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# La diagnostica per immagini al tempo della sostenibilità


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**Nessun conflitto di interessi**

Consiglio Nazionale delle Ricerche

# “Sustained and sustainable growth” (Economy Nobel Prize 2018)

**“The transition towards sustainability is necessary and, on the long run, unavoidable. In a world in which resources are diminishing, those who recognize first the need of sustainability will obtain the best results in the future global competition”** ***Sturm A et al, Private Banking Union Report, Zurich 2000***

Bear: poorly competitive
Bull: highly competitive
Red: high ecologic footprint
Green: low ecologic footprint

***THE RED BEAR***

***THE GREEN BULL***

**National Health System makes good progress on sustainability**:
Carbon emissions fell by 18.5 % over the past 10 years while clinical activity rose by 27.5 %, according to a Report of the Sustainable Development Unit of NHS (**BMJ, 24 September 2018**)

# Le cinque sostenibilità

**Biologica**

**Ambientale**

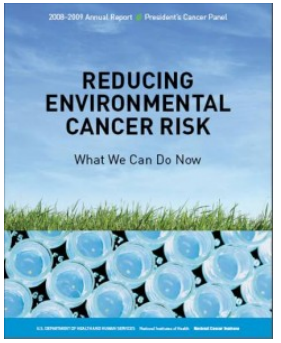
**Economica**

**Legale**

**Etica**

# President's Cancer Panel

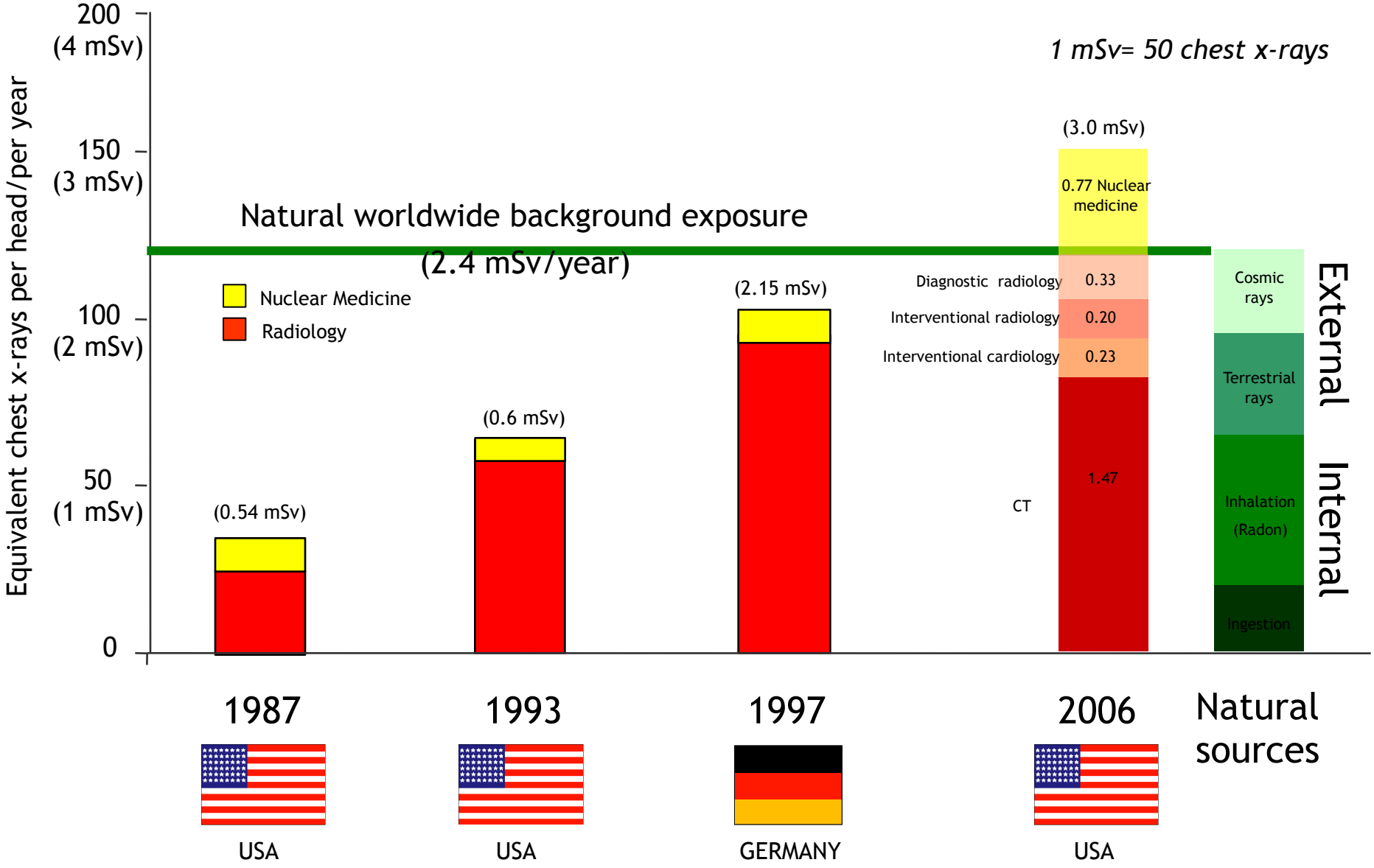
## *6 MAJOR SOURCES OF ENVIRONMENTAL CONTAMINANTS*




1. Industry and Manufacturing
2. Agriculture
3. Modern lifestyles
4. Medical sources:  radiation from medical tests such as CT scans
5. Military sources
6. Natural sources

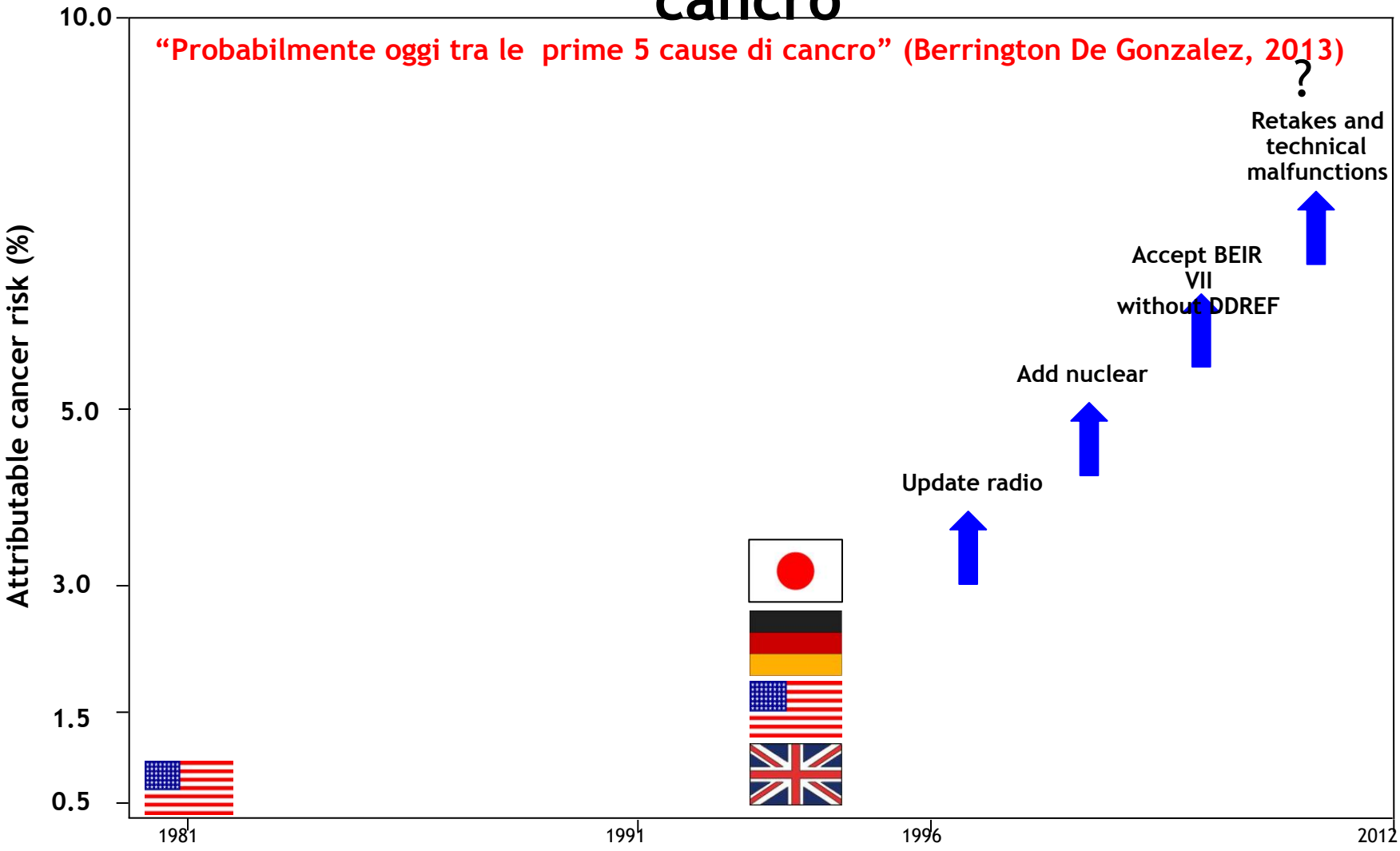
*May 10, 2010*

**Toscana: 1.5 nel 2006, 1.7 mSv (+13%) nel 2011 (QS-Toscana, 15.03.2017)**




*dified and updated from Picano E. BMJ, March 6 2004 in* ***Picano E et al, ESC Position paper on medical radiation, EHJ 2014***

# Dalla dose di radiazioni mediche al rischio di cancro




Source: Doll R and Peto R, 1981

Berrington de Gonzales and Darby, LANCET, 2004

Picano E, Lancet, letter 2004

Berrington de Gonzales, NIH conference May 2013

Medscape from WebMD

# Topol on The Creative Destruction of Medicine

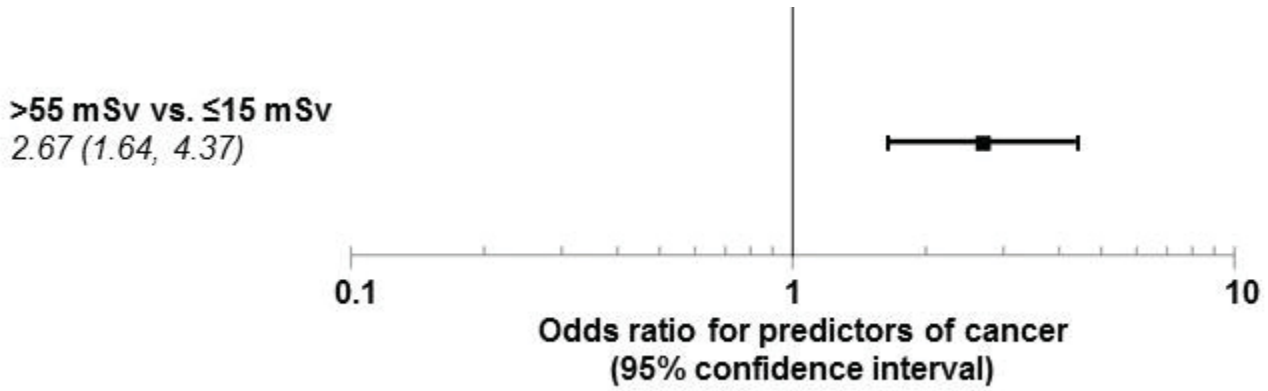
## Runaway Use of Radiation Harming Patients


"We have a very important problem here with this runaway use of radiation procedures but no accountability with respect to patients' exposure. (…) So, why don't tell patients when they have a particular imaging scan how many mSv they're getting exposed to? (…) This is a serious breach of our responsibility to patients. In a digital world, this information could be collected from birth. Every individual should have their mSv exposure through medical imaging recorded cumulatively throughout their life and added to their electronic health record. Hopefully, will see that change come about in the future, this is something that's a big hole in the way we work in medicine"

Dec 17, 2012

# Cancer in Congenital heart disease

**24,833 adult CHD patients with 250,791 person-years of follow-up**
**(OR 1.10 per procedure and 3.08 for ≥ 6 procedures)**




***Cohen S et al, Circulation, 29 December 2017***

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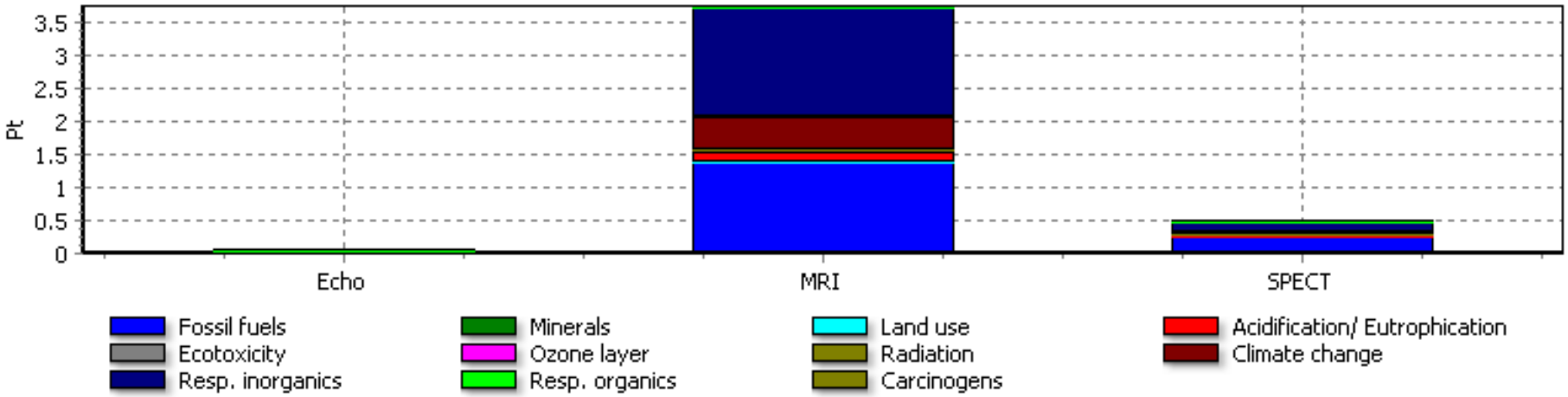
# The environmental cost

One ton of $CO_2$ emissions costs 50 US dollars in indirect costs. One echocardiogram produces about 2 Kg of $CO_2$, and a 3 Tesla MRI 200 to 300 kg of $CO_2$




Comparing 1 p 'Echo', 1 p 'MRI' and 1 p 'SPECT';
Method: Eco-indicator 99 (H) V2.07 / Europe EI 99 H/A / Single score

*Marwick T et al. Environmental impact of cardiac imaging tests for the diagnosis of coronary artery disease. Heart 2011*

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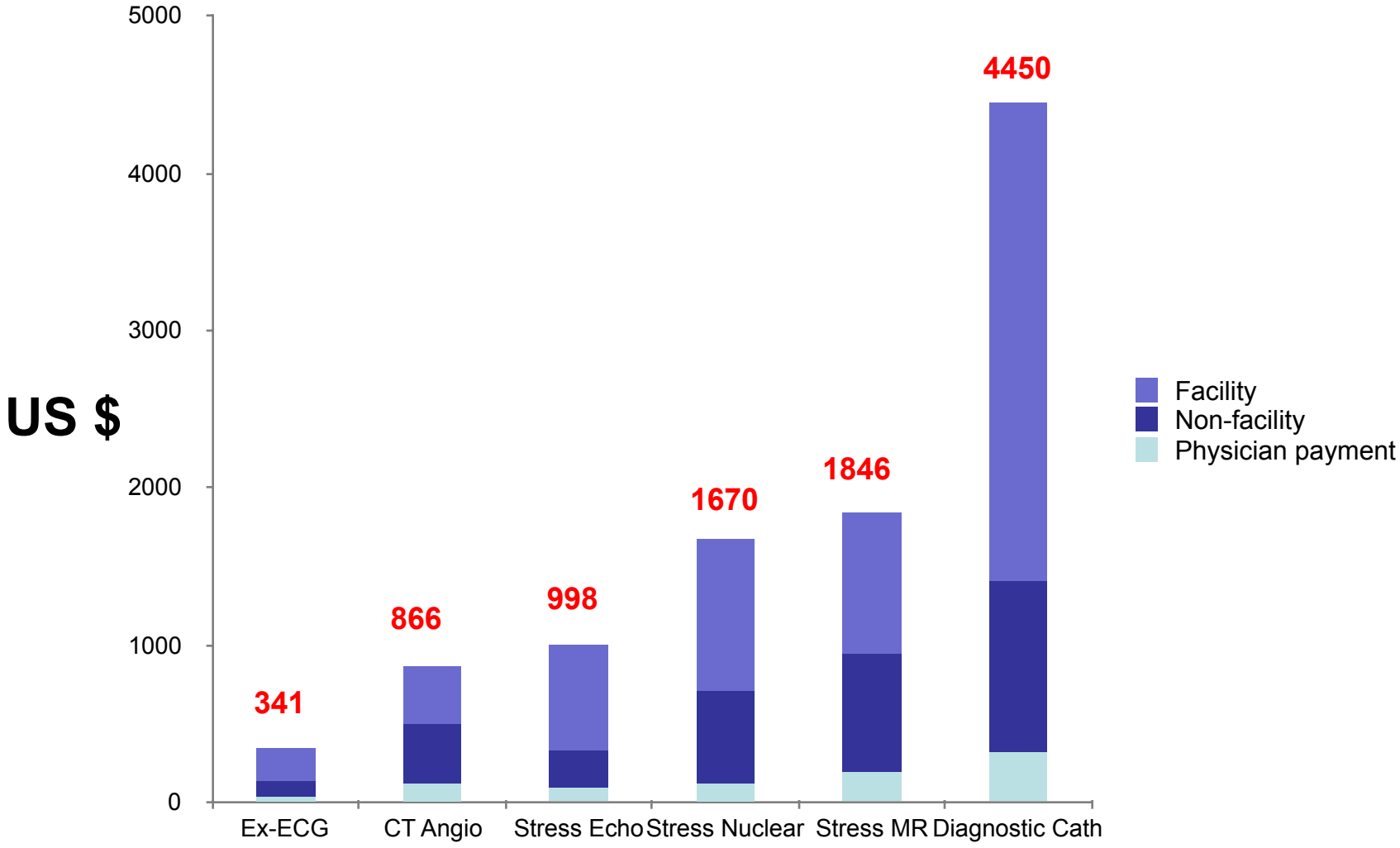
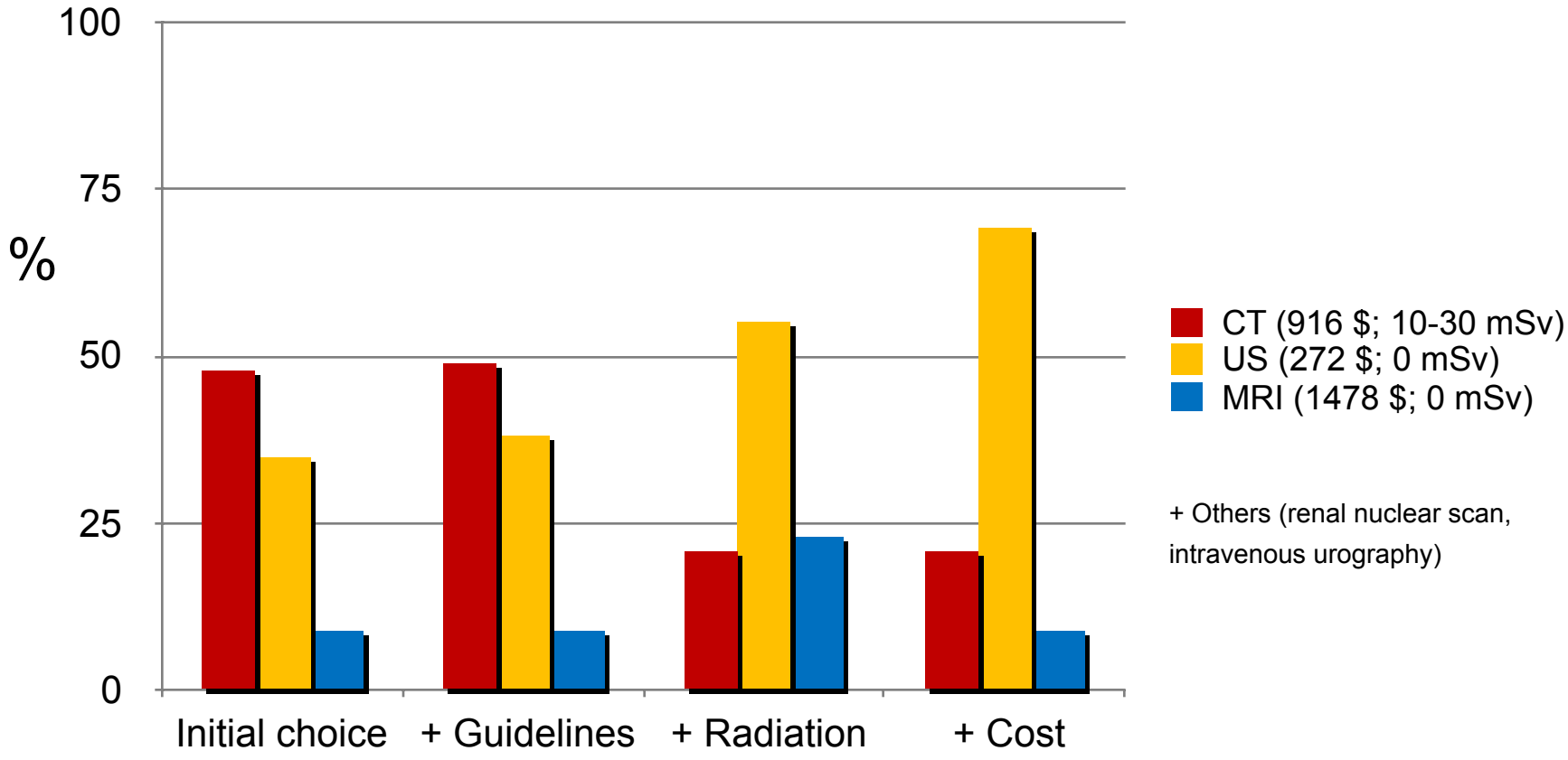
# 2012 Medicare Fee schedule




*Wolk et al, JACC 2014, 4 Febr. ACCF Task Force*

# Physicians ordering of medical imaging (22-year-old female with indeterminate renal mass)




*Gimbel RW et al. Med Care 2013*

# Pay now, gain later

- **723 lives per year spared  radiation induced cancer mortality 30 years after the start of implementation of amendaments.**

- **The average annual financial savings of 519 million $ in the**

**first 10 years of implementation greatly exceeds estimated**

**average annual cost of 49 million $ to manufacturers and the FDA.**

***Fluoroscopy Working Group. Assessment of the impact of the proposed amendments to the diagnostic X-ray equipment performance standard addressing fluoroscopic X-ray systems. Center for Devices and Radiological Health, FDA http://www.fda.gov/cdrh/ radhealth/fluoro/amendxrad.pdf (July 2000)***

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TOSCANA

Il Sole 24 ORE Sanità

14 Dicembre 2010

**SOSTENIBILITA'** *Un progetto triennale punta a ridurre l'esposizione inutile alle radiazioni*

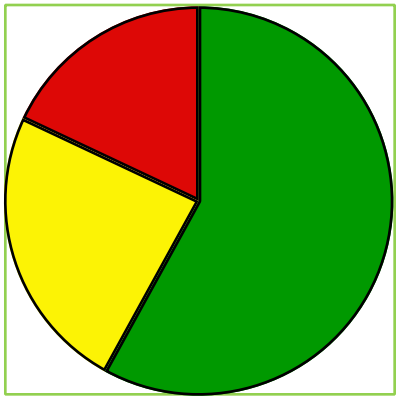
# Stop alla superficialità Rx

**Gli esami medici sono una delle 6 maggiori cause ambientali di cancro**

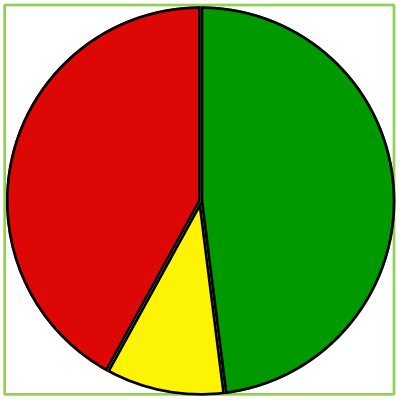
*"E' il progetto SUIT-Heart (Stop Useless Imaging Testing in Heart disease), che implementa in una realtà pilota circoscritta la strategia proposta nel 2010 dall'International Atomic Energy Agency e basata sulle 3 A: Audit; Awareness; Appropriateness (Audit-Avvedutezza-Appropriatezza)*"

# The pandemics of inappropriatene

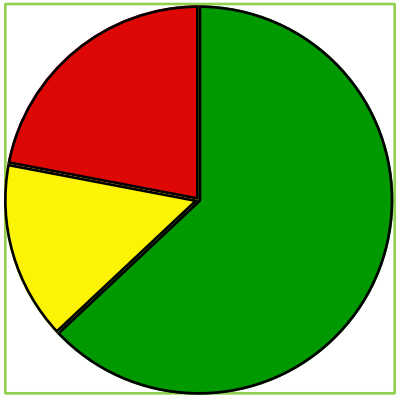
CCT (250 cases)



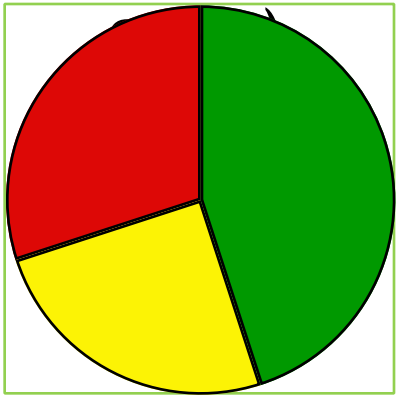
CXr (250 cases)



PCI (250 cases)



CA (250



Appropriate

Partially inappropriate

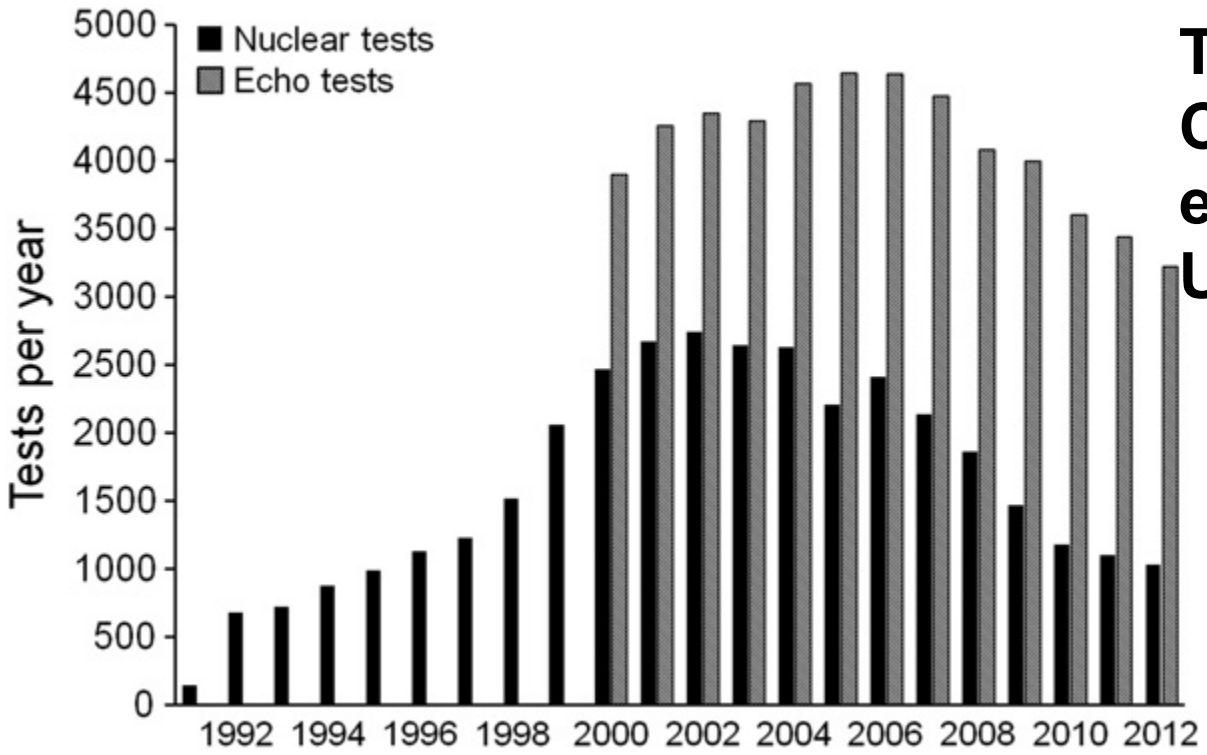
Inappropriate

*Carpeggiani C et al. PLoS One. 2013;8:e81161*

“La prevenzione che si fa in Italia è inutilmente costosa. **Su cento Tac prescritte, cinquanta sono inutili; su cento risonanze sessanta sono inutili;** su cento parti cesarei, sessanta potrebbero essere parti naturali. **Altro che tagli orizzontali**.”

*Fo D, Casaleggio G, Grillo B. Il Grillo canta sempre al tramonto. Chiare Lettere, 2013*

# Radiation issue, a game changer




**The Mayo Clinic experience, USA**

***(Jouini H,Gibbons RJ et al, AHJ 2016)***

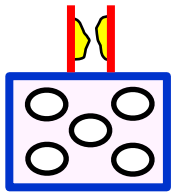
"Increasing concerns about radiation exposure and sustainability of the health care system were the main drivers of the observed reduction in SPECT imaging growth after 2006"

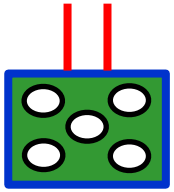
Ischemic or non-ischemic heart

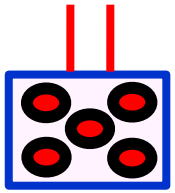
Wet or dry lung

Weak or strong heart

Cold or warm heart

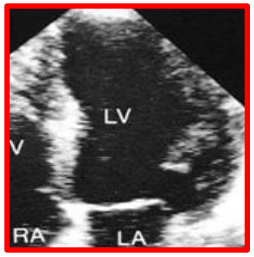


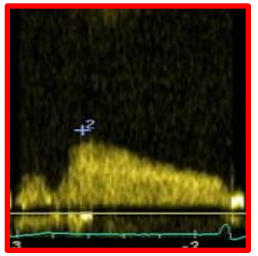


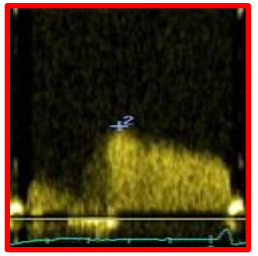


**Rest**

**Stress**





**RWMA** **B-lines** **LVCR** **CFVR**

*A =* *Asynergy*

*B =* *B-lines*

*C =* *Contractile Reserve*

*D =* *Doppler CFVR*

**(Picano E, JACC img 2018)**

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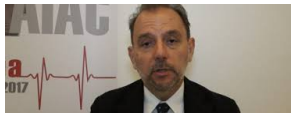
# What patients can do

| RADIATION |
| --- |
| 3. Adults and children can reduce their exposure to electromagnetic energy by wearing a headset when using a cell phone, texting instead of calling, and keeping calls brief. |
| 4. It is advisable to periodically check home radon levels. Home buyers should conduct a radon test in any home they are considering purchasing. |
| 5. To reduce exposure to radiation from medical sources, patients should discuss with their health care providers the need for medical tests or procedures that involve radiation exposure. Key considerations include personal history of radiation exposure, the expected benefit of the test, and alternative ways of obtaining the same information. In addition, to help limit cumulative medical radiation exposure, individuals can create a record of all imaging or nuclear medicine tests received and, if known, the estimated radiation dose for each test. |
| 6. Adults and children can avoid overexposure to ultraviolet light by wearing protective clothing and sunscreens when outdoors and avoiding exposure when the sunlight is most intense. |

*President's Cancer Panel, May 2010*

# The race towards zero exposure in cardiology

Dr.Marzia Giaccardi,Florence-Santa maria Nova



Dr. Maurizio Del Greco, Trento

Dr.Michela Casella,Milan-Monzino

***MPI*** ***MBCT*** ***cardiologists yearly exposure*** ***radiofrequency ablation***

*Picano E, Vano E. Cardiovasc Ultrasound. 2011 Nov 21;9:35.*

# Il buon paziente

"E' ormai parte del sapere comune che troppe radiografie fanno male alla salute, che una donna incinta deve ricorrerci solo in caso di assoluta urgenza e che anche il dentista deve essere parsimonioso con quel suo facile sistema di reperire le carie. Il rischio è che quelle radiazioni, pur limitate, abbiano come effetto secondario l'attivazione di un qualche cancro. Una lastra, diciamo del torace, manda tre unità di quella misura con cui vengono contate le radiazioni, e già quelle tre sono ormai giudicate potenzialmente pericolose. Figuriamoci…"

*Tiziano Terzani, Un altro giro di giostra.*