



EU Scientific Seminar 2013  
Radiation induced long-term health effects after medical exposure  
Luxembourg, 19 November 2013



# Policy implications and research needs

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# The 5 A's for Europe



European Heart Journal  
doi:10.1093/eurheartj/ehz394

ESC REPORT

## The appropriate and justified use of medical radiation in cardiovascular imaging: a position document of the ESC Associations of Cardiovascular Imaging, Percutaneous Cardiovascular Interventions and Electrophysiology

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**A**PPROPRIATENESS

**A**UDIT

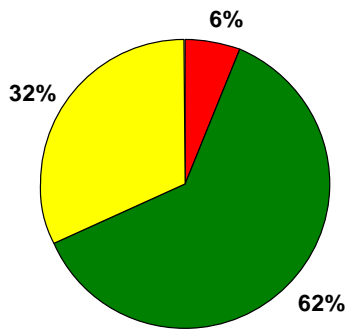
**A**WARENESS

**A**CCOUNTABILITY

**A**DVANCING KNOWLEDGE (scientists and general public)

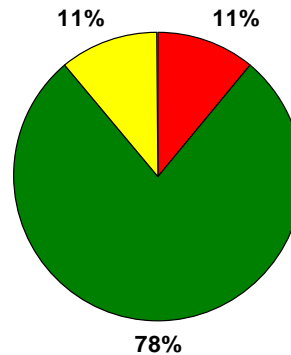
# A for APPROPRIATENESS

Stress  
echocardiography



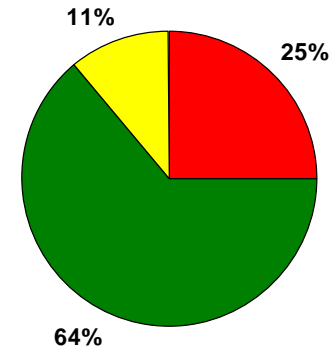
Picano E, Marwick TH. *Am Heart J* 2007

Cardiac CT




Ayyad AE et al. *J Cardiovasc Comput Tomogr.* 2009


Stress Scintigraphy



Gibbons, Pellikka et al. *JACC* 2008

 Appropriate





 Partially inappropriate

 Inappropriate

**Stop paying quantity (with public money),  
start paying appropriateness**

# A for AWARENESS

**Table 6** Terminology that should be used

Investigation (example)	Effective dose range	Additional lifetime risk of fatal and non-fatal cancer	RCR symbolic representation	Proposed risk term
CXR	<0.1 mSv	1:1 million		Negligible
Abdominal X-ray	0.1–1 mSv	1 in 100 000 to 1 in 1 million		Minimal
Chest CT	1–10 mSv	1 in 10 000 to 1 in 1000		Very low
PCI	10–100 mSv	1 in 1000 to 1 in 100		Low

These examples relate to a healthy 50-year-old man. Multiply by 1.38 for women, by 4 for children, and by 0.5 (reduced by 50%) in an 80-year-old man. Adapted from references 18,48, and 49.

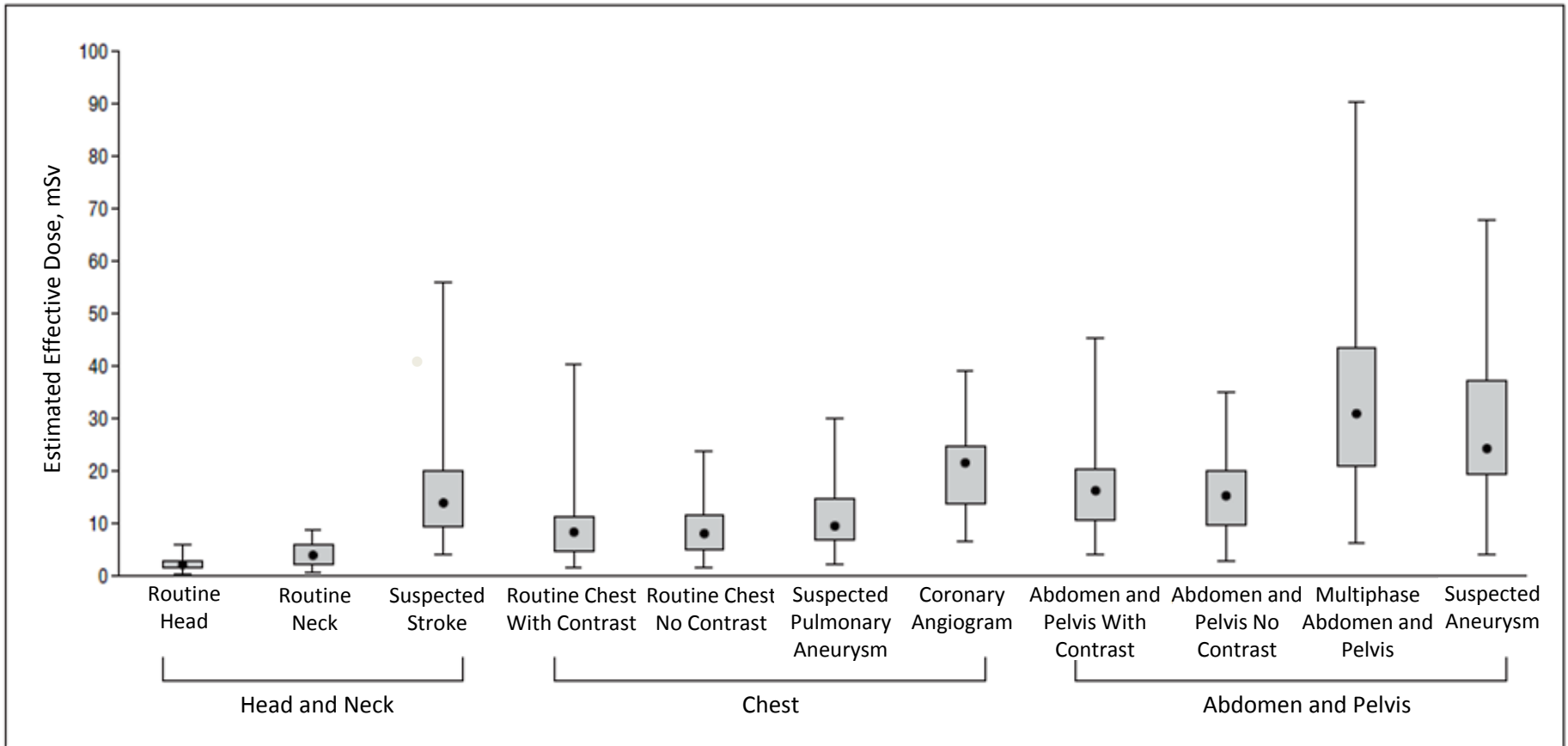
CXRs, chest X-rays; RCR, Royal College of Radiology; PCI, percutaneous coronary intervention.

 <0.1 mSv; , 0.1–1 mSv; , 1–10 mSv; , > 10 mSv.

Picano E, et al. *Eur Heart J* doi: 10.1093/eurheartj/eh394

**The dose in informed consent forces the doctor to know what he/she should already know  
(you know what you are going to do)**

# A for AUDIT

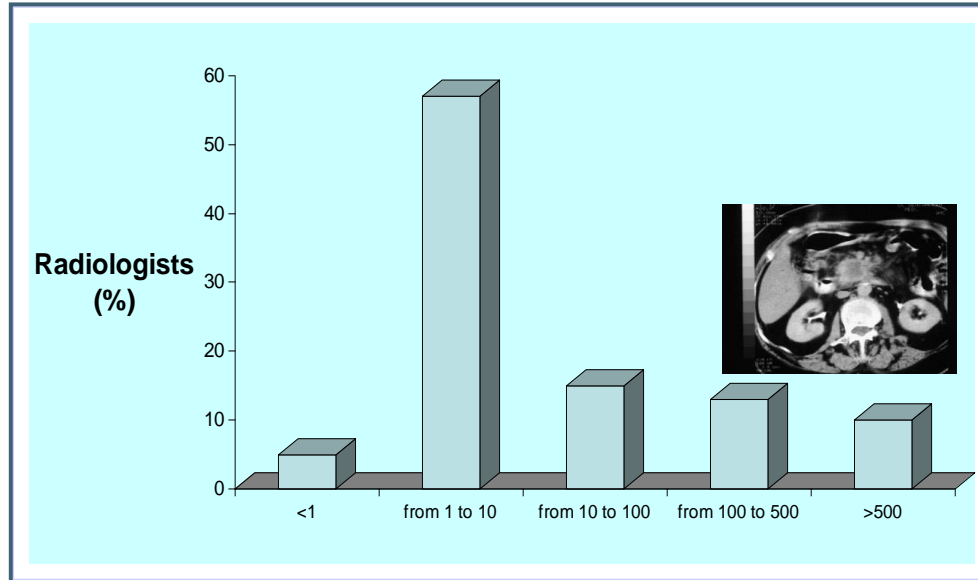


Rebecca Smith-Bindman et al. Arch Intern Med 2009;169(22):2081.

ARCHIVES OF  
INTERNAL MEDICINE

**The truly given dose in mSv should be spelled-out in the written report (you know what you did)**

# A for ACCOUNTABILITY



*Lee TH et al. Radiology. 2004;231:393-8*

## Dose abdomen CT =500 CXR's

- 20% of internists believe MRI is ionizing (Shiralkar. BMJ 2004)
- 12% of pediatricians think scintigraphy is non-ionizing (Thomas et al. Pediatr Radiol, 2006)
- 60% of cardiologists underestimate of 500 times the dose of a scintigraphy (Correia et al. Int J Cardiol, 2005)
- 22% of interventional radiologists do not wear dosimeter (Kottou et al. Radiat Prot Dosimetry, 2001)
- 81% of the interventional cardiology fellows did not know their radiation exposure (Kim C, Am J Cardiol 2010)

**There is no cut-off value between high or low dose:  
but the certainly wrong dose is the one we ignore**

# A for ADVANCING KNOWLEDGE



Main funding	NIH and NCI	Italian CNR National Research Council – IFC, Institute of Clinical Physiology
Scientific Societies endorsement	Multispecialty Occupational Health Group	Italian Society of Invasive Cardiology (GISE)
Enrolled population	<ul style="list-style-type: none"> <li>• 44,000 fluoroscopists (interventional cardiologists, radiologists, neuroradiologists)</li> <li>• 49,000 non-interventional radiologists</li> <li>• 100,000 non-exposed physicians</li> </ul>	<ul style="list-style-type: none"> <li>• 500 exposed interventional cardiologists (nurses, technicians)</li> <li>• 500 non exposed clinical cardiologists (nurses, technicians)</li> </ul>
Endpoint	Epidemiological clinical endpoints (cancer, cataract, vascular events)	Surrogate biomarkers of genetic, vascular, reproductive, neurocognitive effect



Baysson et al. BMC Public Health 2013, 13:266  
<http://www.biomedcentral.com/1471-2458/13/266>



## STUDY PROTOCOL

Open Access

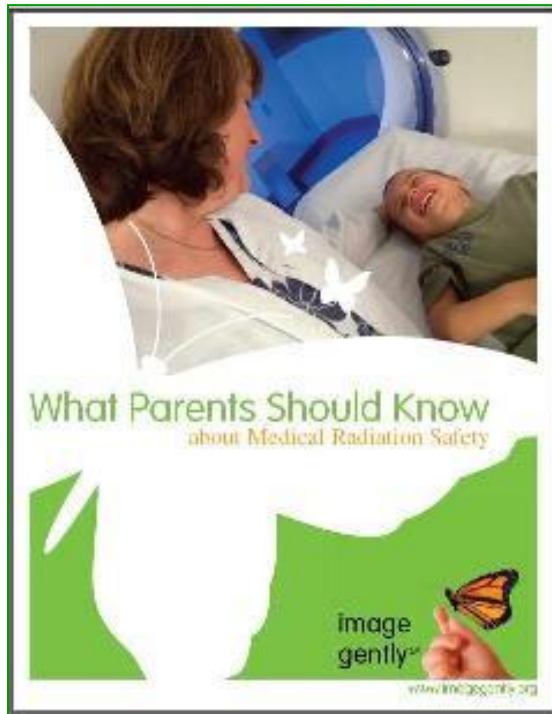
### Risk of cancer associated with cardiac catheterization procedures during childhood: a cohort study in France

Helene Baysson<sup>1\*</sup>, Jean Luc Réhel<sup>1</sup>, Younes Boudjemline<sup>2</sup>, Jérôme Petit<sup>3</sup>, Brigitte Girodon<sup>2</sup>, Bernard Aubert<sup>1</sup>, Dominique Laurier<sup>1</sup>, Damien Bonnet<sup>2</sup> and Marie-Odile Bernier<sup>1</sup>

- ❖ Genetic factors in radiation risk
- ❖ Heritable genetic effects of radiation
- ❖ Future medical radiation studies: *“including studies of infants who experience diagnostic exposures related to cardiac cath...”*
- ❖ Future occupational radiation studies *“...Studies of occupational radiation exposures are well suited for direct effects of long-term, low-level radiation exposure in humans”.*

(BEIR VII Executive Summary, 2005)

# The Image Gently Campaign



**IMAGE WISELY™**  
Radiation Safety in  
Adult Medical Imaging

<http://www.choosingwisely.org/doctor-patient-lists/american-college-of-cardiology/>

**The paternalistic (“trust me, I’m the expert”) and efficientistic (“I have no time to loose”) era is over. Social marketing campaign directly on public is more effective than moral suasion on specialists and corporations**