



**Challenges of Radiological Protection
in Research and Society
referring to Medical Field**

**October 3/2024
Milan, Italy**

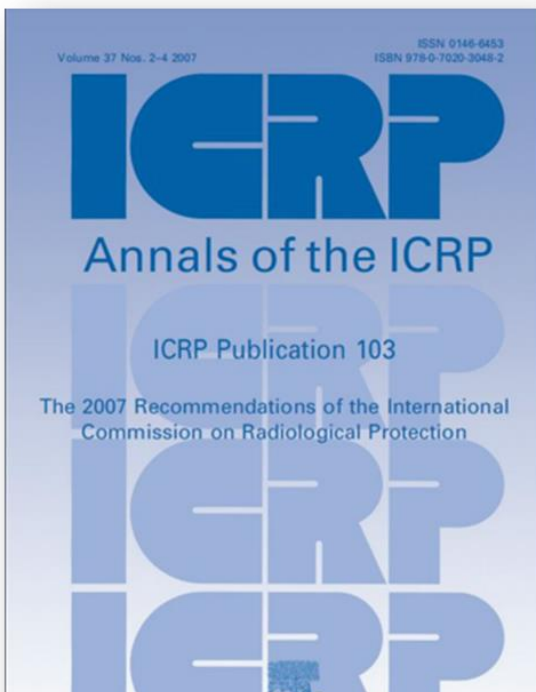
Lights and shadows of ICRP's recommendation on medical exposure in Italy

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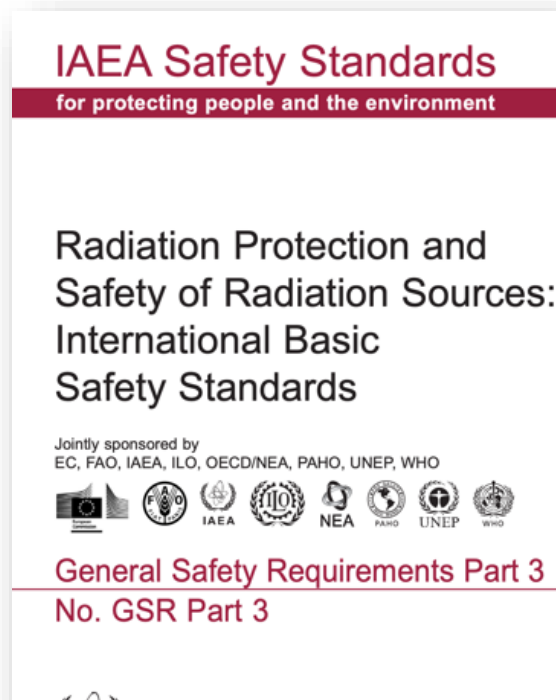
SNR - Sindacato Nazionale Area Radiologica
Secretary Giulio Argalia



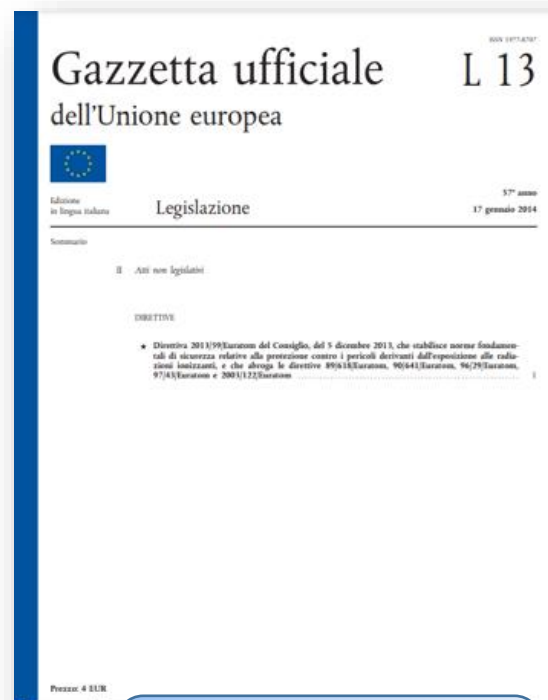
Legislative Decree 101/2020 represents the main legislative act through which Italy has implemented Directive 2013/59/Euratom and updates previous legislation in accordance with international standards, including those proposed by the ICRP. This decree establishes safety regulations to protect individuals from the dangers arising from ionizing radiation.



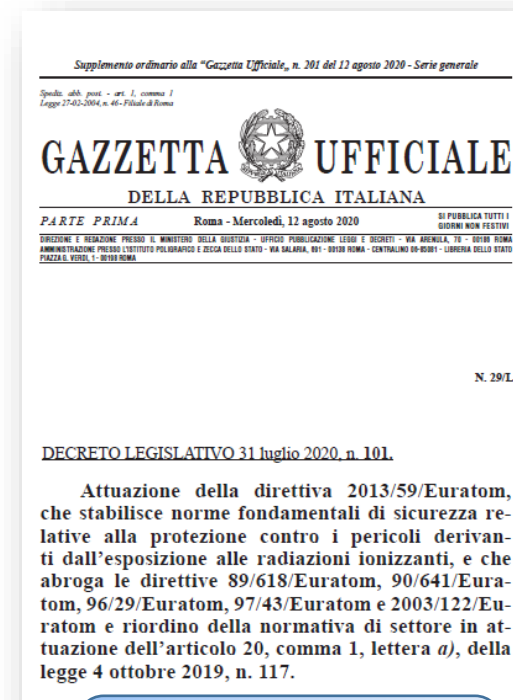
ICRP 103 (2007)



IAEA BSS (2011)



EU 2013/59



D.Lgs 101/2020



The radiation protection system is based on the principles of: justification, optimization, and dose limitation

JUSTIFICATION

- Any practice involve IR ensure that the benefit for individuals or the community outweighs the health detriment it may cause
- All examinations are performed under the clinical responsibility of the medical specialist, based on a justified request from the referring physician [art 159, c1].



Ionizing radiation used to produce images for **diagnostic** purposes:

- Medical practitioner with specialization in Radiology (radiologist)
- Medical practitioner with specialization in Nuclear Medicine (not interchangeable)



Ionizing radiation used to produce images for **treatment** purposes:

- Interventional Radiologist
- Specialist Physician in Nuclear Medicine for radiometabolic procedures
- Dentist / Medical practitioner ... for complementary activities (ie cardiologist, neurologist, ...)



Ionizing radiation used exclusively for **treatment**:

- Radiation Oncologist



D.Lgs 101/2020

Responsibility for supervision and management of individual medical exposures:

- **Justification** [Art 157, c 2] and **optimization** [Art 158, c 2]
- **Clinical evaluation** of the result [Art 159, c 3]
- **Cooperation** with other healthcare professionals involved, within their competence, in the radiological procedure [Art 159, c 4]
- **Transmission**, if requested, of radiological information and records to other medical specialists and the prescriber [Art 168, c 1]
- **Informing patients** and other interested parties, where appropriate, about the benefits and risks of medical exposure [Art 159, c 6].

- Motivated request inclusive of clinical query from referring physician
- Evaluation of clinical information and review of possible previous imaging investigations
- Justification of the proposed examination (considering the purpose of the exposure and the patient's characteristic) or motivated non-justification with possible suggestion of alternative techniques and methods
- Provision of information and informed consent (**risk/benefit exposure to ionizing radiation**)
- Execution
 - Adequacy of equipment/optimisation
 - Effective professional competence
 - Technical aspects of the procedure
 - Images
- Interpretation/Reporting
- Communication/discussion with the clinician
- Archiving

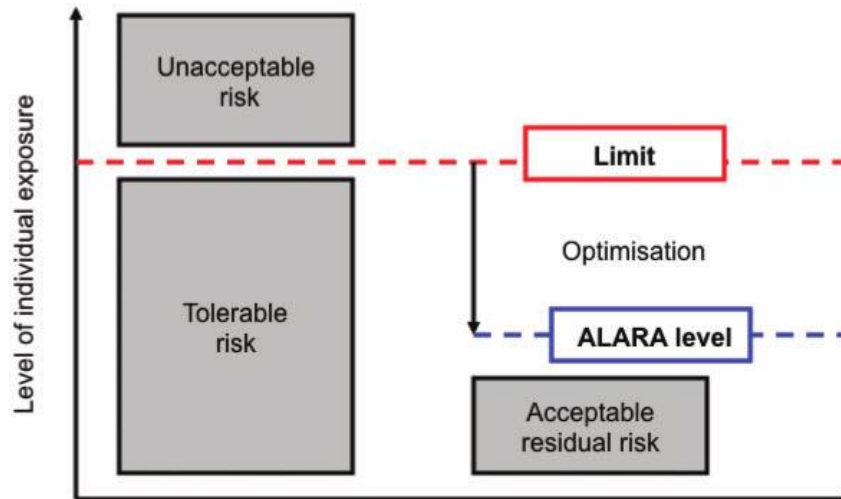


OPTIMIZATION



The principle of optimization states that every exposure to ionizing radiation must be kept as low as reasonably achievable (A.L.A.R.A.).

Minimize patient exposure while ensuring clinical images are of sufficient quality for accurate diagnosis and correct care decisions



ICRP 2007

TEAM

The design and construction of the equipment and the installation are the responsibility of:

- Medical Physics Expert
(UNFORTUNATELY MPE ARE NOT PRESENT IN ALL DIAGNOSTIC FACILITIES)
- Radiologist
- Radiological facility manager
- Radiology technologist

INDIVIDUAL

For high-dose examinations individual justification by the **radiologist** is crucial:

- Details of proposed procedure and alternative procedures
- **The patient's characteristics**
- Expected dose to the patient
- Availability of information on previous or expected examinations or treatment

OPTIMIZATION-COOPERATION



RADIOLOGY TEAM

Radiological facility manager, radiographer, Medical Physics Expert, Medical Radiologist

- Technology verification, Age/Weight protocols
- DRL estimation
- Best practices
- Image quality
- Report issues
- DRL verification
- Quality check
- Clinical audit
- Significant Event Audit
- Training

MEDICAL RADIOLOGICAL PRACTITIONER

“Tailor the examination to the individual patient”

- Use substitute or alternative techniques
- Select the protocol
- Adjust scan acquisition based on clinical condition
- Decide on contrast agent administration
- Perform one or multiple phases
- Optimize imaging protocols

The justification of a medical procedure does not necessarily lead to the same choice of the best procedure in all situations **ICRP 105**

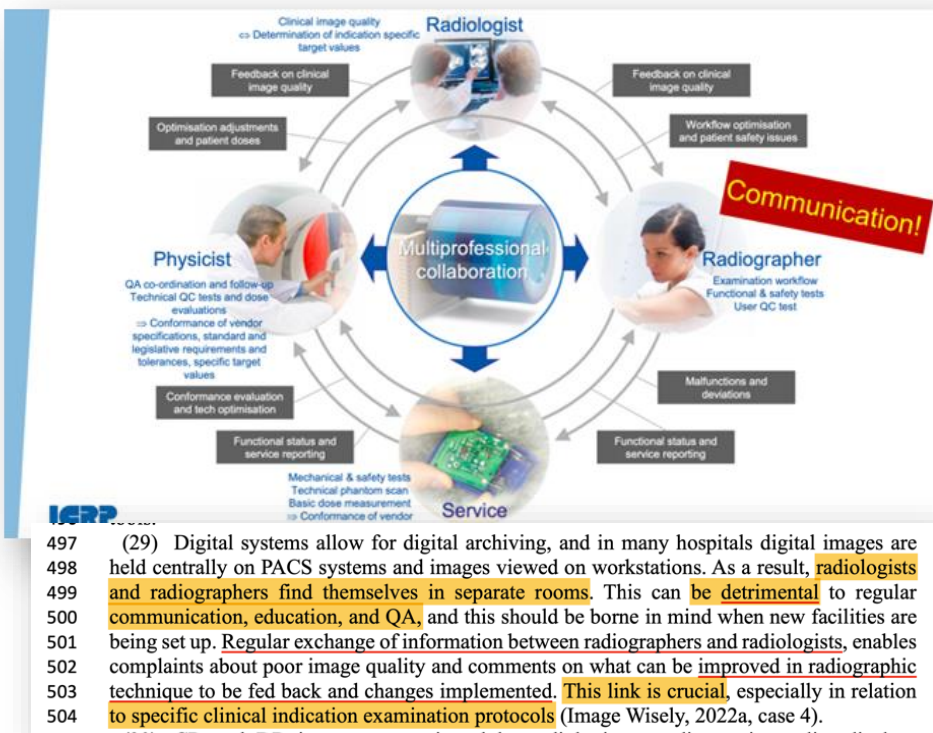
..the process of optimization should be individualized

COMMUNICATIONS AND STAKEHOLDER INVOLVEMENT



Stakeholders

Involving stakeholders is crucial for integrating values in decision-making, improving the quality of decisions, resolving conflicts among interests, and building trust in institutions (ICRP 2006).

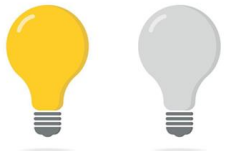


Patients

Communicating radiological risks presents challenges, as the perception of risk depends on **how familiar** and **understood** the risk is, whether the activities are perceived as beneficial, and whether the risks are voluntary or imposed.

The decision to undergo an examination must be shared, and the medical practitioner must be available to answer the patient's concerns

Education and training in radiological protection

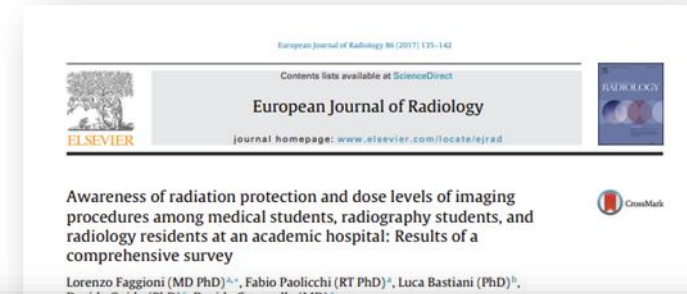


Educational activities on patient radioprotection are included in the curricula for degrees in medicine, dentistry, radiographer and radiotherapy, as well as in specializations like radiodiagnostics and nuclear medicine and for medical practices involving the use of ionizing radiation

Periodic updates, including radioprotection, are part of continuing medical education (CME), requiring:

- 10% of total credits in a three-year period for specialist doctors, general practitioners, pediatricians, radiologic technologists, nurses, and pediatric nurses.
- 15% of total credits for medical physics experts (MPEs) , and specialist doctors or dentists performing complementary activities

(Article 162, paragraph 4).



Conclusions

Radiology residents, radiography students and medical students have a limited awareness about radiation protection, with a specific gap of knowledge concerning real radiation doses of daily radiological examinations. Both undergraduate and postgraduate teaching needs to be effectively implemented with radiation safety courses.



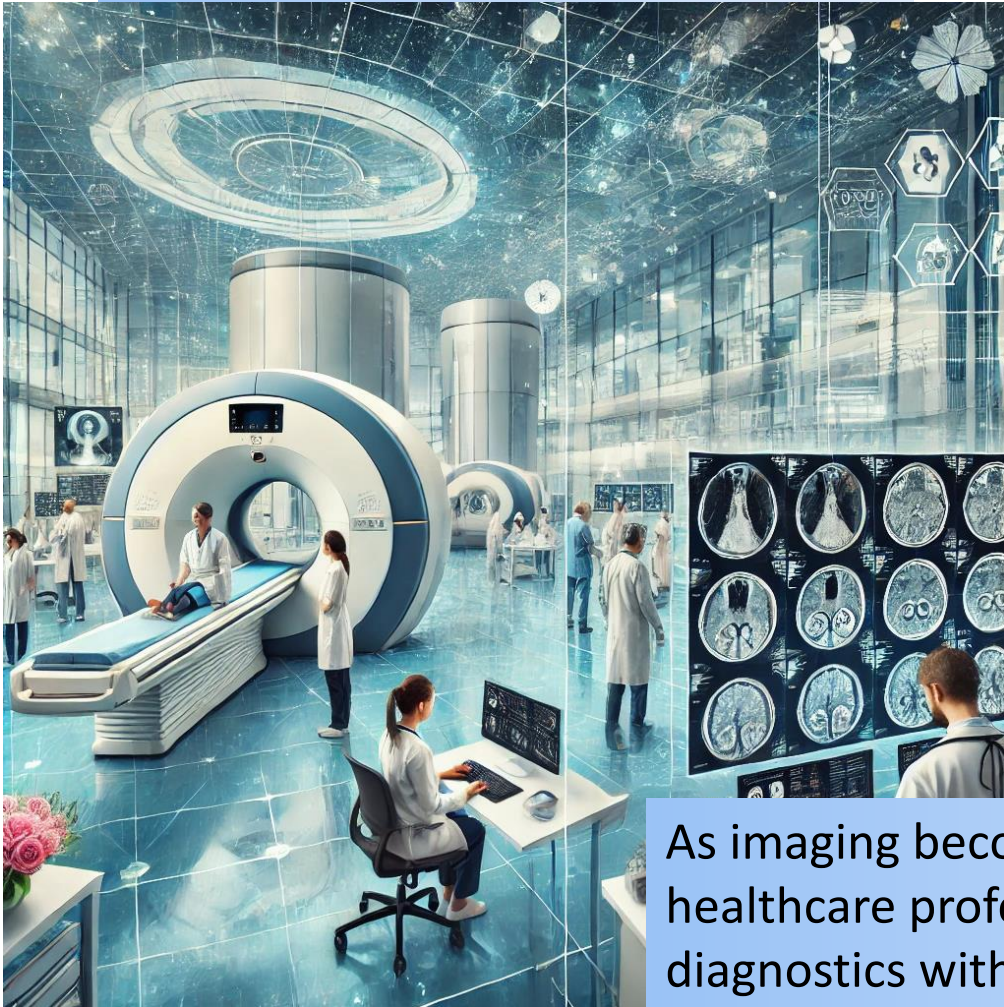
Conclusions

The findings of our survey suggest a substantial lack of knowledge about medical radiation among Italian patients. This scenario calls for improved communication between medical staff and patients to provide them with adequate awareness about medical radiation and the risks related to cumulative radiation exposure.

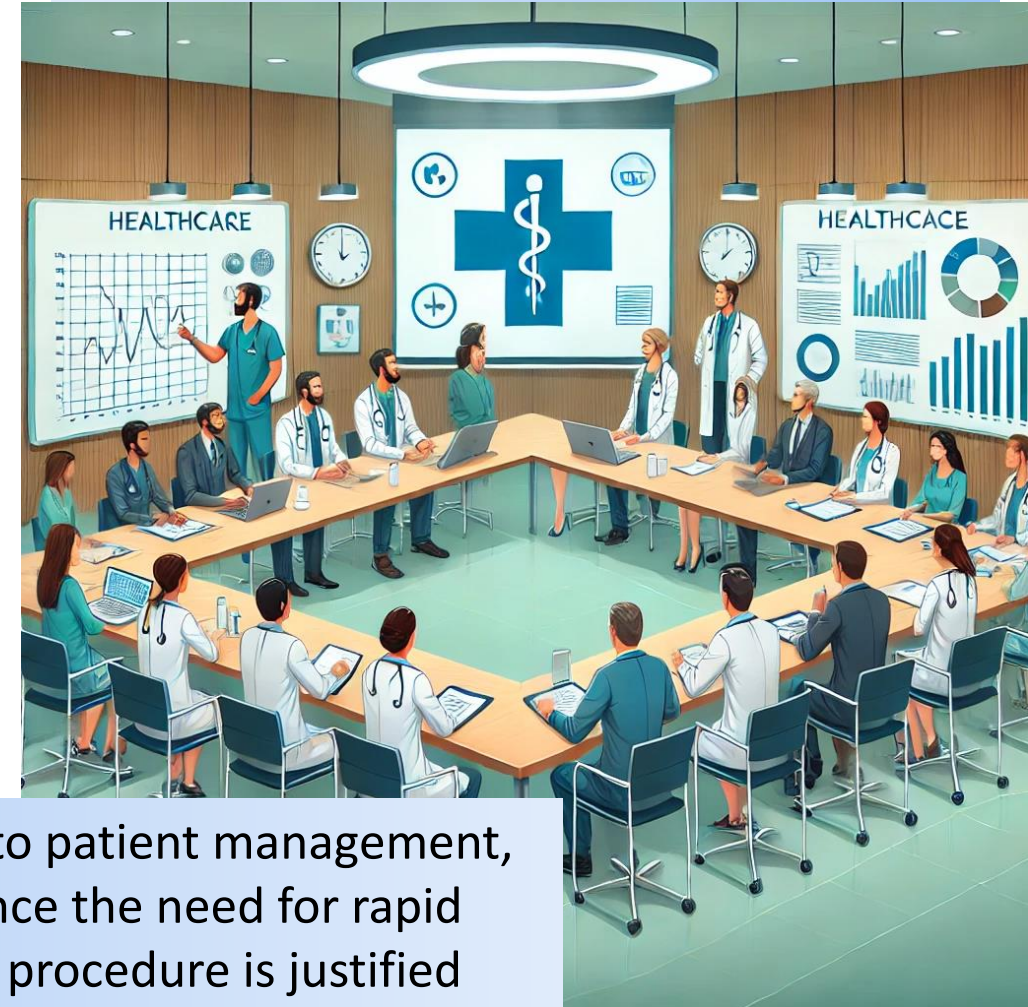
In medicine challenges related to justification and optimization arise from:

HEALTHCARE COMPLEXITY
AND
INCREASED USE OF IMAGING

WIDER STAKEHOLDER
EXPECTATIONS, PARTICIPATION,
AND DEMANDS



TIME OF
CARE
↔
QUALITY
OF CARE

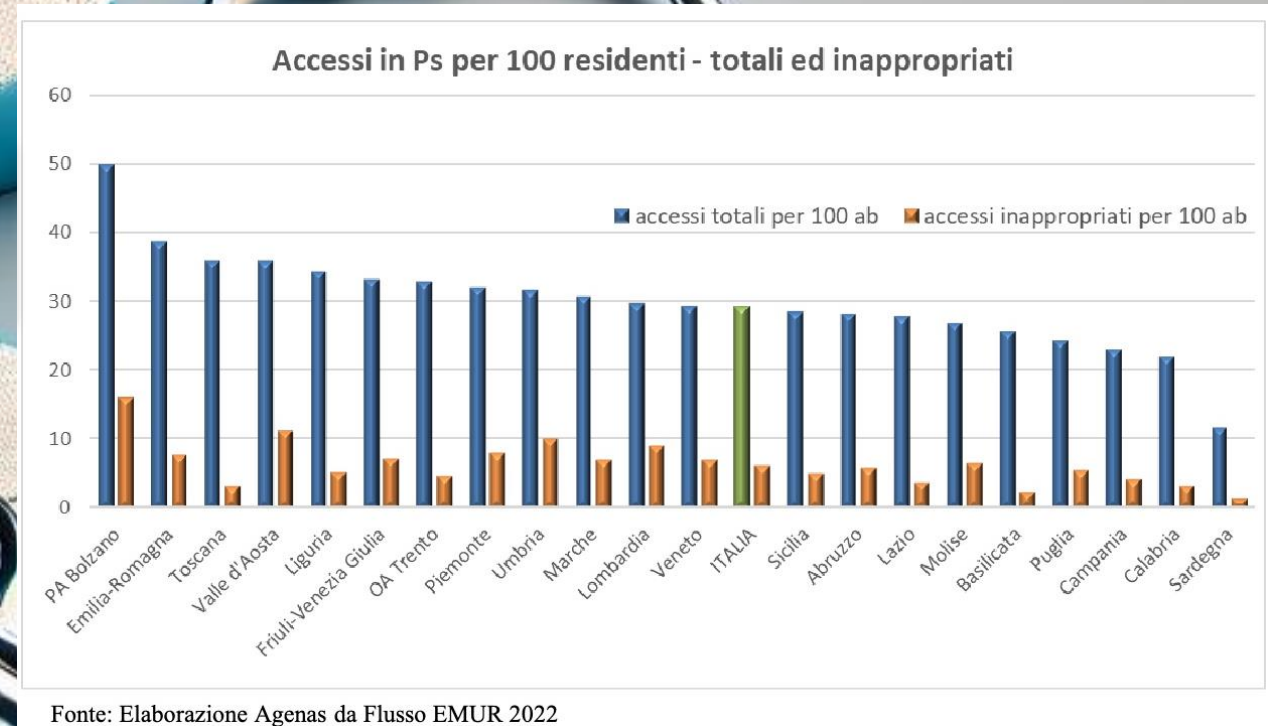


As imaging becomes more integral to patient management, healthcare professionals must balance the need for rapid diagnostics with ensuring that each procedure is justified

Italian public healthcare system background



- Underfunding
- Spending caps on healthcare personnel
- Closure of 110 hospitals and reduction of 37,000 hospital beds
- Hiring freezes and blocked staff turnover
- Inadequate salaries for doctors and health workers
- **Increase discharge in favor of private healthcare or working abroad**
- Lacking of family physicians
- Increased workload and exhausting shifts for public healthcare workers
- Long waiting lists



- Heavy use and congestion of the emergency departments
- In 2023, there were 18.27 million emergency room visits in Italy of which 68% white or green codes; **22% (4 million) were deemed INAPPROPRIATE**

RADIOLOGY UTILIZATION IN THE EMERGENCY DEPARTEMENT



The abuse of emergency rooms has led to a progressive increase in the use of diagnostic imaging

UOS Diagnostica per Immagini nel DEA										
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Apparecchiature	PS									
DEA RX	42899	46086	45797	47340	47326	46197	43845	44291	42421	39703
DEA Eco	8506	9089	9487	8933	9478	9819	9530	10198	9787	8843
DEA TC	11527	13582	14761	16832	17343	19468	20988	23173	22960	22624
Totale	62.932	68.757	70.045	73.105	74.147	75.484	74.363	77.662	75.168	71.170
Accessi PS	101.708	98.076	96.501	97.234	95.845	95.417	90.396	87.324	84.922	81.007

DI: + 13% **CT: + 96 %** **Dlexamination/Edvisits +26%**
 US: + 4 % RX: - 8 % 2006: 62% 2015: 88%

CT utilization in EDs has increased over time due to:

- A decrease in other exams (e.g., X-rays, ultrasounds) and a significant increase in CT scans
- **A higher ratio of patients undergoing at least one imaging exam during ED admissions.**

Prestazioni firmate
gennaio 2016 - dicembre 2022

		2016	2017	2018	2019	2020	2021	2022
PRONTO SOCCORSO	TOMOGRAFIA COMPUTERIZZATA	25.670	25.773	26.249	27.879	24.625	29.751	29.746
	RISONANZA MAGNETICA	899	698	477	407	374	459	425
	ECOGRAFIA	12.122	12.783	12.094	12.329	7.419	8.513	7.879
	RADIOLOGIA	75.337	74.453	72.130	72.389	51.532	61.642	64.196
	ASSISTENZA RADIOLOGICA INTERVENTO	44	17	25	61	51	86	74
	CONSULENZE E VISITE	4	11	29	25	47	103	78
	INTERVENTISTICA	173	198	198	153	167	161	156
	ANGIOGRAFIA	80	78	52	11	30	18	17
	BIOPSIE	2	2	1	1		2	2
	PET	1						
	MEDICINA NUCLEARE	3	8	4	1			3
PRONTO SOCCORSO	Somma:	114.335	114.021	111.259	113.256	84.245	100.735	102.576
Accessi PS	Somma:	127.559	118.964	116.453	118.838	76.850	88.723	98.691

CT: + 16 % US:- 35 % RX: - 15 % **Dlexamination/Edvisits +13%**
 2016: 91% **2022: 106%**

Possible reasons:

- Technological advances leading to more accurate diagnoses in the ED
- Increased demand for **rapid turnover in EDs**
- CT scans are frequently used to determinate **hospitalization vs. discharge**
- Growing concerns about **malpractice liability (defensive medicine)**

Policy proposals to the lack of medical staff and the lengthening of waiting lists in the Italian public healthcare system



- Reduction of the duration of each visit and shortening of the time required to perform exams
- (Ab)Use of teleradiology in both emergency and non-emergency settings, potentially contra legem (outside the legal framework)
- Non-medical staff prescribing exams, including those involving ionizing radiation

TIME OF CARE

QUALITY OF CARE

Justification (More good than harm -
-100% dose savings if not justified)

Optimization (Maximize the
benefits-Manage the dose)

Stakeholder involvement

Communications
(informed and shared risks
of ionizing radiation)

Prescriptive
appropriateness

“...radiology is a clinical service not a reporting service”

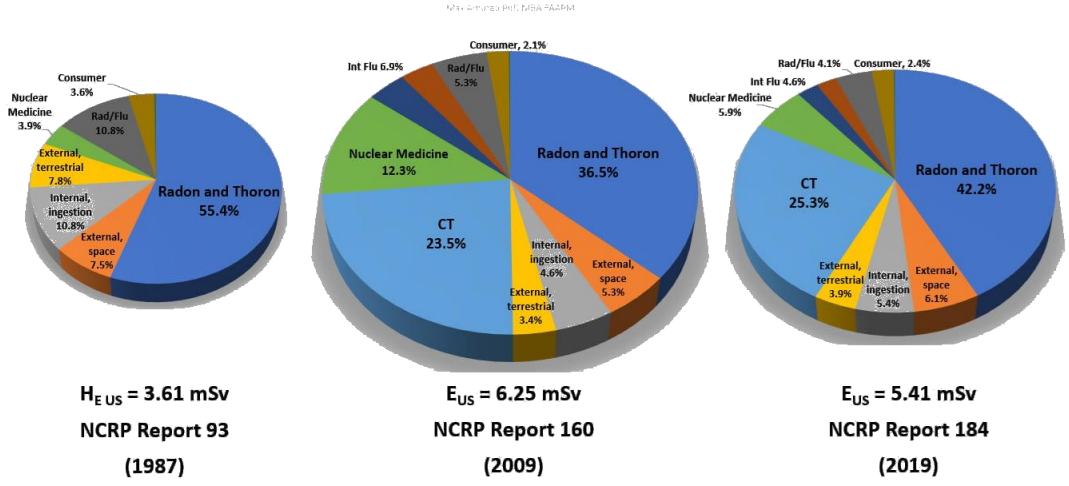
GLOBAL trends in medical exposure



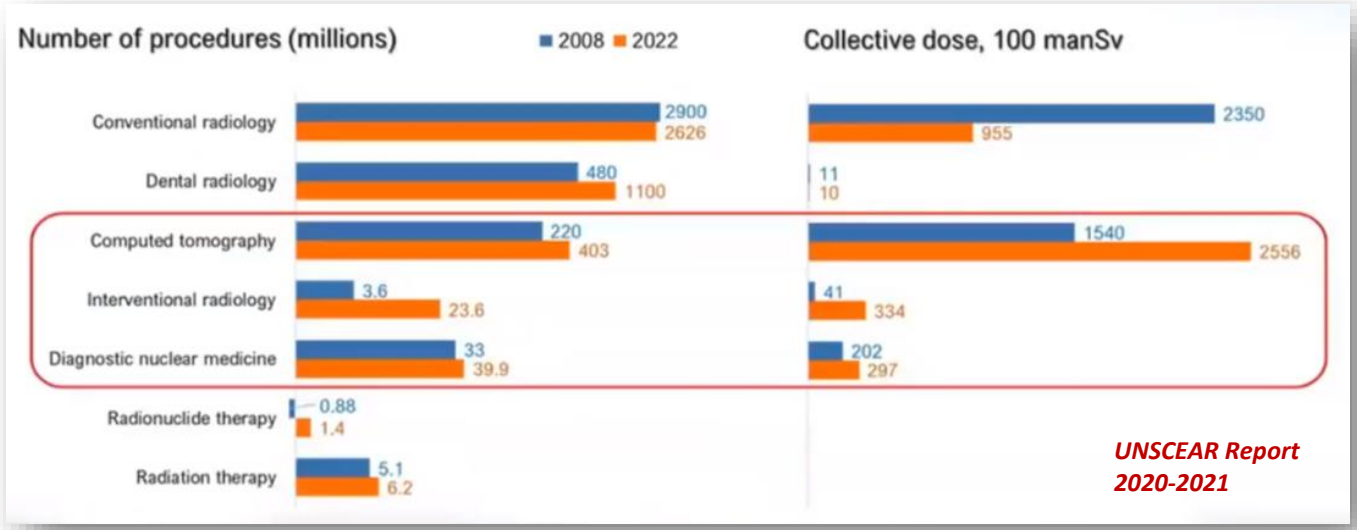
Medical procedures represent the main contributor in radiation exposure to the US population

The trend of the cumulative radiation dose to the population is mainly influenced by the increase in Computed Tomography (CT) scans

evolving radiation effective doses in the USA



NCRP Reports n 93, 160, 184



UNSCEAR Report 2020-2021

It can be assumed that the cumulative dose in Italy has increased due to the rise in the number of CT scans



SCUOLA DI SPECIALIZZAZIONE	CONTRATTI DI SPECIALIZZAZIONE		
	BANDITI	ASSEGNATI	
Chirurgia plastica	108	108	100%
Dermatologia e venerologia	133	133	100%
Endocrinologia	214	214	100%
Malattie dell'apparato cardiovascolare	613	613	100%
Malattie dell'apparato digerente	225	225	100%
Oftalmologia	245	245	100%
Pediatria	840	839	100%
Neurologia	343	342	100%
Radiodiagnostica	683	681	100%
Medicina Termale	3	3	100%
Medicina legale	162	161	99%
Malattie dell'apparato respiratorio	264	261	99%
Medicina dello sport	88	87	99%
Medicina del lavoro	205	202	99%
Chirurgia maxillo facciale	56	55	98%
Ginecologia ed Ostetricia	551	538	98%
Reumatologia	125	122	98%
Allergologia ed immunologia clinica	79	77	97%
Otorinolaringoiatria	197	192	97%
Neuropsichiatria infantile	227	221	97%
Chirurgia pediatrica	58	56	97%
Ortopedia e traumatologia	495	469	95%
Psichiatria	543	514	95%
Neurochirurgia	118	111	94%
Chirurgia Vascolare	119	109	92%
Oncologia medica	323	291	90%
Medicina fisica e riabilitativa	342	302	88%
Cardiochirurgia	96	84	88%
Scienza dell'alimentazione	69	59	86%
Urologia	262	221	84%
Ematologia	219	175	80%
Medicina interna	836	661	79%
Geriatría	400	287	72%
Igiene e medicina preventiva	567	378	67%
Malattie Infettive e Tropicali	254	167	66%
Audiologia e foniatria	37	24	65%
Genetica medica	81	50	62%
Anestesia	1566	940	60%
Chirurgia Generale	715	362	51%
Chirurgia Toracica	89	43	48%
Nefrologia	351	167	48%
Anatomia patologica	188	89	47%
Medicina d'emergenza urgenza	1020	304	30%
Medicina nucleare	93	25	27%
Statistica sanitaria e Biometria	50	13	26%
Medicina e Cure Palliative	170	37	22%
Medicina di comunità e cure primarie	119	25	21%
Radioterapia	170	31	18%
Farmacologia e Tossicologia Clinica	119	20	17%
Patologia Clinica e Biochimica Clinica	309	46	15%
Microbiologia e virologia	117	13	11%
TOTALE DELLE SPECIALIZZAZIONI	15256	11392	75%

Shortage of Specialists in Radiotherapy and Nuclear Medicine

- In Italy, the three specializations in radiodiagnostics, nuclear medicine and radiotherapy follow separate residency
- In recent years, fewer medical doctors have been choosing specialty training in radiotherapy and nuclear medicine
- Respectively in 2024, 82% and 63% of these specialty training are unfilled each year
- Radiodiagnostics maintains a high number of assignments, but the total number of trained doctors is still insufficient to meet national demand for covering all available positions
- An increasing number of specialists are opting to work in the private sector or are migrating abroad

Summarizing...



- The radiation protection system is robust and effective, and is adequately represented in Italian regulations
- The processes of justification, optimization, dose limitation, communication and stakeholder involvement require adequate time
- Reducing the time dedicated to care diminishes quality and increases the risk of radiation-induced harm
- We need to focus on prescribing appropriateness (100% dose savings if not justified)
- In the near future, the shortage of professionals could lead to task shifting, an increased workload, and a decline in the quality of care

Thank you very much for
your attention