

# Fluoroscopy:

## Regulation and Radiation Protection



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# Fluoroscopy: Regulation and Radiation Protection

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*Fluoroscopy is used in a variety of different settings, including operating rooms, interventional departments, cardiac catheterization suites, pain management clinics and orthopedic centers. Fluoroscopic procedures can expose patients and personnel to high levels of radiation, an area of public and regulatory concern. Radiologic technologists, radiologist assistants and other professionals operating fluoroscopic units or assisting in fluoroscopic procedures are legally and ethically responsible for operating equipment safely and taking proper radiation protection measures. One way of fulfilling this responsibility is to understand the federal and state regulations regarding fluoroscopy and to be conscious of public awareness initiatives concerning radiation exposure during medical imaging procedures.*

## After completing this article, readers should be able to:

- Describe international advisory groups that have studied and created radiation protection standards.
- Summarize the function of the various federal and state agencies that standardize radiation protection practices.
- Discuss the federal laws and regulations that govern fluoroscopy and radiation protection of patients and personnel.
- Explain the significance of the CARE (Consistency, Accuracy, Responsibility and Excellence in Medical Imaging and Radiation Therapy) bill in relation to radiation safety practices.
- Describe various radiation dose reduction practices in fluoroscopy.
- Discuss the regulation and education of fluoroscopy operators.
- Discuss various radiation safety awareness campaigns and their audiences.

International, federal and state agencies have been involved in establishing radiation protection practices since the early 1900s.<sup>1</sup> Over time, excessive radiation from appliances such as televisions and microwave ovens has become a thing of the past, and regulatory agencies have turned their focus on equipment that produces ionizing radiation and reducing the radiation dose from that equipment.<sup>1</sup> The United States works in conjunction with numerous international organizations to protect the public and radiation workers from the effects of ionizing radiation.<sup>2-5</sup> Statutory rules have been established for nuclear power plants, radionuclide management, the manufacture of electronic products and the handling of nuclear contamination.<sup>2,6</sup> With respect to medical imaging equipment, design standards have been established at the national level, but medical imaging personnel are licensed primarily by the individual

states.<sup>4,7,8</sup> Today, medical imaging equipment is capable of emitting higher levels of radiation for longer periods of time and is used by a variety of practitioners on more patients for different types of procedures.<sup>1</sup> For the most part, fluoroscopy operators can be assured that their equipment meets federal and state regulations if there is an inspection sticker on the radiographic unit. Medical imaging personnel who operate fluoroscopy units are ethically and legally responsible for using equipment safely and for minimizing radiation exposure. In addition, fluoroscopy operators and other staff involved in fluoroscopic procedures should be qualified under the national and state regulations.

## Organizations and Agencies

Congressional acts or state mandates have established radiation exposure limits and equipment specifications based on international recommendations,<sup>7,9-11</sup> and

federal and state agencies are responsible for enforcing those regulations and standards established by law.<sup>9</sup> Because numerous international and national agencies have played a role in developing radiation protection guidelines and recommendations, the vast amount of documents and regulations can be overwhelming to read and understand.<sup>9</sup> In addition, the various advisory groups and regulatory agencies usually are referred to by an array of abbreviations and acronyms. However, to adequately understand radiation protection and safety, imaging professionals must be familiar with various agencies and organizations and be aware of recent concerns regarding radiation exposure. Increased use of fluoroscopy-guided procedures — and the resulting radiation dose — is an example of current national concern.<sup>1</sup>

### International Organizations

International advisory groups that have studied and created radiation protection standards include the:

- International Commission on Radiological Protection (ICRP).
- International Commission on Radiation Units and Measurements (ICRU).
- United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR).
- World Health Organization (WHO).
- International Atomic Energy Agency (IAEA).<sup>2,9-11</sup>

The International Commission on Radiological Protection (ICRP) is considered the international authority regarding the safe use of ionizing radiation.<sup>9</sup> The ICRP is an independent registered group that provides recommendations and guidance on all aspects of ionizing radiation protection.<sup>3</sup> Functioning as an advisory body, it consists of a main commission and 4 standing committees. The committees focus on radiation effects, radiation exposure, radiation protection in medicine and the application of ICRP recommendations.<sup>3,9</sup>

The ICRP has published reports since 1928, and in 1959 the committee began to develop its own series of publications. From 1977 onward, the commission published *Annals of the ICRP*, which contains information about ICRP activities.<sup>9</sup> Although the ICRP has no formal enforcement power, most countries adhere closely to ICRP recommendations when developing and enforcing their own regulations.<sup>3</sup> Two ICRP reports, Publication 26 (1977) and Publication 60 (1990) provide the basis for

regulations and recommendations not only in the United States and Canada but also in other countries.<sup>11</sup>

Established in 1925, the International Commission on Radiation Units and Measurements (ICRU) ensures consistent reporting of data and information on radiation risks and protection. The ICRU primarily deals with radiation quantities, units and measurement techniques, and is responsible for the development of radiation units such as the sievert, gray and roentgen per kilogram.<sup>11</sup>

The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) provides information to the ICRP for evaluation. UNSCEAR develops radiation risk assessments from epidemiological data and research, and issues reports concerning the risks associated with radiation.<sup>9,11</sup>

The World Health Organization (WHO) is a specialized agency of the United Nations. WHO acts as a coordinating authority for health concerns within the United Nations system, providing leadership on global health issues.<sup>12</sup>

The International Atomic Energy Agency (IAEA) is an international organization that seeks to promote the peaceful use of nuclear energy and to inhibit its use for military purposes.<sup>13</sup>

### Federal Organizations

In the United States, a number of organizations function as advisory groups or regulatory agencies for radiation protection standards, including the:

- Nuclear Regulatory Commission (NRC).
- National Council on Radiation Protection and Measurements (NCRP).
- U.S. Food and Drug Administration (FDA).
- Environmental Protection Agency (EPA).
- Occupational Safety and Health Administration (OSHA).
- National Research Council, Committee on the Biological Effects of Ionizing Radiation (NRC-BEIR).
- National Institutes of Health (NIH).<sup>9-11</sup>

The ICRP and NCRP recommend effective dose limits for radiation workers based on reports from UNSCEAR and NRC-BEIR.<sup>9,11</sup> Legal dose limits have been set for the radiation dose received per year or accumulated over a working lifetime by occupationally exposed individuals. There are no dose limits for medical exposure of patients.<sup>11</sup>