

NCRP Activities Related to Radiation Protection in Medicine



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David A. Schauer
Executive Director

Health Care Industry Advisory Council

Identifying the Future: Exploring Trends, Changing Direction

May 4-6, 2010
Savannah, GA

Key Dates in NCRP's History

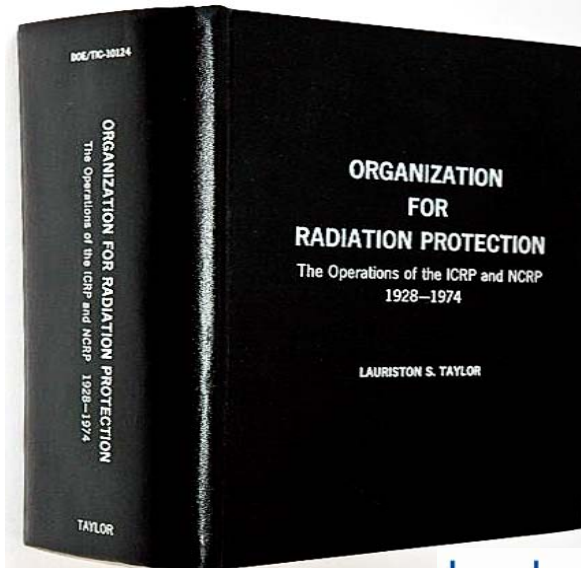
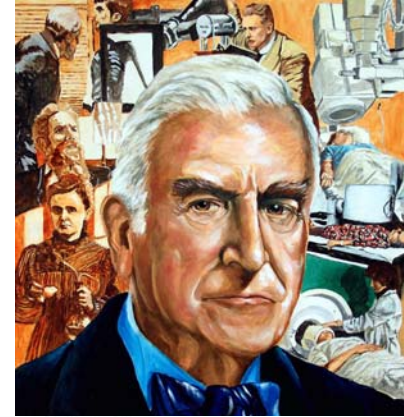


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1929: U.S. Advisory Committee on X-ray and Radium Protection

1946: U.S. National Committee on Radiation Protection

1964: National Council on Radiation Protection and Measurements (NCRP) chartered by U.S. Congress (Public Law 88-376)



Key Elements of NCRP's Charter Under U.S. Public Law 88-376



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- **Cornerstones of role in radiation health protection:**
 - 1) *Collect and analyze* information and recommendations in the public interest about:
 - a) protection against radiation; and
 - b) radiation measurements, quantities and units.
 - 2) *Develop* basic concepts of radiation protection;
 - 3) *Facilitate* effective use of combined resources of organizations concerned with radiation protection; and
 - 4) *Cooperate* with national and international governmental and private organizations; and
 - 5) *Disseminate* the Council's work.

Organizational & Operational Structures



NCRP

Collaborating
Organizations
(>75 including ASRT)

Board of Directors

(13 members including NCRP's President)

- **Approve** topics to be addressed and committee membership

Council

(100 members elected for 6 year terms)

- **Review** reports, commentaries and statements

Special
Liaison
(20 including ICRU)

Program Area Committees

(~12 members serving annual renewable terms)

- **Identify** topics to be addressed and possible funding sources
- **Suggest** committee members
- **Perform** peer reviews of draft reports prior to Council review

PAC4 - Radiation protection in medicine

Scientific Committees

(various sizes and compositions)

- **Draft** reports, commentaries and statements

Radiation Protection Goals: NCRP Report No. 116



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1. prevent the occurrence of clinically significant radiation-induced deterministic effects by adhering to dose limits that are below the apparent threshold levels; and
2. limit the risk of stochastic effects, cancer and genetic effects, to a reasonable level in relation to societal needs, values, benefits gained and economic factors.

Radiation Protection Objectives: NCRP Report No. 116



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1. justify any activity which involves radiation exposure on the basis that the expected benefits to society exceed the overall societal cost (justification);
2. ensure that the total societal detriment from such justifiable activities or practices is maintained ALARA, economic and social factors being taken into account (optimization); and
3. apply individual dose limits to ensure that the procedures of justification and ALARA do not result in individuals or groups of individuals exceeding levels of acceptable risk (limitation).

11th Report on Carcinogens (2004)*

X-Radiation and Gamma Radiation*

Known to be Human Carcinogens



Carcinogenicity

- X-radiation and gamma radiation are *known to be human carcinogens* based on sufficient evidence in humans.
- Epidemiological studies of radiation exposure provide a consistent body of evidence for the carcinogenicity of X-radiation and gamma radiation in humans.
- Exposure to X-radiation and gamma radiation is most strongly associated with leukemia and cancer of the thyroid, breast, and lung; associations have been reported at absorbed doses of less than 0.2 Gy.

**U.S. Department of Health and Human Services
Public Health Service
National Toxicology Program*

Pursuant to Section 301(b) (4) of the Public Health Service Act as Amended by Section 262, PL 95-622

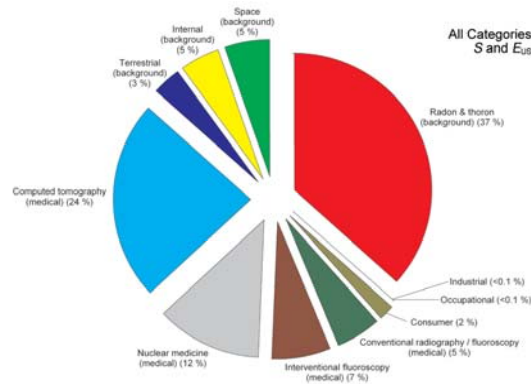
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IONIZING RADIATION EXPOSURE OF THE POPULATION OF THE UNITED STATES

PREPUBLICATION COPY

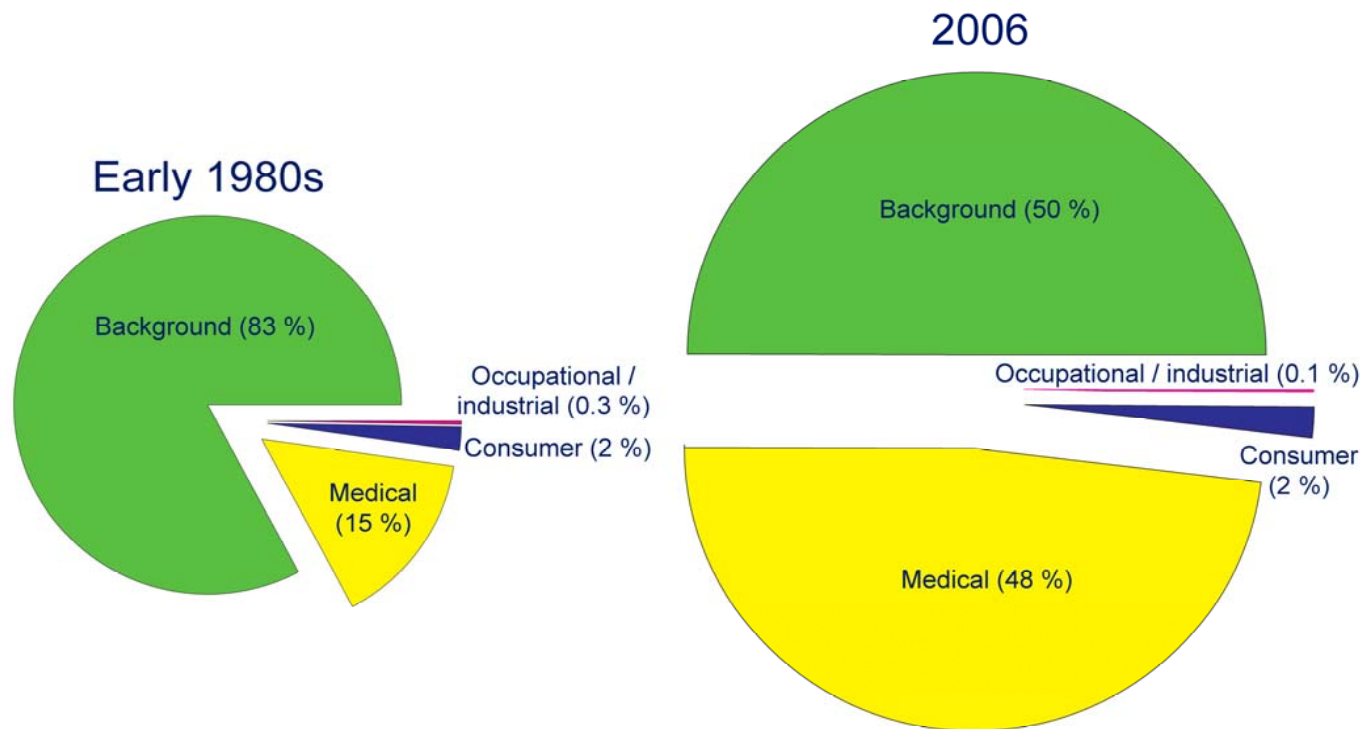
(This Report is undergoing final editing. Revisions due to style, format, or inadvertent errors may occur.)



NCRP Report No. 160, *Ionizing Radiation Exposure of the Population of the United States*



NCRP



	Early 1980s	2006
Collective effective dose (person-Sv)	835,000	1,870,000
Effective dose per individual in the U.S. population (mSv)	3.6	6.2

Radiation Exposure to US Population - Medical Exposures



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	Number of Procedures (millions)	%	Collective Effective Dose (person Sv)	%	E_{US} (mSv)
Computed Tomography	67	17	438,000	49	1.5
Nuclear Medicine	18	5	231,000	26	0.8
Interventional	17	4	128,000	14	0.4
Conventional Radiography & Fluoroscopy	292	74	99,000	11	0.3
TOTALS	426	100	898,000	100	~3

(600 % increase)

Justification of Medical Exposures



- *How* – use of ACR appropriateness criteria, ACC appropriate use criteria or EU referral guidelines;
- Why has this become a significant issue?
 - Self Referral (GAO report, 2008)
 - Defensive Medicine (Massachusetts Medical Society Report, 2008)
 - Lack of appropriate training (credentials) and certification for facilities
 - *Centers for Medicare and Medicaid Services named three national accreditation organizations to accredit suppliers seeking to furnish the technical component of advanced diagnostic imaging services under the Medicare program:
 - American College of Radiology (ACR);
 - Intersocietal Accreditation Commission (IAC); and
 - The Joint Commission (TJC).

NIH

Congress of the United States
Washington, DC 20515

April 16, 2010

The Honorable Gene L. Dodaro
Acting Comptroller General of the United States
U.S. Government Accountability Office
441 G Street, NW
Washington, D.C. 20548

Dear Mr. Dodaro:

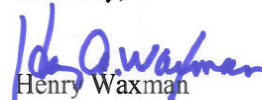
As you know, the physician self-referral law, set forth in section 1877 of the Social Security Act, prohibits physicians from referring Medicare patients for imaging services, radiation therapy services, and certain other designated health services to an entity with which the physician or a member of the physician's immediate family has a financial relationship. However, there are exemptions to the self-referral prohibition. For example, the 'in-office ancillary exemption' allows a physician, under certain conditions, to provide imaging services, radiation therapy services, and some other designated health services in his or her office.

Proponents of the in-office ancillary exemption note that the ability to self-refer may help improve patient access to services and better enable physicians to make rapid diagnoses and initiate treatment. However, there are also concerns that the potential financial incentives associated with self-referral could lead to the overprovision of imaging and radiation oncology services. In fact, studies have suggested that physicians tend to be responsive to these financial incentives and that self-referral may be a contributing factor in the rapid increase of use of these services.

Consequently, we request that GAO conduct a study to evaluate the extent of physician self-referral arrangements for advanced imaging and radiation oncology services provided to Medicare beneficiaries and the effects of such arrangements on Medicare spending. Specifically, the study should focus on (1) prevalence, patterns, and trends in physician self-referral for advanced imaging and radiation oncology services, (2) Medicare spending on these physician self-referred services,

and (3) the extent to which self-referral may have led to increases in the provision of, and Medicare spending for, advanced imaging and radiation oncology services. Thank you for your attention to this important matter. If you have any questions about this request, please contact Tim Gronniger of Committee on Energy and Commerce at (202) 225-5056 and John Barkett with the Committee on Ways and Means at (202) 225-3943.

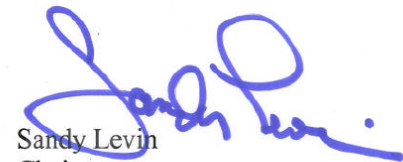
Sincerely,



Henry Waxman
Chairman
Committee on Energy and Commerce



Pete Stark
Chairman
Subcommittee on Health
Committee on Ways and Means



Sandy Levin
Chairman
Committee on Ways and Means

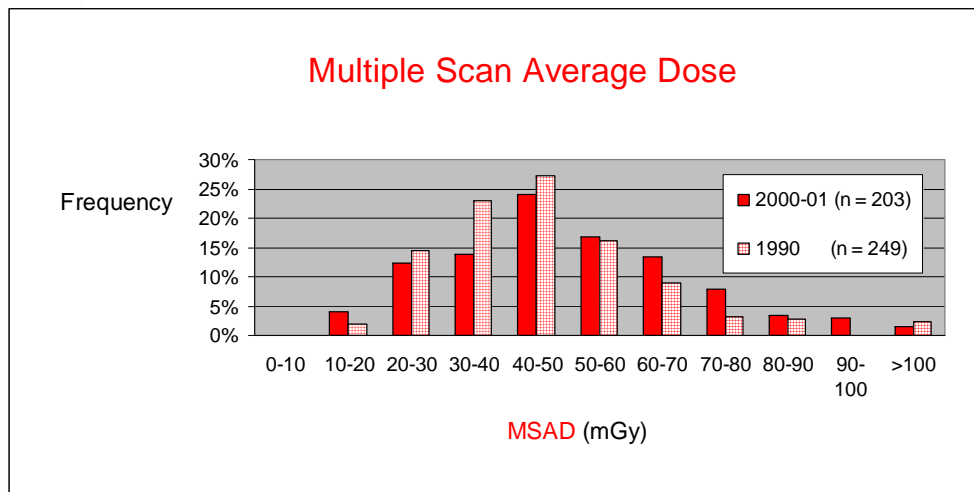
Optimization of Medical Exposures



- “American College of Radiology White Paper on Radiation Dose in Medicine”, *JACR* 4:272.284; (2007)
- Image Gently, Step Lightly and Image Wisely Campaigns
- American Board of Radiology Foundation: Summit 2009, “Medical Imaging: Addressing Overutilization in the Era of Healthcare Reform”
- AAPM CT Dose Summit
- Medical Imaging and Technology Alliance (MITA)
 - CT Dose Check: will provide an alert to CT machine operators when recommended radiation dose levels, as determined by hospitals and imaging centers, will be exceeded.

Optimization of Medical Exposures

- NCRP scientific committee 4-3, “Diagnostic Reference Levels in Medical Imaging: Recommendations for Application in the United States”



	MSAD	
	Survey Year 2000-01 (mGy)	Survey Year 1990 (mGy)
mean	50.3	45.9
standard error of sample mean	1.4	1.1
standard deviation	19.4	18.1
n	203	249

“DRLs may be more necessary, because we may be optimizing image quality, and compromising on high patient doses because technology allows us to.” Moore and Iball, Leeds General Infirmary

Putting it All Together

- *FDA Initiative to Reduce Unnecessary Radiation Exposure from Medical Imaging*



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1. Support informed clinical decision making (justification)
 - develop and adopt appropriate use criteria for CT, fluoroscopy, and nuclear medicine procedures
2. Promote safe use of medical imaging devices (optimization)
 - develop nationally recognized diagnostic reference levels for medical imaging procedures that use radiation
3. Increase patient awareness (communication)
 - provide patients with tools to track their personal medical imaging history

Aim: To help patients get the right imaging exam, at the right time, with the right radiation dose.

2011 Annual Meeting



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- ***Scientific and Policy Challenges of Particle Radiations in Medical Therapy and Space Missions***
(Chairman, Dr. Held, Harvard)
 - March 7-8, 2011 at the Bethesda Hyatt

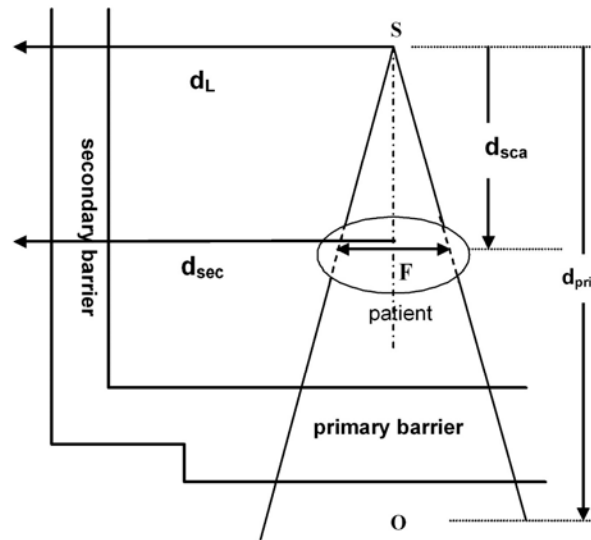


NCRP's Role in Radiation Therapy Report No. 151 (2005)



NCRP

NCRP REPORT No. 151



**STRUCTURAL SHIELDING
DESIGN AND EVALUATION
FOR MEGAVOLTAGE
X- AND GAMMA-RAY
RADIOTHERAPY FACILITIES**

NCRP

National Council on Radiation Protection and Measurements

ICRU Organization of Activities



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Medical
Applications:
Diagnostic
Therapeutic
Non-Ionizing

*Quantities
and
Units*

Non-Medical
Applications:
Protection, Radiation
Processing
Environmental

Basic Data:
Cross Sections
Material
Specification
Radiation
Constants



International Commission on
Radiation Units & Measurements

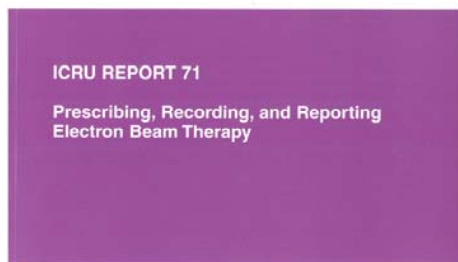
ICRU's Role in Radiation Therapy Report 71 (2004), 78 (2007) & 83 (2010)



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Journal of the ICRU



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INTERNATIONAL COMMISSION ON
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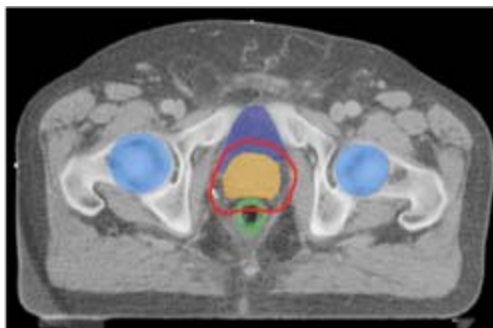
OXFORD JOURNALS



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INTERNATIONAL COMMISSION ON
RADIATION UNITS AND
MEASUREMENTS

**Prescribing, Recording, and Reporting Intensity-Modulated
Photon-Beam Therapy (IMRT) – to be published later this year**



Planning aims

- PTV: median dose (D_{50}) of 74 Gy
near-min dose (D_{95}) of 70 Gy
near-max dose (D_2) of 79 Gy
- PRV rectum: $D_{40} \leq 65$ Gy
 $D_{30} \leq 70$ Gy
 $D_5 \leq 75$ Gy
- PRV bladder: near-max dose (D_2) of 70 Gy
- PRV femoral heads: $D_3 \leq 50$ Gy



International Commission on
Radiation Units & Measurements

NCRP and ICRU Publications – “Disseminate”



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- NCRP and ICRU reports and current activities are described online at
<http://NCRPonline.org>
<http://www.ICRU.org>
- Publications can be purchased online at
<http://NCRPpublications.org>
- Institutional license agreements for NCRP publications are now available through:
 - **Knovel** (<http://www.Knovel.com>)
 - **NetLibrary** (<http://www.NetLibrary.com>)
 - **ebrary** (<http://www.ebrary.com>)



International Commission on
Radiation Units & Measurements