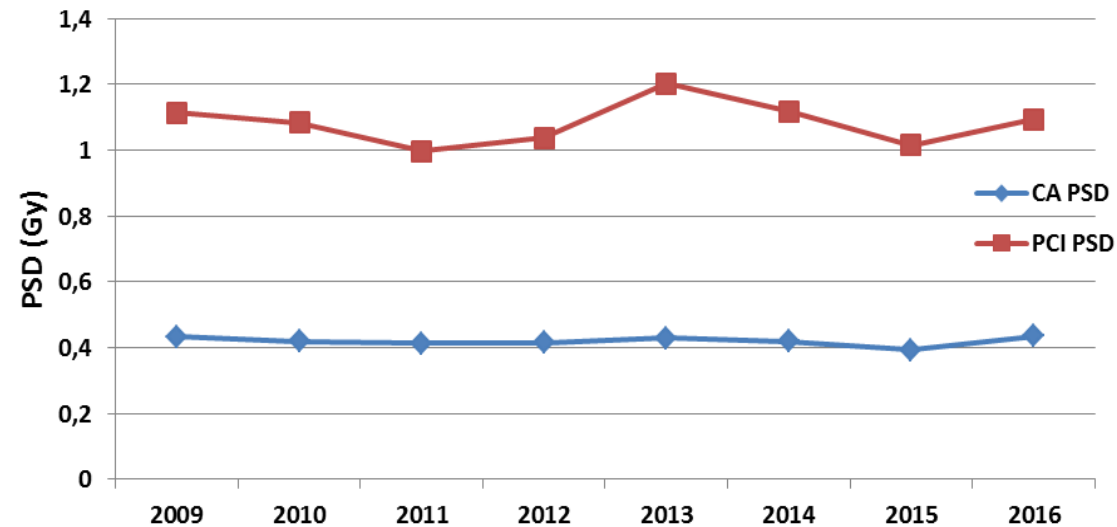
- Radiation Protection Report 185: European Guidelines on Diagnostic Reference Levels for Paediatric Imaging, 2018
- No national paediatric DRLs have been set for IR procedures.
- Data concerning dose exposures are very scarce.
- 8 European articles located considered data from a single institution. Main aim was to determine Local DRLs

Πως το εφαρμόζουμε στο νοσοκομείο μας

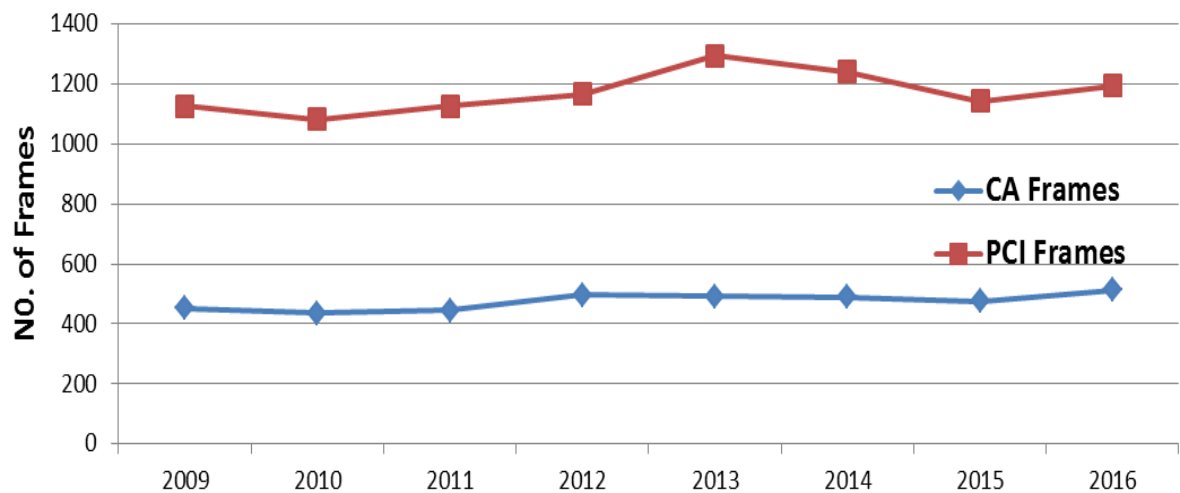
Medians of DAP in Years 2009-2016



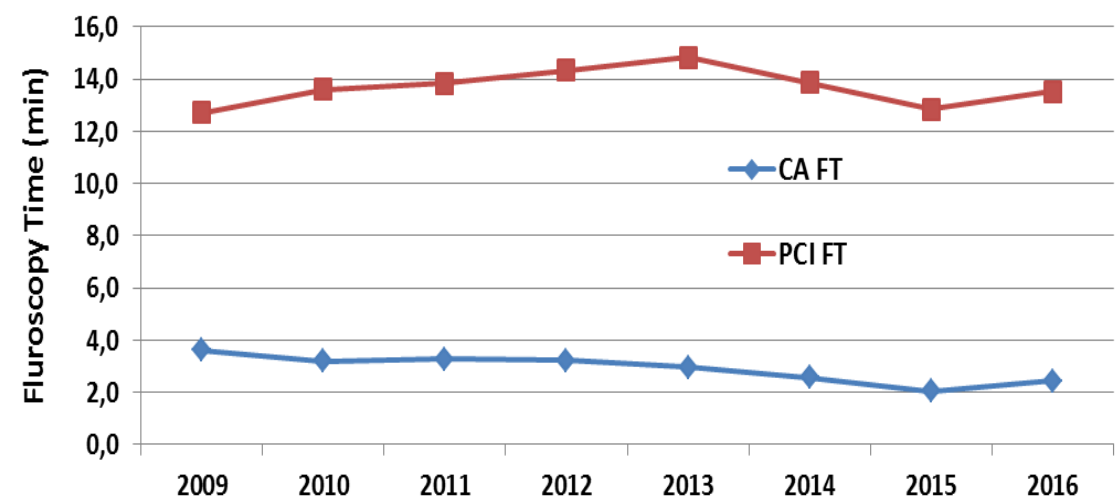
Medians of Peak Skin Dose in Years 2009-2016



Medians of Frames in Years 2009-2016



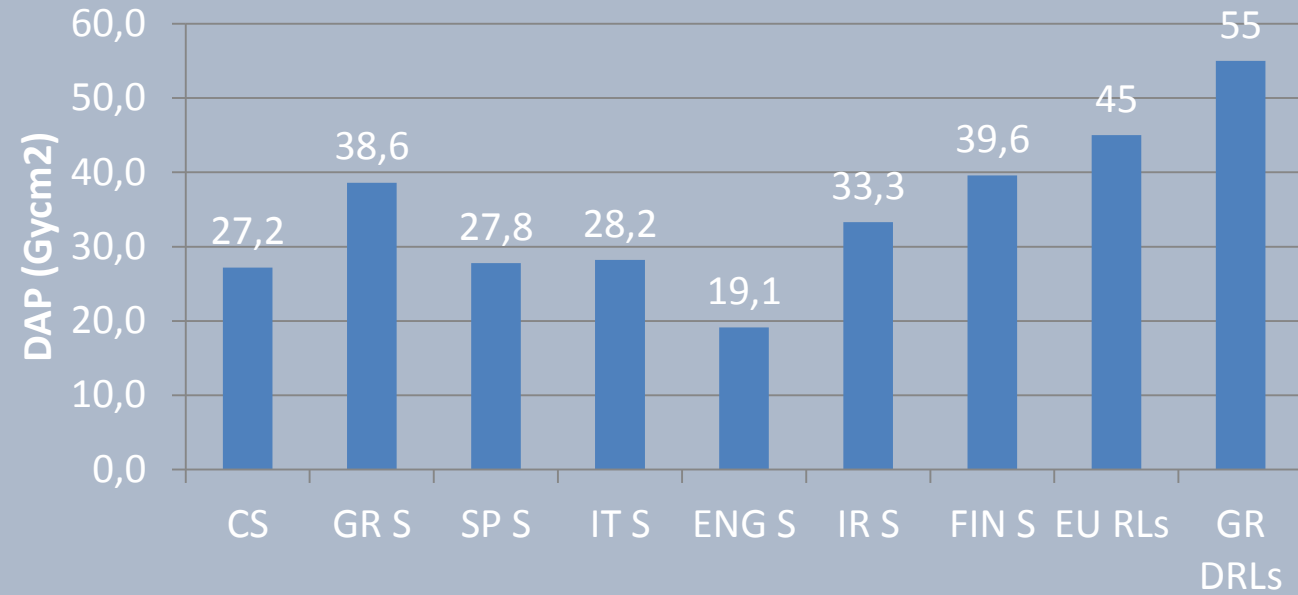
Medians of Fluoroscopy Time in Years 2009-2016



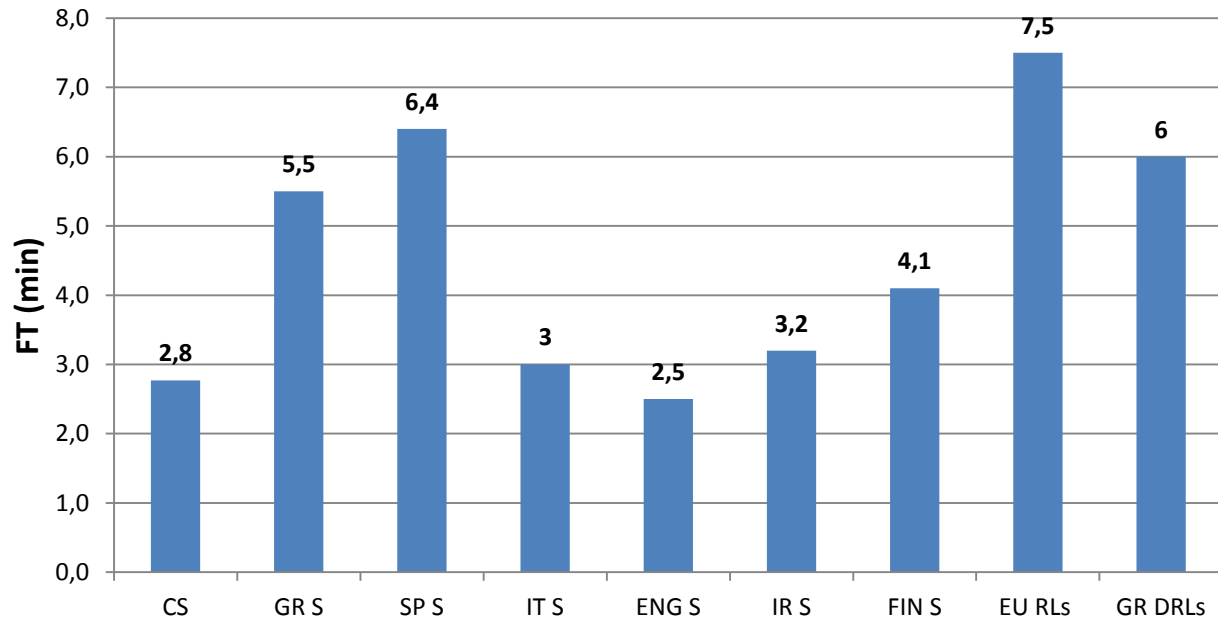
MEDIAN VALUES for CA

	Frames	DAP (Gycm2)	FT (min)
Current Study (2016)	481	27,2	2,8
Greek Study [4]	1620	38,6	5,5
Spanish Study [4]	903	27,8	6,4
Italian Study [4]	570	28,2	3
English Study [4]	845	19,1	2,5
Irish Study [4]	580	33,3	3,2
Finnish Study [4]	417	39,6	4,1
EU RLs (2003) [4]	1250	45	7,5
Greece DRLs [6]	-	55	6

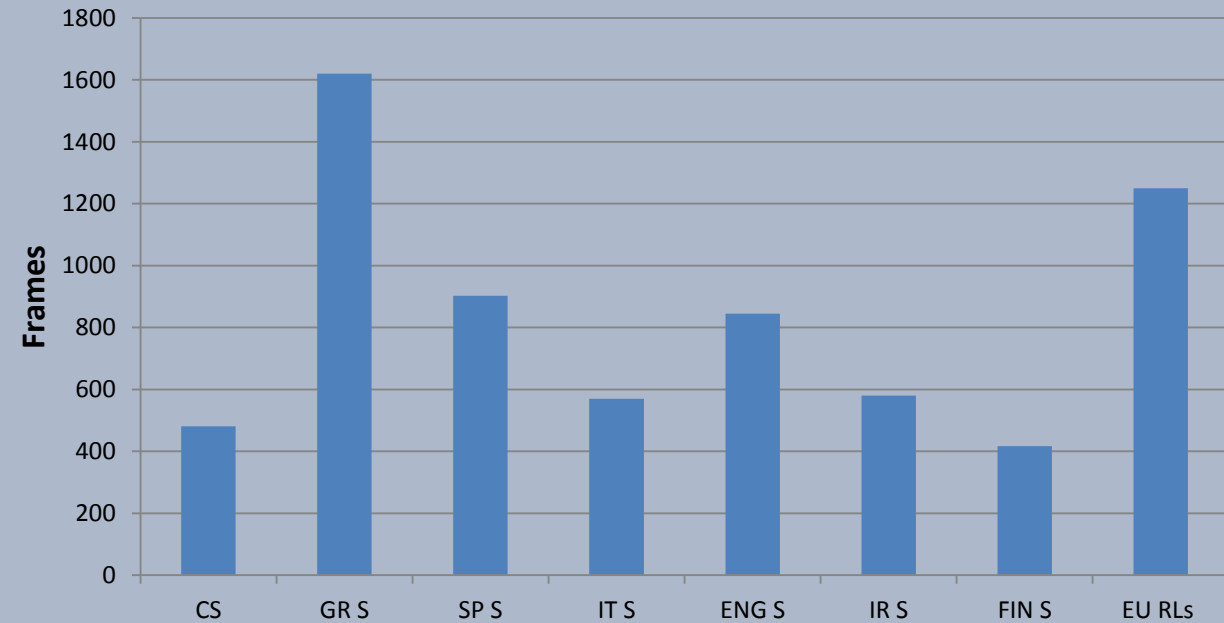
DAP



Fluoroscopy Time



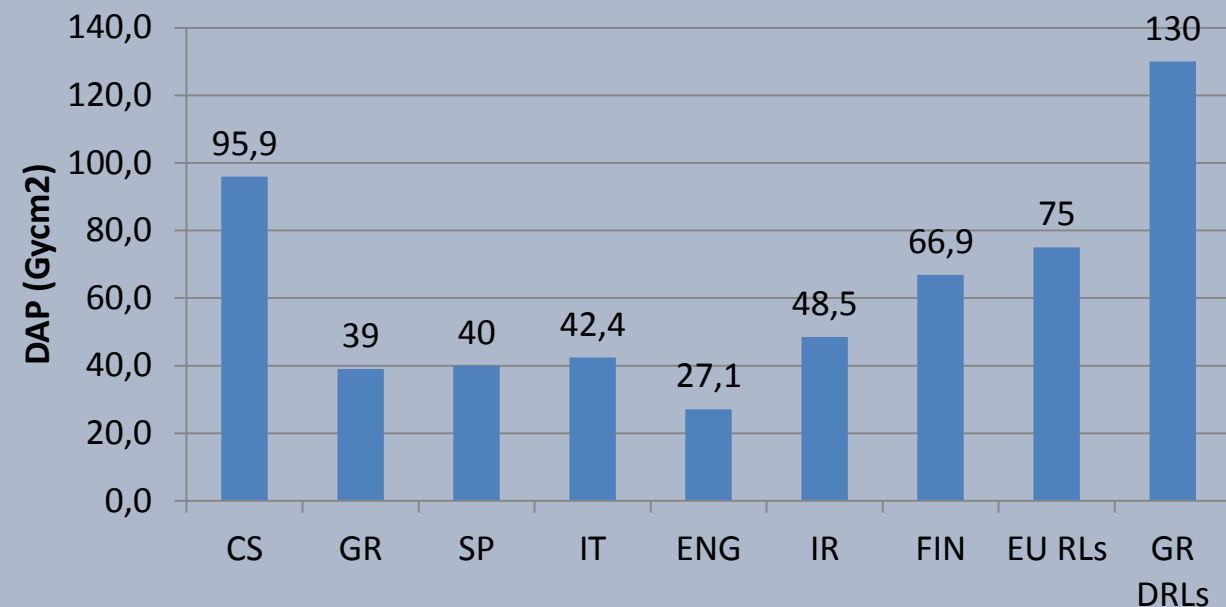
Number of Frames



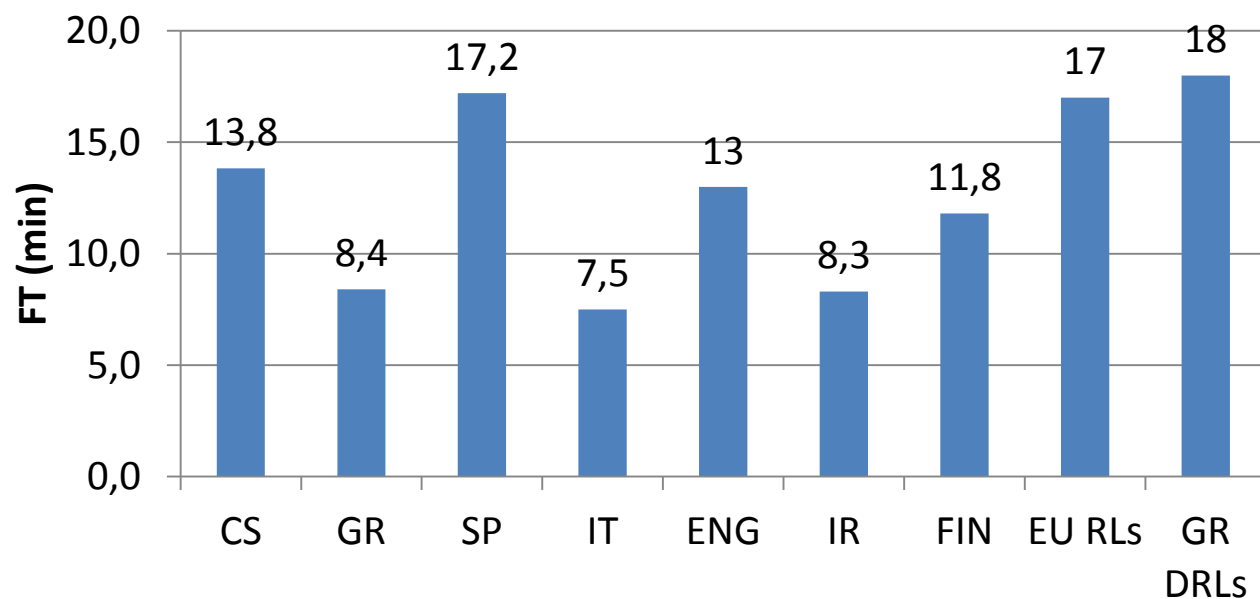
MEDIAN VALUES for PCI

	F	DAP (Gycm2)	FT (min)
Current Study (2016)	1177	95,9	13,8
Greek Study [4]	1300	39	8,4
Spanish Study [4]	975	40	17,2
Italian Study [4]	540	42,4	7,5
English Study [4]	440	27,1	13
Irish Study [4]	449	48,5	8,3
Finnish Study [4]	1425	66,9	11,8
EU Rls (2003) [4]	1300	75	17
Greece DRLs [6]	-	130	18

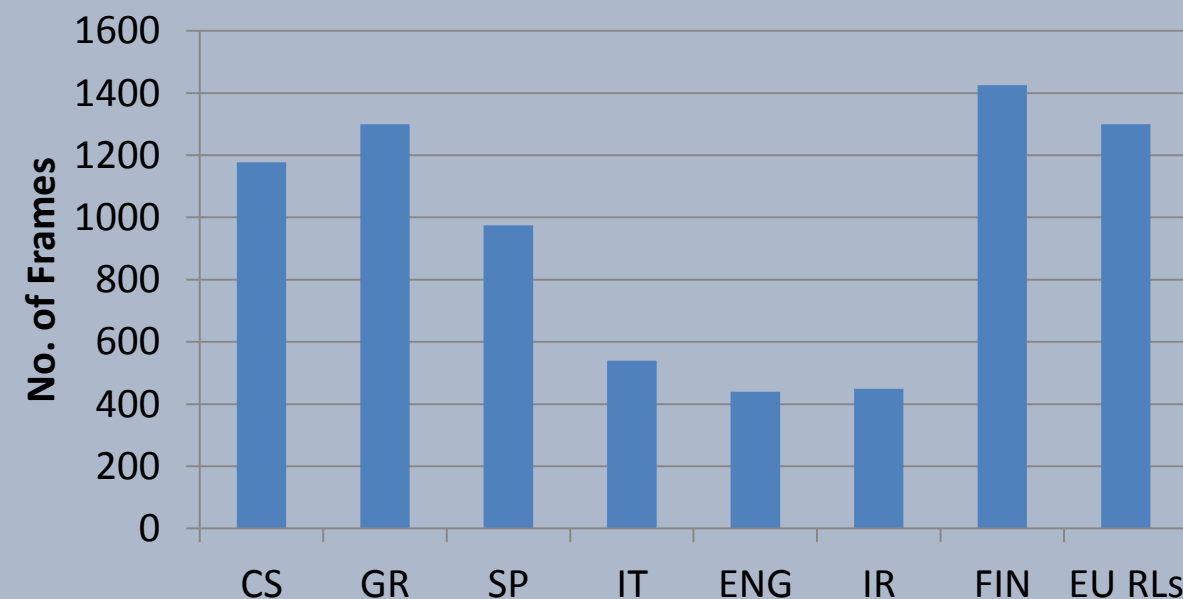
DAP



Fluoroscopy Time



Total number of Frames





WORK IN
PROGRESS

New EC Project: EUCLID - European Study on

Clinical DRLs

- [22 Νοσοκομεία](#)
- <http://www.eurosafeimaging.org/euclid>

Clinical task	Anatomical location	Procedure
<u>Arterial occlusive disease of iliac arteries</u> Angiographic diagnosis and endovascular treatment of arterial stenosis or occlusion causing Intermittent claudication or ischemia	Pelvis	Recanalisation & stenting
<u>Localization and treatment of hepatocellular carcinoma</u> TACE: transarterial chemoembolisation	Liver	Transarterial (chemo)embolisation of tumor vasculature and feeding hepatic arteries
<u>Arterial occlusive disease of femoropopliteal arteries</u> Angiographic diagnosis and endovascular treatment of arterial stenosis or occlusion causing intermittent claudication or ischemia	Lower extremity	Recanalization and angioplasty +-stenting
<u>Biliary drainage</u> Localization of biliary obstruction and percutaneous treatment of biliary obstruction	Abdomen	Percutaneous transhepatic cholangiography and biliary drainage

Σας ευχαριστώ για την προσοχή
σας

