Revised Radiation Protection Guidance for Diagnostic and Interventional X-ray Procedures

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What is Federal Guidance?
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The Federal guidance function is to "...advise the President on radiation matters, directly or indirectly affecting the public, including guidance for all Federal agencies in the formulation of radiation standards..."

- Authority transferred from Federal Radiation Council to EPA Administrator in 1970
- President signs final guidance

EPA has used Federal Guidance to recommend

- New Limits for Uranium Workers (1970*)
- Revised General Standards for Workers (1987)
- Guidance on the Use of Diagnostic X-rays (1978)
Two Kinds of Federal Guidance

Presidential Guidance

- Radiation protection principles and policy recommendations to Federal agencies
- Signed by the President

Technical Reports

- Methodologies and coefficients for radiation dose and risk assessments
- Background information to support Presidential Guidance and standards
### History of Federal Guidance

<table>
<thead>
<tr>
<th>Year</th>
<th>Guidance/Reports</th>
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<tbody>
<tr>
<td>1960</td>
<td>Supplemental FG: KENNEDY 1961 (FRC)</td>
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<tr>
<td>1965</td>
<td>Underground Mining of U Ore: NIXON 1970 (FRC; EPA reviewed)</td>
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<tr>
<td>1975</td>
<td>Guidance on Diagnostic X-rays: CARTER 1978 (EPA)</td>
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<td>1985</td>
<td>Tech. Report 11 ALIs, DACs, &amp; DCFs (current, ICRP 26) 1988 (EPA)</td>
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**Notes:**
- Tech. Reports 1, 2, 5, & 7 Background for Rad. Protection Stds. 1960, 61, 65 (FRC)
- Tech. Reports 3, 4, 6 Fallout Studies 1962, 63, 64 (FRC)
Original Federal Guidance on X-rays

Radiation Protection Guidance for Diagnostic X-rays (FGR 9, Oct 1976)

Interagency Working Group on Medical Radiation

- Subcommittee on Prescription of Exposure to X-rays
  - Eliminate clinically unproductive exams
- Subcommittee on Techniques of Exposure Prevention
  - Examine factors to assure the use of optimal technique
- Considered importance of appropriate and properly functioning equipment
  - Assure Federal equipment consistently meets FDA performance standards
- Both subcommittee reports were published in the FR for public comment

FGR 9 combined both reports and addressed public comments

- Representatives: Army, Navy, Air Force, EPA, VA
- Consultants: NIH, ACR, George Washington University, FDA

Recommendations: 12 recommendations of consensus judgment

- Noted periodic reviews and revisions would be necessary
1976 FGR 9 Goals

Eliminate unnecessary/unproductive exams
  • Supported by NCRP, ICRP, ACR

Produce improved diagnosis with minimal patient exposure
  • Strong training, credentialing, better equipment
1976 Recommendations

DIAGNOSTIC INFORMATION: Conduct medical x-ray studies only to obtain diagnostic information;

REDUCE SCREENING: Limit routine screening examinations to those with demonstrated benefit over risk;

PROTECT FETUS: Consider possible fetal exposures during examinations of pregnant or potentially pregnant patients;

CREDENTIALING: Ensure diagnostic equipment operators meet or exceed the standards of credentialing organizations

EXPOSURE CRITERIA: Specify that standard x-ray examinations should satisfy maximum numerical exposure criteria.

Stood as a guidepost until the advent of digital imaging and higher dose procedures (CT, interventional fluoroscopy); underlying philosophy remains appropriate.
U.S. Exposure 10 Years after FGR 9
(from NCRP Report 94)

- Radon (55%, 2.0 mSv)
- Cosmic (8%)
- Terrestrial (8%)
- Internal (11%)
- Consumer products (3%)
- Occ + other (<1%)
- Nuclear medicine (4%, 0.14 mSv)
- Medical x-rays (11%, 0.39 mSv)
New Guidance for Diagnostic X-rays

Guidance only applies to use of medical/dental x-rays in federal facilities (HHS, VA, DoD)

1976 guidance based on film radiography (film overexposure provided ALARA incentive)

Digital radiography, CT, and interventional fluoroscopy can give sizable doses creating a concern for increased latent cancer risk

Goal is to choose the appropriate imaging procedure and give the dose necessary for proper diagnosis – and no more!
Goals for Revising FGR 9

Address film and digital imaging

Extend scope
  • Radiography, CT, interventional fluoroscopy, bone densitometry, dentistry, veterinary

Address
  • Adequate image
  • Optimization of dose, benefit:risk
  • Newer dose metrics
    • CTDI, DAP, DLP, KAP
  • Hybrid modalities
US Population Radiation Dose (6.2 mSv in 2006)

- Radon and thoron (37%, 2.12 mSv)
- Other background (13%)
- Consumer/occ/ind (2%)
- Nuclear medicine (12%, 0.77 mSv)
- Conv radiog/fluoro (5%, 0.33 mSv)
- Interventional fluoro (7%, 0.43 mSv)
- Computed tomography (24%, 1.47 mSv)
REFERENCE LEVELS: Should be adopted as a non-regulatory approach for promoting good practice

- Allows a facility to compare itself against national average effective dose (or other metric) for common x-ray procedures (Sources can be NEXT data, ACR, NCRP, ICRP…)
- If the mean radiation dose at a facility exceeds the reference level, investigation is appropriate to potentially reduce radiation dose.

CHILDREN: Techniques and imaging protocols for children should be appropriate for their age, size, and weight.

TRAINING: Every person who operates or directs the operation of x-ray imaging equipment should be trained in the safe use of the equipment.
New DRAFT Recommendations
(under development)

TRAINING: Additional training is required for operators of fluoroscopy equipment where skin dose may exceed 2 Gy.

DOSE REDUCTION TECHNOLOGY: When purchasing x-ray imaging equipment, the additional cost of including dose-reduction technology is justified.

RECORD DOSE: Patient radiation dose data should be recorded in the patient’s medical record.

INFORMED CONSENT: Informed consent and appropriate documentation shall be obtained prior to the initiation of any procedure that is likely to expose the patient to any significant risks and potential complications.