



POSITION STATEMENT

Radiation Safety in the Endoscopy Setting

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Definition of Terms

ALARA is an acronym that stands for "As Low As Reasonably Achievable," which refers to the principle/goal of keeping radiation exposure to a minimum (Bushlong, 2004; Statkiewicz-Sherer, Visconti, & Ritenour, 2006).

Associate refers to assistive personnel such as technicians, technologists, and assistants.

Brachytherapy is the use of an encapsulated source to deliver gamma or beta radiation (Wooton, 1993). Endobronchial brachytherapy is a palliative treatment used for individuals with lung cancer (Rector, Knapp, & Brant, 1993).

Collimating refers to the act of decreasing the size of x-ray beam, which minimizes the volume of tissue irradiated in the patient and reduces scattered radiation (National Council on Radiation Protection Measurements [NCRPM], 2000b).

Deep Dose refers to the penetrating dose equivalent from all types of radiation at a depth of 1000mg/cm squared in soft tissue—the absorbed dose equivalent to the whole body (Statkiewicz-Sherer et al., 2006).

Dose Limits Annual radiation dose limits are as follows (Bushlong, 2004; Jankowski, 1992; NCRPM, 2000b):

Whole Body, Deep Dose	5 rem, 5,000 mrem or 50 mSv
Shallow Dose	50 rem, 50,000 mrem or 500mSv
Eye Dose	1.5 rem, 1,500 mrem or 15 mSv
Pregnancy Dose	0.5 rem, 500 mrem or 5 mSv throughout gestation or 0.05 rem, 50 mrem or 0.5 mSv per month once the pregnancy is known

Eye Dose refers to the dose equivalent to the lens of the eye from all radiation sources. Dose to the lens of the eye is based on the film badge worn closest to the head area (on thyroid shield).

Film Badge is an assembly containing a packet of unexposed photographic film and filters. When the film is developed, the dose and type of radiation exposure can be estimated (Bushlong, 2004; Phillips, 2004).

Film Dosimeter is a radiation dose-measuring device.

Millirem (mrem) refers to a unit of radiation equivalent to 1/1,000 of a rem (Statkiewicz-Sherer et al., 2006) or 0.01mSv for the System International units (Brown, 1999).

Nurse refers to registered nurse, licensed practical nurse, or licensed vocational nurse.

Radiology refers to the branch of medicine which uses X-rays, radioactive substances, and ionizing radiation for diagnosis and treatment. This position statement specifically addresses the role of the gastroenterology nurse and associate during radiography (X-ray) and fluoroscopic procedures.

Radiation Safety Officer is an individual with extensive training and education in areas such as radiation protection, radiation physics, radiation biology, instrumentation, dosimetry, and shielding design (NCRPM, 2000b).

REM refers to the traditional unit of absorbed dose equivalent to humans (NCRPM, 2000b), now expressed as Sievert (SV) for the system international units.

1 SV=100 rem or 1 rem= 10 mSv (Bushlong, 2004).

Shallow Dose is a dose equivalent from all types of radiation at a depth of 7mg/cm squared in soft tissue; the dose to the skin of the whole body (Statkiewicz-Sherer et al., 2006).

Thermoluminescent dosimeter (TLD) is a monitoring device that uses a special crystalline material as a sensing medium in place of film (Association of periOperative Registered Nurses [AORN], 2005).

Background

Care of the patient undergoing an endoscopic procedure continues to become more complex as technology advances. Radiographic equipment is often utilized during endoscopic procedures. These procedures are performed in a variety of inpatient and outpatient settings with or without the presence of a radiologist or radiology technician. Radiation is a hazard. It can modify molecules within body cells, causing cell dysfunction, alteration or halt in cell replication, or cell destruction (SGNA, 2003; Statkiewicz-Scherer et al., 2006).

Due to its potential damaging effects, the amount of radiation exposure to patients and staff should be minimized. Radiation safety in the practice setting is a responsibility shared by the department of radiology, the department of radiation safety/health physics, and endoscopy personnel.

Position

The Society of Gastroenterology Nurses and Associates, Inc. supports the position that the nurse and/or associate responsible for the setup and operation of all radiographic equipment must be educated in the technical aspects of radiology as well as equipment maintenance and safety controls. The person responsible for the intra-procedural operation of the radiographic equipment must not be the registered nurse responsible for monitoring the patient receiving sedation and analgesia.

Additionally, this document exists to define the qualifications and competencies necessary to provide direction for staff in the endoscopy settings in the development of radiation safety policies and procedures.

The practice of radiation safety is defined and regulated by federal, state, and local agencies. Specific written policies and procedures for the safe use of radiographic equipment must be available to all gastroenterology personnel. Radiation policies and procedures should be written, reviewed annually, and accessible to all endoscopy personnel. The nurse and/or associate present during the

exposure must be provided with appropriate protective and monitoring devices (i.e. thyroid shields, gloves, aprons, eye shields, and monitoring badges). The pregnant nurse or associate must follow institutional policy. The patient should be protected by controlling the length of exposure and covering body areas. Designated areas where radiographic equipment is in use should be clearly identified.

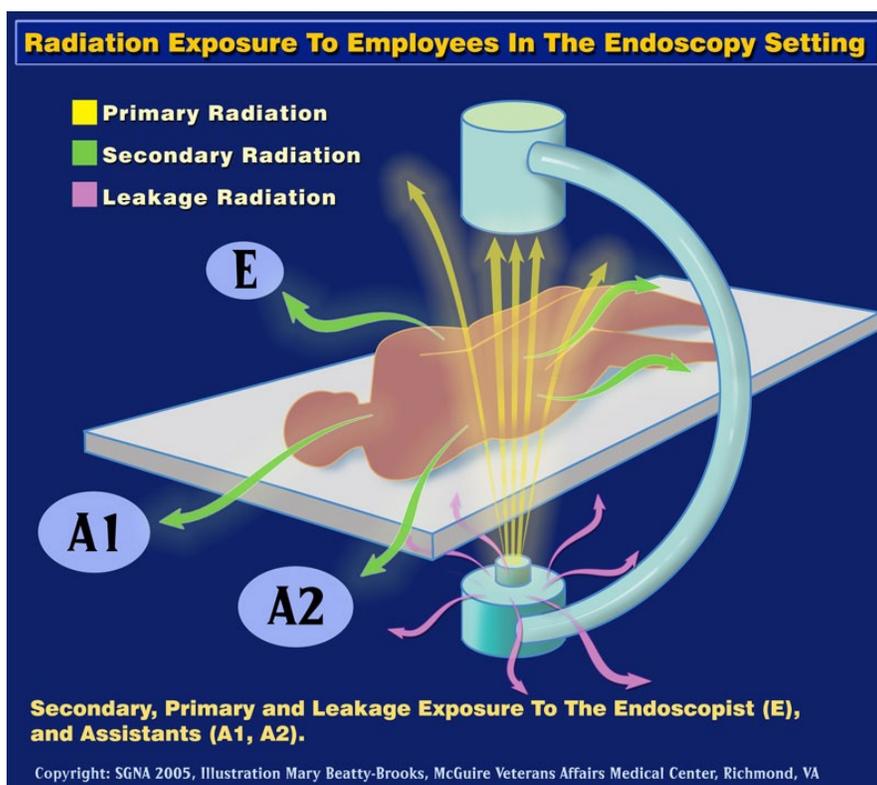
In addition to following these guidelines, SGNA also recommends that each practice setting maintain and implement a quality monitoring plan.

General Principles

Radiation source in the endoscopy setting

The function of the x-ray imaging system is to provide a control flow of electrons intensive enough to produce an x-ray beam appropriate for imaging (Bushlong, 2004). There are three types of radiation exposure within the room: primary, secondary, and leakage.

1. **Primary** - The incident beam is the primary radiation source of radiation exposure for the patient. The primary radiation beam produced is focused and directed through the area to be examined.
2. **Secondary** - The personnel in the room are exposed to secondary radiation or scatter radiation (Campbell et al., 2002; Johlin et al., 2002). This is the major source of radiation to the endoscopist and staff.
3. **Leakage** - Radiation from the radiographic machine itself (Campbell et al., 2002).



I. Minimizing Radiation Exposure

Exposure to radiation should be as low as reasonably achievable (ALARA). Endoscopy personnel can limit occupational exposure to radiation by using the principles based on distance, time, and shielding.

- A. Distance self as much as possible from radiation source (Campbell, Sparrow, Fortier, & Ponich, 2002; NCRPM, 2000a & b; Shymko & Shymko, 1998; Statkiewicz-Sherer et al., 2006).
- B. Limit the amount of radiation exposure by minimizing the amount of time in the exam room and the amount of time radiation is used for imaging (Campbell et al., 2002; Statkiewicz-Sherer et al., 2006).
- C. Rotate staff assigned to procedures requiring fluoroscopy (Statkiewicz-Sherer et al., 2006).
- D. Face the unit that is emitting radiation (if using a single sided apron) and use protective shielding devices such as the following (Statkiewicz-Sherer et al., 2006):
 1. Lead apron (Note: A wrap-around apron should be available for use when duties require staff members to turn away from the radiation source, exposing their backs.)
 2. Thyroid shield
 3. Lead glasses
 4. Radioprotective gloves
 5. Shield over head of table
- E. Maintain shielding devices to prevent and detect damage that could diminish their effectiveness (Shymko & Shymko, 1998).
 1. Vertically hang leaded protective devices to prevent cracks.
 2. Annually test leaded protective devices radiographically.
 3. Clean aprons and shields according to manufacturer's recommendations.
- F. A protective or sliding leaded panel placed on three sides of the x-ray carriage will reduce radiation scatter to the personnel standing to the side, head, or foot of the fluoroscopy table (Chen, Van Swearingen, Mitchell, & Ott, 1996; Statkiewicz-Sherer et al., 2006).
- G. Standardized "X-ray On" radiation warning signs placed outside of the fluoro room warn personnel of the potential for radiation exposure (Shymko, 1998; Wooton, 1993).
- H. A pulse mode rather than continuous imaging will reduce radiation exposure by half (Uradomo, Goldberg, & Darwin, 2006; Wooton, 1993).
- I. A programmable audible alarm system preset to sound at fixed intervals alerts the team of fluoroscopic time elapsed (Campbell et al., 2002).
- J. Limit the amount of boost fluoroscopy (i.e., high dose for heavier, dense bodies) being used by personnel.
- K. Potential differences exist in radiation exposure levels to personnel based on the type of radiographic equipment utilized (Johlin, Pelshing, & Greenleaf, 2002).

II. Monitoring Radiation Exposure

- A. A monitoring device (film badge or TLD) should be worn by personnel during endoscopy cases requiring fluoroscopy. The device should be worn outside the protective apparel at the neckline (Phillips, 2004; Shymko & Shymko, 1998).
- B. When two monitoring devices are used, one should be worn at the neckline outside the leaded apron to monitor exposure to the head, neck, and eyes; the other under protective apparel at waist level (Statkiewicz-Sherer et al., 2006).
- C. The monitoring device should be stored in a radioactive protective container or in the endoscopy area in a place that reduces exposure to matter (e.g., heat) that may alter the readings (Shymko & Shymko, 1998).
- D. Submit monitoring devices for monthly readings, maintain permanent records, and communicate unusual results as per institutional policy.
- E. The radiation time used for each endoscopy procedure can be obtained from the radiology technologist and documented according to the institution's policy and procedure (Orders & Wright, 2003).

III. Radioactive Material Management

- A. Sealed radiation sources used for brachytherapy should be accounted for before, during, and after each use (Wooton, 1993).
- B. There must be a source storeroom in which the radiation source is kept when not in use (Balter, 2001; Wooton, 1993).
- C. Minimize personnel exposure by using distance, time, and shielding (Wooton, 1993).
- D. The telephone number of the institution's radiation protection officer should be posted and readily available wherever radiation or radioactive materials are used.

IV. Special Precautions

- A. An endoscopy staff member who is pregnant, or suspects pregnancy, should follow departmental policy. If no policy exists, one should be developed by the endoscopy unit in conjunction with the radiology department and the radiation safety officer for the institution (Jankowski, 1992).
- B. The National Council on Radiation Protection and Measurements (2000) recommends that the total deep exposure during pregnancy may not exceed 500 millirem and also 50 mrem/mo. once the pregnancy is known (Jankowski, 1992; Stastkiewicz- Sherer et al., 2006).
- C. Document known pregnancy status of the patient at the time of procedure and follow institutional policies.
- D. Expose only the area of study to fluoroscopy.
- E. Limit the size of the fluoroscopic field by collimating the x-ray beam (Campbell et al., 2002; NCRPM, 2000b).
- F. Use patient gonadal shielding as appropriate (SGNA, 2003).

V. Written Policies and Procedures

- A. Policies and procedures should be developed collaboratively and approved by the radiation safety officer and/or institution's radiation safety committee.
- B. Policies and procedures should include the following:
 1. A statement indicating the need for protection for pregnant personnel.
 2. Identification of measures for protecting patients and personnel from unnecessary exposure to radiation.
 3. Identification of the person(s) responsible and accountable for radiation safety (endoscopy staff and the radiation safety officer).
 4. A schedule for cleaning and radiographic testing of lead protective devices (Shymko & Shymko, 1998).
 5. Identification of the method of procurement, storage, control, distribution and monitoring of radiographic contrast media (Joint Commission on Accreditation of Healthcare Organizations [JCAHO], 2007).
- C. Radiation safety policies and procedures should be included in the orientation and ongoing education of personnel in the endoscopy setting (Jankowski, 2002; NCRPM, 2000a).
- D. Personnel should be provided with information concerning possible health risks from radiation exposure (OSHA, 2007).
- E. Radiation exposure reports are important legal records and should be kept a minimum of 50 years (Wooton, 1993).

VI. Quality Improvement (QI)

The radiation safety officer should act as an advisor in the design and implementation of a QI program as it applies to equipment and technique (JCAHO, 2007).

Summary

In summary, it is imperative that the nurse and/or associate responsible for the setup and operation

of all radiographic equipment be educated in the technical aspects of radiology as well as equipment maintenance and safety controls. Due to radiation's potentially hazardous effects, institutional policies regarding radiation use and safety must be followed.

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