South Carolina
State Reorganization Commission

THE SUNRISE REVIEW PROCESS

Review of Occupational Registration and Licensing For Radiologic Technologists

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EXECUTIVE SUMMARY

"Radiologic technologists" are allied health professionals who assist physicians and others in the application of x-rays and other forms of radiation for medical diagnostic and therapeutic purposes. This report examines the potential impact of regulation of this occupation by the State of South Carolina. Occupations seeking regulation in South Carolina must be reviewed according to criteria established in Act 572 of 1988, "Review of Occupational Registration and Licensing" or the "Sunrise Law." The nine Sunrise Review criteria are designed to determine, in this instance, the extent to which the public has been or could be harmed as a result of the unregulated practice of radiologic technologists, and whether the benefits of regulation of the profession by the State outweigh the potential negative effects such intervention may have, such as limiting the public's access to health care services that are affordable and available in sufficient quantity.

The focus of this particular Sunrise Review are the provisions of the proposed "Medical Radiation Health and Safety Act."[1] If enacted, the legislation would establish a seven-member "South Carolina Radiologic Technologists Board of Examiners," to license radiologic technologists who meet specific educational, examination, and experience requirements. The board would be comprised of four radiologic technologists, one public member, a medical radiation physicist, and a physician, serving three-year terms to exam applicants, issue licenses, establish standards for licensees and educational programs, and to investigate complaints and impose sanctions on licensees. The measure would establish four distinct categories of licensure under the general term of "radiologic technologist" : radiographer, nuclear medicine technologist, radiation therapist, and temporary licensure. The bill would prohibit any person, other than licensees, physicians, podiatrists, dentists, chiropractors, or osteopaths, from using ionizing radiation on humans for diagnostic or therapeutic purposes; prohibit persons from employing unlicensed individuals to apply ionizing radiation; and require licensees to apply ionizing radiation only upon the prescription of a licensed practitioner.

After analyzing testimony from interested parties, along with evidence gathered by staff research throughout the process, the State Reorganization Commission applied the nine Sunrise Review criteria to the proposed regulation, and arrived at the following conclusions:

The incompetent or improper practice of unregulated radiologic technologists poses a clear and recognizable danger to the public, and could result in serious harm to patients. (Criterion 1, page 12).

State laws regulating professions and occupations are designed to protect the public from harm that could be caused by incompetent practice. Some of the ways in which unregulated professionals may pose a threat to the public are by: (1) using

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[1] The text of the bill is contained in the Appendix of this report.

devices and substances that are dangerous; (2) lacking proper qualifications to practice; (3) performing functions that are inherently risky or dangerous; or, (4) performing such tasks in situations requiring a large degree of unsupervised, independent judgment. The State Reorganization Commission evaluated the potential for public harm occurring as a result of incompetent radiologic technology practice in each of these areas. The Commission also searched for evidence of actual instances where South Carolinians have been harmed as a result of the unregulated practice of radiologic technologists.

The Commission discovered that radiologic technologists are primarily responsible for delivering 90% of the annual dose of man-made radiation to humans. If radiologic technologists do not properly perform their assigned tasks, it results in unnecessary exposure to excess radiation, poor quality images that could lead to missed diagnoses, improper administration of contrast media, or overdoses of prescribed radiation amounts. While the Commission did not find instances of acute harm to consumers in South Carolina, there is evidence to suggest that patients are being unnecessarily overexposed to medical radiation by poorly trained radiologic personnel, a condition whose health effects may not be evident for years. The effects of exposure to excessive levels of ionizing radiation include cancer; genetic or heritable changes in future generations; developmental changes in fetuses exposed to radiation during gestation; and degenerative changes, such as impairment of fertility, or altered immune responses.

In addition, the Commission found evidence in other states of radiologic technologists being found guilty of misconduct while practicing as a radiologic technologist.

Patients and employers cannot easily determine whether radiologic personnel are competent and suitable practitioners prior to engaging their services. (Criterion 2, page 18)

A state-issued credential would help the public and employers more easily identify competent and suitable radiologic technologists. While consumers do not employ the services of a radiologic technologist directly, in the event that a physician or hospital employs an incompetent radiologic technologist, the Commission determined that the majority of outcomes of poor performance could be irreversible or directly life-threatening, particularly in radiation therapy or nuclear medicine. In addition, while employers could be reasonably expected to employ a radiologic technologist who will not expose the patient to the risks and liability associated with harmful effects, regulation would provide employers and patients with added assurance that radiologic personnel have achieved a certain level of competence. Regulation would also provide a means of disciplining or removing from practice unsuitable practitioners, and from discouraging practitioners who have lost their privileges in another state from relocating and applying for employment in South Carolina.

The Commission concluded that there exists a low degree of consumer sophistication in regard to judging the quality of services that have been, or will be, rendered by radiologic technologists in South Carolina. The damaging effects of the radiologic technologist's errors are not always immediately visible. Medical radiation

is applied by persons with a confusing array of titles: "x-ray technician," "radiologic assistant," "radiation technician," "medical assistant," and more. Many patients assume that radiologic technologists are already state-licensed, since there is no way for a patient to easily determine the extent of the technologist's training. While the machines used by radiologic technologists are regulated, there is no visible indication on the machine to inform a consumer of when it was last inspected by the Department of Health and Environmental Control. The Commission determined that the provision in the proposed legislation requiring radiologic technologists to display their state-issued credential prominently in their place of employment would benefit the public. A system of title protection, while not a provision of the existing bill, would further benefit the public by standardizing and clarifying titles associated with various radiologic personnel.

While a system of voluntary certification exists for some categories of radiologic personnel, the public cannot rely on the existing credentialing system alone to identify qualified radiologic technologists. (Criterion 3, page 21)

Although it certifies and disciplines radiologic technologists, the American Registry of Radiologic Technologists is a private, non-governmental body, and does not have the authority to prevent radiologic technologists from practicing in South Carolina, nor can it regulate the scope of practice of radiologic technology. While hospitals employ an overwhelming number of ARRT-certified radiologic technologists, the State Reorganization Commission determined that, in other healthcare settings, certified radiologic technologists account for less than one-fifth of the persons performing x-ray examinations. In addition, there is no voluntary x-ray certification program available for many of the persons who are performing limited-scope x-ray examinations in physician's offices across the state, and do not possess the qualifications required for ARRT certification.

While current laws and regulations provide some measure of protection against the harmful effects of unnecessary medical radiation, the likelihood of public harm could be further decreased by strengthening state regulation to include a more effective system for assessing the training and competency of radiologic technologists. (Criterion 4, page 24)

Existing regulations promulgated by the Department of Health and Environmental Control (DHEC) to govern the possession and use of x-ray equipment, acknowledge the potential harm inherent in using untrained persons to perform x-ray examinations, by requiring that a registrant "assure that all x-ray machines under his control are operated only by individuals adequately instructed in safe operating procedures and competent in the safe use of the equipment." However, DHEC's inspection system is primarily directed at registrants' compliance with regulations governing the possession, installation, calibration, and use of x-ray equipment, and only incidentally with monitoring operator qualifications. Compliance with training requirements is but one component of the regulatory program, and inspections are an unsuitable means for judging the competency of all radiologic personnel. DHEC is not required to, and does not, maintain a central registry of approved operators, so there is no way of tracking individual machine operators. Many of the listed operators may never be asked to

demonstrate machines during an inspection. As a result, the public may be exposed to untrained, unqualified, and potentially harmful practitioners.

Regulation of radiologic technologists, if it incorporates a system of limited licensure and exemptions for certain licensed professionals, should not adversely affect the supply, or the cost, of radiologic technologists' services. (Criteria 6 and 7, page 31)

Some restrictions on the supply of radiologic technologists are already in place through existing regulation and hiring practices, particularly in hospitals. Consequently, the radiation therapists and nuclear medicine technologists currently employed would most likely meet the qualifications outlined in the proposed regulation. However, under the provisions outlined in the proposed regulation, approximately 47% of personnel now engaged in performing limited scope diagnostic x-rays may be prohibited from practicing. Such provisions would most likely result in increased costs for services, by forcing licensed practitioners to add or substitute a graduate of a minimum 24 month course of study in radiography for current practitioners. However, this adverse impact could be significantly lessened if certain licensed professionals were exempted from regulation; and a system of limited licensure were included in any proposed legislation.

Because of the low volume or limited scope of x-ray examinations performed by operators who do not possess the qualifications to be licensed as radiologic technologists, and perform x-rays as an ancillary duty, a limited license would alleviate any potential shortage, a particular concern in rural areas of the State. Estimates included in a 1985 study of radiographer credentialing found that radiographers perform one in four of the diagnostic x-ray procedures in private offices and clinics and a little more than one in three in other facilities. Overall, about 16 percent of the diagnostic x-ray procedures are performed by these operators. Limited licenses are issued by nineteen of the states that regulate this profession. A limited license would authorize a person to conduct diagnostic radiology examinations limited to the performance of specific procedures or applications of ionizing radiation to specific parts of the body. For example, chest x-rays are a common procedure in many physicians' offices. Podiatrists require x-rays of the feet and ankles; chiropractors' offices take x-rays of the skull and spine. Incorporating a system of limited licensure into the bill would not require a physician to employ a radiologic technologist, but would establish training, competency, and testing standards for these operators.

The Board would have no direct control over the prices charged by radiologic technologists. However, Board regulations would impose costs on radiologic technologists such as initial licensing, examination, and renewal fees. If continuing education requirements were promulgated as a requirement for renewal of licenses, this would also impose additional costs. These costs may be passed on to the consumer, but it appears unlikely that the proposed regulation alone will significantly increase the costs of radiologic services. Many of these costs are already associated with existing regulations and hiring practices which rely upon the system of private certification available through the American Registry of Radiologic Technology, so the impact on costs will not come from regulation alone. If regulation results in the increased quality of x-ray work, it may, over time, have the potential to reduce the cost of services because

time, personnel, and equipment will be used more efficiently, such as in avoiding the need for repeating diagnostic x-ray exams.

The establishment of a board to regulate radiologic technologists within the existing Department of Labor, Licensing and Regulation would have a positive effect on the competency of these practitioners. (Criteria 8 and 9, page 40)

Regulation will not impact the State's General Fund, and would help to protect the public by assuring that each person serving as a radiologic technologist in South Carolina has met the minimum standards of an approved training program. Regulation would provide a means of determining an applicant's competency to enter, or continue, the practice of radiologic technology. In addition to maintaining a central registry of all approved radiologic technologists, a board would have the power to investigate complaints against licensees, and could discipline licensees for misconduct, in some cases removing them from practice for unethical or unprofessional conduct. Placement of the board within the Department of Labor, Licensing, and Regulation, which administers the State's other health-related professional licensing boards, would assure the coordination of the Board's duties with those of similar agencies.

Therefore, in accordance with the provisions of the Sunrise Law, the State Reorganization Commission recommends that the General Assembly enact legislation to license radiologic technologists in South Carolina. (Recommendations, page 47)

State licensure of radiologic technologists will allow the administration of ionizing radiation to humans for diagnostic or therapeutic purposes, only by persons licensed or exempted under statutory requirements. In imposing licensure on a profession, the State will grant permission to persons meeting predetermined qualifications, and passing a examination to demonstrate competency, to have the exclusive use of an occupational title **and** the exclusive right to engage in an occupation to the exclusion of unlicensed persons.

Under the provisions of the Sunrise Act, the State Reorganization Commission must recommend licensure only if the other means of regulation listed in the Sunrise Act are inadequate to protect the public. Existing regulations of the Department of Health and Environmental Control governing the inspection of facilities and practitioners using sources of ionizing radiation indirectly regulate radiologic technologists, and contain elements that resemble components of a licensure program. However, the Commission has determined that the current regulatory structure was not intended to, nor does it, provide assurance of radiologic technologists' competency to the extent that licensure would. Degrees of regulation contained in the Sunrise Act that are less stringent than licensure would reduce or eliminate existing protective measures, such as in the case of existing mandatory certification requirements for mammographers. Therefore, the State Reorganization Commission has determined that state licensure of radiologic technologists is the only form of regulation that offers the following elements necessary to ensure the protection of the public from the hazards of incompetent or unqualified practice of radiologic technology:

• *Clear, Consistent Standards for Radiologic Technologist Education Programs.* A board should be assigned responsibility for the development of minimum standards for radiologic technologist education programs in each category of licensure; approval of programs that meet the prescribed standards; and denial or withdrawal of approval of education programs that fail to meet the prescribed standards. Minimum standards for "on-the-job" training and shorter-term training for limited licensees should also be adopted.

• *Independent Verification of Practitioner Competency Through Use of Valid Testing.* All licensees should have demonstrated their knowledge and competency in radiologic technology by passing a valid and reliable examination. The Board should develop or adopt examination standards, and exam candidates. Examination results of other states or recognized credentialing organizations should be accepted, provided the examinations meet or exceed the standards established by the Board.

• *Central Registry of Qualified Radiologic Technologists.* Under existing conditions, the absence of a central listing of radiologic technologists makes it difficult to verify the number, location, and training of practitioners. Licensure of radiologic technologists will not only provide consumers and employers with information on qualified practitioners, but also has the potential to improve tracking of the occupational radiation exposure of practitioners, and to provide reliable statistical information on practitioners that can be used in health manpower projections and planning.

• *Consistent Nomenclature for Radiologic Technologists.* Since only those who meet the qualifications may legally use designated titles and initials, licensure will assist the public in identifying competent radiologic technology practitioners. The Board should be authorized to prescribe appropriate titles for use by licensees and to limit the use of such titles.

• *Disciplinary Sanctions Against Incompetent or Unsafe Practitioners.* Licensure of radiologic technologists will protect by public by providing a means for disciplining or removing persons from practicing who pose a threat to public health or safety. The Commission recommends that the proposed legislation be amended to expand the grounds for disciplinary action to include the incompetent or negligent practice of radiologic technology, failure to observe radiation safety principles, and the use of titles by unauthorized persons.

To ensure the protection of the public's health and safety, the Commission recommends enactment of a multi-level system of licensure that classifies radiologic technologists within the following four categories, according to their professional training and competence: radiographer, limited-practice radiographer, nuclear medicine technologist, and radiation therapist. Previous legislative proposals to regulate radiologic technologists would have required successful completion of a minimum 24-month course of study in each category of licensure, regardless of the range of duties performed by the radiologic technologist. Instead, the Commission recommends that educational

requirements for licensure should recognize the varying types and length of training that are commensurate with the ability to competently perform the range of duties within each category of licensure. For example, requiring the same length of training for a limited-practice radiographer, who only performs x-rays of the chest and extremities, and a nuclear medicine technologist is unnecessary and impractical. Educational standards should be the *minimum* required to ensure safe and competent practice within each category of licensure.

Responsibility for licensure of radiologic technologists should be assigned to a seven-member "Board of Radiologic Technologists," housed within the Department of Labor, Licensing, and Regulation. The board should be composed of radiologic technologists representing each of the four categories of licensure; a licensed physician, specializing in radiology; a medical radiation physicist; and a public member.

In addition, the Commission recommends that, in light of the percentage of operator violations cited by DHEC against licensed practitioners during x-ray machine inspections, the General Assembly consider amending the practice acts of chiropractors, physicians, nurses, and podiatrists to provide specific grounds for disciplinary action against practitioners who fail to observe adequate radiation safety practices. In South Carolina's health licensing statutes, such a provision is currently contained only in the Dental Practice Act.

Finally, the Commission recommends that dental radiographers and nurses be added to the list of persons exempt from licensure requirements. However, the Commission recommends that in order to achieve a consistent level of protection to the public, the State Board of Dentistry should strengthen its existing x-ray certification program for unlicensed dental employees by promulgating regulations to establish specific standards for x-ray educational programs for unlicensed dental personnel, examination requirements, and a system of maintaining a current registry of all persons who have been successfully x-ray certified.

INTRODUCTION

This report examines the potential impact of regulation of radiologic technologists by the State of South Carolina. Occupations seeking regulation in South Carolina must be reviewed according to criteria established in Act 572 of 1988, "Review of Occupational Registration and Licensing" or the "Sunrise Law." The nine Sunrise Review issues contained in the "Sunrise Law" (Act 572 of 1988) are designed to determine, in this instance, the extent to which the public has been or could be harmed as a result of the unregulated practice of radiologic technologists, and whether the benefits of regulation of the profession by the State outweigh the potential negative effects such intervention may have, such as limiting the public's access to health care services that are affordable and available in sufficient quantity and quality.

The focus of this particular Sunrise Review is the proposed "Medical Radiation Health and Safety Act" which would establish a seven-member "South Carolina Radiologic Technologists Board of Examiners," to license radiologic technologists who meet specific educational, examination, and experience requirements. The board would be comprised of four radiologic technologists, one public member, a medical radiation physicist, and a physician, appointed by the Governor for three-year terms. The board's responsibilities would be to exam applicants, issue licenses, establish standards for licensees and educational programs, and to investigate complaints and impose sanctions on licensees. The board would also issue cease and desist orders against persons violating provisions of the Act. Violations of the Act are misdemeanors punishable by a $300 fine, six months, or both.

If enacted, the bill would establish four distinct categories of licensure under the general term of "radiologic technologist" : radiographer, nuclear medicine technologist, radiation therapist, and temporary licensure. The bill would prohibit any person, other than licensees, physicians, podiatrists, dentists, chiropractors, or osteopaths, from using ionizing radiation on humans for diagnostic or therapeutic purposes; prohibits persons from employing unlicensed individuals to apply ionizing radiation; and requires licensees to apply ionizing radiation only upon the prescription of a licensed practitioner. Licensed practitioners, supervised resident physicians, and students enrolled in an approved course of radiologic technology study are exempt.

All applicants would be required to take an examination prior to being issued a license. However, there is a two-year grandfathering period following the effective date of the Act, for persons who have been employed for three of the past five years. There is also a provision that allows persons who have worked for one of the past three years prior to the Act's effective date to pass a proficiency test conducted by the Board to obtain licensure. The examination may be waived for persons currently certified by American Registry of Radiologic Technologists or a similar voluntary credentialing body

on the basis of an examination. To be eligible for examination, an applicant must be at least eighteen years old, pay a nonrefundable fee of $100, and meet the following three requirements: a high school graduate who has completed a minimum 24-month course of study in radiography, nuclear medical technology, or radiation therapy approved by "the national accrediting agency," who has not been guilty of any of the acts that would be grounds for disciplinary action. Grounds for disciplinary action include: fraudulently obtaining a license; being convicted of a felony; exceeding the allowed scope of practice; applying ionizing radiation without a licensed practitioner's prescription; interpreting a diagnostic image for a patient; or violating any the Act's provisions or regulations promulgated under its authority.

SCOPE AND METHODOLOGY

When Subcommittees of standing House or Senate Committees are referred bills proposing to regulate a profession, they have three options under the provisions of Act 572 of 1988, "Review of Occupational Registration and Licensing" or the "Sunrise Law." The subcommittee can handle the bill independently, request assistance from the State Reorganization Commission to conduct a public hearing, or request that the Commission be responsible for a public hearing on the bill. Senate Bill 636, the "Medical Radiation Health and Safety Act," was introduced in the South Carolina Senate on April 6, 1993, and subsequently referred to the Environmental Issues Subcommittee of the Senate Labor, Commerce, and Industry Committee. On January 28, 1994, Senator Thomas Moore, the Subcommittee's chairman, requested that the State Reorganization Commission review the bill in accordance with the provisions of the Sunrise Law. When a subcommittee requests the Commission to conduct a public hearing, the Commission is directly responsible for the hearing and subsequent reporting of its findings to the General Assembly. An analyst of the State Reorganization Commission was assigned to the project, and the members of the Commission's nine-member Sunrise Subcommittee were notified.

The Sunrise Law contains nine factors which are to be applied when the State Reorganization Commission reviews a request for professional regulation. The objectives of Sunrise Review are established in state law (§1-18-40 of the South Carolina Code of Laws, 1976, as amended) as follows:

1. Whether the unregulated practice presents a clear and recognizable danger to the public;
2. Whether the trade or profession is such a specialized skill that the public is not able to select a competent practitioner without some assurance of professional qualifications;
3. Whether the public can be protected by other means;
4. Whether strengthening existing laws would provide adequate protection;
5. Whether third-party payments can only be made to a licensed practitioner;
6. Whether regulation will increase the cost of goods;
7. Whether regulation will increase or decrease the availability of services to the public;
8. Whether regulation will ensure practitioner competency; and,
9. Whether regulation can be provided by an existing agency or by existing licensed practitioners.

These criteria serve as the basis for a fact-finding process that includes a public hearing, extensive background research on the nature of the profession under review, and investigation of the extent to which public harm is occurring as a result of the unregulated practice of the profession. This report was produced in accordance with the provisions of the Sunrise Law, as well as the policies and procedures contained in the Sunrise Review Operating Manual.

State Reorganization Commission analysts collected background information from state and national sources, using the nine evaluation criteria outlined in the Sunrise Law as a guide. These sources included the Council of State Governments' Clearinghouse for Licensing, Enforcement, and Regulation (CLEAR); a survey of other states that already regulate radiologic technologists; the Department of Health and Environmental Control; the S.C. Employment Security Commission; the Department of Labor, Licensing, and Regulation, along with a number of existing state regulatory boards, such as the State Board of Medical Examiners; the Board of Nursing; the Board of Chiropractic Examiners; the Board of Podiatry; and the State Board of Dentistry. An extensive bibliographical search was conducted using library resources of the State Reorganization Commission, the Council of State Governments, the South Carolina State Library, and the Thomas Cooper and Law Libraries of the University of South Carolina.

In addition, a number of professional associations and organizations either submitted or were contacted for information. The South Carolina Society of Radiologic Technologists, as chief proponent of professional regulation of radiologic technologists in the State, provided the Sunrise Subcommittee and the State Reorganization Commission with a written response to the nine evaluation criteria. Other groups participating in the process included the S.C. Medical Association; the S.C. Dental Association; the S.C. Podiatric Medical Association; the S.C. Chiropractic Association; the S.C. Hospital Association; the S.C. Radiological Society; and the S.C. Allied Health Education Committee.

Analyst fieldwork included an on-site visit to the radiology department of the Lexington Medical Center to observe firsthand the tasks performed by radiologic technologists. Analysts also visited the Department of Health and Environmental Control's Bureau of Radiologic Health to review the records of annual inspections of medical facilities licensed by the Department to use radioactive materials and x-ray equipment.

A Sunrise public hearing on the proposed regulation of radiologic technologists was held on March 17, 1994. Press notices and letters outlining procedures for those wishing to testify at the hearing were mailed to approximately 70 individuals and organizations in advance of the hearing. Eighteen people testified before the Sunrise Subcommittee on the proposed regulation of radiologic technologists. A certified court reporter produced a verbatim transcript of the proceedings.

After analyzing written and oral testimony, the Sunrise Subcommittee met on October 5, 1994, to approve and issue the report containing its findings and recommendations. The Subcommittee's report was adopted by the full State Reorganization Commission at its December 5, 1994 meeting.

BACKGROUND OF PROFESSION

Ionizing Radiation As a Medical Diagnostic and Therapeutic Tool

"Radiologic technologists" are allied health professionals who assist physicians and others in providing services involving the application of x-rays and other forms of radiation for medical diagnostic and therapeutic purposes. Radiation is a word that often calls to mind images of the destruction of nuclear warfare, the pollution caused by nuclear reactor accidents, or the problems inherent in disposing of the nuclear waste that is piling up in our country. Yet one of the most beneficial uses of radiation that exists is its use in medical settings as a powerful diagnostic and therapeutic tool. Since the discovery of x-rays in 1895, humans have marvelled at the views it can produce of the human body, at first unaware of radiation's potential to inflict damage on human cells and tissue. Eventually, the biological effects of exposure to ionizing radiation came to be recognized as being both somatic (changes affecting the present generation) and genetic (changes affecting future generations). The effects of exposure to ionizing radiation depend on a number of factors; the principal ones being the quantity of radiation received and the area of the body exposed. Different types of cells react differently to radiation: young, rapidly developing cells are very sensitive to radiation (making it an effective weapon against cancer cells), while fully developed cells are relatively resistant to its effects. Radiation's effects are most visible when large doses of radiation are administered to extensive areas of the body, involving the most sensitive cells, within a relatively short period of time.

A basic understanding of **all** sources of radiation exposure to humans helps to place medical x-rays in a proper context. All living things are exposed daily to radiation. It is not commonly known that a United States resident receives a total "average annual effective dose equivalent" of approximately 360 mrem[2]/year. More surprising to many laypersons is that, by far the largest contribution (300 mrem, or 82%) is made by natural sources. As Table 1 illustrates, more than half (165 mrem) of this natural radiation is caused by radon, an odorless, colorless, and radioactive gas which results from the decay of uranium in the earth's crust. The importance of environmental radon as a health hazard has only recently been recognized. Approximately equal contributions to this remaining naturally-occurring radiation come from cosmic radiation, terrestrial radiation, and internal radiation from within our own bodies. The remaining 18% (60 mrems) of the average annual effective dose equivalent consists of radiation from medical procedures and from consumer products.

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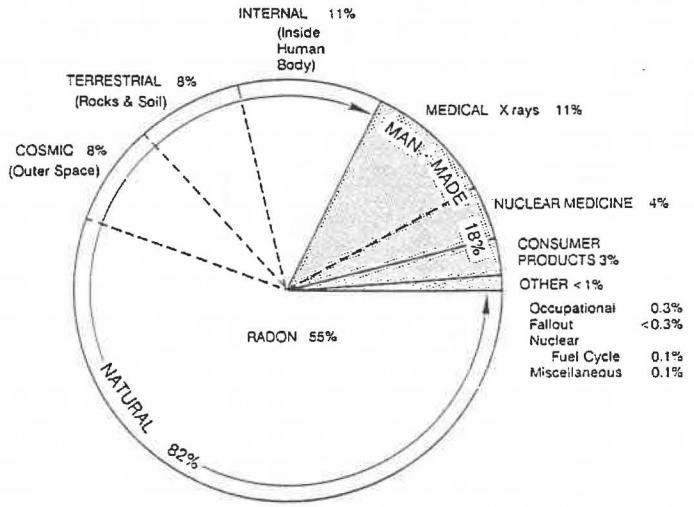
[2] The *millirem (mrem)* is a unit used to measure radiation dosages. One thousand millirems are equal to 1 rem, which stands for "radiation equivalent in man." Radiation dosages may also be expressed in "rads" or "Roentgens," which are roughly synonymous with "rems."

As Table 1 reveals, although much publicity is given to the hazards of nuclear power and radioactive wastes, these sources, on average, account for a minuscule amount of the population's total radiation exposure in comparison to exposure from x-rays used in the healing arts. Medical and dental X-rays now account for more than 90% of the man-made radiation to which the population is exposed, with operators of diagnostic x-ray equipment delivering the largest portion of man-made radiation to the general public.

TABLE 1
SOURCES OF RADIATION EXPOSURE TO U.S. POPULATION



To help laypeople understand the relative doses of radiation delivered in diagnostic procedures, a medical physicist has developed a system for expressing exposure to laypeople using the average annual effective dose equivalent. The amount of radiation received during a dental bitewing x-ray is roughly equal to receiving an additional week's exposure of background radiation, as is the exposure rate on a jet flight to Europe. A chest x-ray represents an additional 10 days' exposure; a mammogram, three months; while a barium enema doubles the average annual dose. Tables 2 and 3 on the following page, indicate the relative levels of exposure involved in common radiologic procedures. As illustrated in the tables, diagnostic images, particularly those of the spine, may involve exposure to relatively large or vulnerable areas of the body.

While research on the effects of the radiation doses used in medical diagnosis has sometimes yielded contradictory results, the risks are sufficient to have generated national and international standards for medical radiation protection programs. The recommended standard is "that only necessary exposures be made, that these exposures be justifiable on the benefits that would not otherwise have been received, and that the doses actually administered be the minimum that would be of medical benefit to the patient."

TABLE 2 Average Effective Doses of Common X-Ray Examinations (Somatic Doses)	TABLE 3 Average Dose to the Reproductive Organs from Common X-Ray Examinations (Genetic Doses)
A. *High-dose Examinations* (more than 125 mrads or mrems per average examination) Mammography (breast examination) Upper GI Series (barium swallow) Thoracic spine (middle or dorsal spine) Lower GI Series (barium enema, colon examination) Lumbosacral spine (lower spine) Lumbar spine (lower back) **B. *Medium-dose Examinations* (25-125 mrads or mrems per average examination)** Intravenous pyelogram (kidney, ureter, bladder) Cervical spine (upper spine) Cholecystography (gall bladder) KUB (kidney, ureter, bladder) Skull Lumbopelvic (pelvis and lower spine) **C. *Low-dose examinations* (less than 25 mrads or mrems per average examination)** Chest Hip or upper femur (hip or upper thigh) Shoulder Dental (whole mouth or bitewing examination) Extremities (feet, hands, forearm, etc.)	**A. *High-dose Examinations* (exposure of male gonads, more than 200 mrads or mrems per average exam)** Lower GI Series (barium enema, colon exam) Intravenous pyelogram (kidney, ureter, bladder) Lumbar spine (lower back)* Lumbopelvic (pelvis and lower spine) Hip or upper femur (hip or upper thigh) **B. *Medium-dose Examinations* (exposure of male gonads, between 10 and 200 mrads or mrems per average exam)** Upper GI (barium swallow) Cholecystography (gall bladder) Thoracic spine (middle or dorsal spine) Abdomen KUB (kidney, ureter, bladder) **C. *Low-dose examinations* (exposure of gonads less than 10 mrads or mrems per average exam)** Cervical spine (upper spine) Skull Shoulder Chest Dental (whole mouth or bitewing examination) Extremities (feet, hands, forearm, etc.)

Source: Laws, X-Ray Information Book, 1983

Profile of Radiologic Technologists

"Radiologic technologist" is a generic term used to refer, most commonly, to two distinct groups of health care professionals: radiographers and radiation therapy technologists. The term also includes nuclear medicine technologists, and may also refer to dental assistants who take x-rays. While licensed practitioners (physicians, dentists, chiropractors, osteopaths, or podiatrists) are exempt from its licensing provisions, the proposed legislation would regulate the practice of radiologic technology in the following categories:

(1) "Radiographer" is defined in the bill as "a person, other than a licensed practitioner, who applies radiation to humans for diagnostic purposes." Radiographers use x-rays, as directed by physicians qualified to order such procedures, to produce images of the inner body which are then interpreted by radiologists (physicians) to help diagnose a patient's condition. Procedures range from basic x-rays, such as those taken of an arm or leg for fractures, to more complex x-ray examinations involving a series of particular organs or systems. Radiographers who perform basic x-ray procedures, limited to a few specific body sites may also be known as radiologic assistants. Some x-ray procedures performed by radiographers require special equipment and expertise.

For example, a radiographer may operate a computerized axial tomographic (CT) scanner, a machine that uses a computer to construct highly detailed cross-sections of parts of the body (such as the brain) into images that can be viewed on a TV-like screen. Radiographers may also assist in special x-ray examinations which use a screen, called a fluoroscope, to view a patient's internal organs. Two of the more common fluoroscopic studies are those of the upper gastrointestinal area and the colon. Mammography, an x-ray exam of the breast, is another example of a highly specialized radiographic procedure.

(2) **"Radiation therapist,"** or radiation therapy technologist, is defined in the bill as a "person, other than a licensed practitioner, who applies radiation to humans for therapeutic purposes." Radiation therapists use highly specialized machines to administer radiation treatments to patients as therapy for disease, primarily cancer. Beams of x-rays are directed into the human body in an effort to destroy the diseased cells. Radiation therapy technologists work as members of radiation therapy teams made up of physicians, medical physicists, and other technical personnel. In addition, radiation therapy technologists also assist in developing patient treatment plans, and monitor the condition of patients during therapy.

(3) **"Nuclear medicine technologist"** is defined in the bill as "a person, other than a licensed practitioner, who prepares and administers radiopharmaceutical agents to humans for diagnostic and therapeutic purposes. Nuclear medicine technologists (NMTs) use radioactive materials in specialized studies of body organs and/or laboratory analyses to assist the physician in the diagnosis of disease and injury. Two common studies performed by NMTs are the bone scan and the thyroid scan. In these procedures, the technologist injects a small dose of a radioactive isotope into the patient and uses special equipment to trace the movement of the isotope through the body.

Number and Training of Practitioners in South Carolina

Traditionally, most radiologic technologists were trained in the military or "on the job." Today, radiologic technologists may be trained in a college setting, or they may rely on training given by the supervising professional (physician, dentist,etc.) with whom they work. Radiologic technologists, who receive formal education, may obtain either a two-year certificate (associate degree); or a four-year bachelor's degree. The two-year programs are more prevalent. Radiologic technologists interested in teaching, supervisory jobs, usually get bachelors' degrees. The curriculum for a radiologic technology two-year degree program covers such topics as human anatomy and physiology, exposure technique, radiographic technology, positioning of patients, darkroom procedures, fluoroscopic procedures, radiation protection, nuclear medicine, radiation therapy, and mobile radiography. In South Carolina, there are fifteen educational programs for radiologic technologists: thirteen in diagnostic radiography, one in nuclear medicine, and one in radiation therapy.

The national professional organization for radiologic technologists is the American Society of Radiologic Technologists (ASRT). The Society has developed accreditation standards for educational programs in collaboration with the American Medical Association and the American College of Radiology (a physician specialist association). These standards are used to accredit educational programs in radiography and radiation therapy technology, nuclear medicine technology, and diagnostic medical sonography. In addition, the society has establishing a private system of credentialing qualified radiologic technologists--the American Registry of Radiologic Technologists (ARRT).

In the absence of a central listing of all radiologic personnel, there is little data on the number and training of practitioners in South Carolina. The State Reorganization Commission developed estimates of the number and training of radiographic personnel within the State, using statistics provided by the Division of Research and Statistical Services of hospital personnel, the Board of Dentistry, the South Carolina Hospital Association, the American Registry of Radiologic Technologists, and a survey of DHEC x-ray registration files. Based on its research, the Commission estimates that there are over 7,000 persons currently performing the duties of radiologic technologists in various health settings statewide. Radiation therapists and nuclear medicine technologists account for approximately 3% of this number. Radiographers, at 97% of the total number, comprise the largest group by far that will be affected by the proposed regulation. A variety of people, with a wide range of training and experience, currently perform x-ray examinations in South Carolina: licensed practitioners; unlicensed, but credentialed radiologic technologists; and other unlicensed personnel, such as receptionists and medical technicians. The Commission also determined that 84% of these x-ray machine operators worked in hospitals or dental offices. Tables 4 and 5 illustrate these findings.

TABLE 4
RADIOGRAPHERS IN SOUTH CAROLINA 1993
By Healthcare Setting

SETTING	% OF TOTAL NUMBER OF RADIOGRAPHERS	% OF RADIOGRAPHERS WHO ARE ARRT-CERTIFIED
Dental Offices	63%	NS[3]
Hospitals	21%	93%
Physicians' Offices	10%	50%
Chiropractors' Offices	6%	1%
Podiatrists' Offices	<0.5%	NS

[3] "Not significant" numbers employed in these settings.

TABLE 5
RADIOGRAPHERS IN SOUTH CAROLINA 1993
Estimated Number and Background of Those Currently Practicing

CATEGORY	ESTIMATED NUMBER AND % OF TOTAL	STATUS UNDER PROPOSED REGULATION
Licensed Practitioners (Physicians, dentists, chiropractors, and podiatrists)	2,030 (29%)	Exempt
Other Licensed Practitioners (Primarily nurses and dental hygienists)	1,470 (21%)	Not Exempt
Unlicensed Practitioners	3,500 (50%)	Not Exempt
ARRT-registered, or registry eligible, radiographers	1,680 (24%)	Meet licensing standards.
Dental assistants	1,400 (20%)	Not exempt
Other Unlicensed (Medical or lab technicians; receptionists; office assistants)	420 (6%)	Not exempt
TOTAL	**7,000 (100%)**	**53% Exempt or meet standards for licensure** **47% Non-exempt; may not qualify for licensure**

SUNRISE CRITERIA

CRITERION (1) HARM FROM UNREGULATED PRACTICE

Determine whether the unregulated practice of radiologic technologists presents a clear and recognizable danger to the public health, safety, or welfare.

State laws regulating professions and occupations are designed to protect the public from harm that could be caused by incompetent practice. Some of the ways in which unregulated professionals may pose a threat to the public are by: (1) using devices and substances that are dangerous; (2) lacking proper qualifications to practice; (3) performing functions that are inherently risky or dangerous; or, (4) performing such tasks in situations requiring a large degree of unsupervised, independent judgment. The State Reorganization Commission evaluated the potential for public harm occurring as a result of incompetent radiologic technology practice. The Commission also searched for evidence of actual instances where South Carolinians have been harmed as a result of the unregulated practice of radiologic technologists. ***Based on its evaluation, the State Reorganization Commission determined that the incompetent or improper practice of radiologic technologists poses a clear and recognizable danger to the public, and could lead to serious harm to patients.***

Potential for Harm in the Practice of Radiologic Technology

• **Use of Dangerous Substances and Devices.** While the harmful effects of unnecessary medical radiation are well-documented, the question of how much radiation exposure is too much remains an unresolved scientific issue. Our current understanding of the effects of low-level exposure to radiation is characterized by contradictory opinions and gaps in scientific knowledge. One thing most scientists agree upon is that any exposure to ionizing radiation can, in principle, deposit enough energy to cause harm to human cells, and consequently it is impossible to set a "threshold" level below which it can be said radiation is "safe."

The Committee on Federal Research on the Biological and Health Effects of Ionizing Radiation has classified four major types of effects of exposure to excessive levels of ionizing radiation:

> *Cancer* may be induced in different tissues and appear after various lengths of time (latent periods) following radiation exposure. While radiation-induced cancers are difficult to attribute, because they are indistinguishable from those

induced by other agents, and the latency periods after exposure vary from 2 years for leukemia to 15 years or longer for some solid cancers, there is evidence linking diagnostic x-rays to carcinogenic effects. For example, one epidemiologic study of patients who contracted chronic myelogenous leukemia determined that nearly one-quarter of the cases studied were attributable to exposure to diagnostic x-rays during the period 3 to 20 years prior to diagnosis. Other studies have found evidence to suggest that fetuses exposed *in utero* to diagnostic x-rays have an increased risk of cancer as adults (BEIR V, 1990).

Genetic or heritable changes may occur in offspring and in future generations derived from exposed humans. The effects of genetic changes do not appear in the person exposed to radiation, but in their offspring, as genetic mutations are magnified in successive generations.

Developmental changes may occur during the development of the embryo or fetus exposed to radiation during gestation, which makes medical radiation of particular concern to pregnant patients.

Degenerative changes may also occur as expressions of local radiation injury, e.g. impairment of fertility, and altered immune responses.

• **Unqualified Practitioners.** Presently, while the possession and use of x-ray equipment is restricted to registrants and subject to inspection by the Department of Health and Environmental Control (DHEC), anyone may be allowed to operate an x-ray machine. The registrant must only produce documentation that the operator has received minimal training specified in various areas, including operating and safety procedures. Under current regulations, this training can be provided on-the-job, and no specific length of training is required. Assurance of an operator competency may be determined by the registrant, with no requirement for testing on training received.

Radiologic technologists, upon the prescription of a licensed physician, must be able to perform a variety of tasks. Radiographers must be able to accurately depict the anatomical structures on a radiograph by applying knowledge of anatomy, positioning, and radiographic techniques. They must also possess training to recognize emergency patient conditions and initiate lifesaving first aid, and adherence to the principles of radiation protection for the patient, self, and others. Radiation therapy technologists assist in all aspects of the administration of radiation therapy treatment according to the prescription and instructions of a physician (usually a radiation oncologist). In addition to possessing the knowledge, skills, and abilities required of radiographers, they must exercise judgment and adhere to principles of radiation protection in exposing the specific area of the patient's body to the prescribed doses of radiation. Nuclear medicine technologists (NMTs) must possess skills that complement those of the nuclear medicine physician, under whose guidance an NMT works. The NMT is involved in the use of radioactive tracers for both diagnostic and therapeutic procedures. Scanning imaging, function studies, application of radioactive materials in treatment procedures, safe

disposal and storage of radioactive materials, and the conduct of a wide variety of diagnostic testing on patients and their body fluids are the overall responsibilities included in the patient care, technical skills, and administrative functions of the nuclear medicine technologist.

A radiologic technologist's poor performance of many of these tasks could lead to serious harm to patients. An incompetent or poorly trained operator may endanger patients by (1) exposing them to unnecessary and harmful radiation (2) making errors that result in poor quality x-rays or improper treatment, or (3) performing invasive procedures improperly.

1. Unnecessary exposure to ionizing radiation. Unnecessary radiation in the area of medical and dental X-ray diagnosis is defined as that radiation which can be eliminated without impairing the quality and quantity of diagnostic information obtainable from the X-ray examination. Unnecessary exposure in medical X-ray may result from the equipment and its accessories, and the manner in which the equipment is used. One form of unnecessary X-ray exposure is improper collimation of the X-ray beam (the X-ray beam covers an area greater than that under diagnostic study). Studies show that improper collimation is common among untrained operators, who may expose a larger than necessary area to improve chances of getting a more accurate image of the affected body part.

Unnecessary exposure may also result from delivering too high a dose of radiation to the area under review or treatment, either through improper machine settings or mistaken dosage calculations. For example, unlike the relatively low doses of radiation used in most diagnostic x-rays, the amounts of radiation received in treatments administered by radiation therapy technologists are clearly dangerous. Radiation for a course of treatment that runs for a number of weeks, with five daily treatments per week would be lethal if given at one time. Patients could receive excessive radiation or irradiation of the wrong area of the body if a radiation therapy technologist errs in interpreting the directions for treatment or in carrying them out.

2. Errors Resulting in Poor Quality Images. Poor quality x-ray images may result in misdiagnosis or the need to subject the patient to additional radiation exposure during retakes. The quality of an x-ray image depends on the skill of the radiographer in positioning the appropriate part of the body, determining and setting the proper exposure factors for each patient, and developing the exposed film. While improved technology in machinery has reduced the likelihood of operator error, new machines are not universally used and many technical decisions are left to radiographers. A poor image will result if the operator overexposes or underexposes the film. If the machine operator fails to obtain a useful image on the first try, a patient may have to undergo a repeat x-ray.

On the basis of several studies, the FDA's Center for Devices and Radiological Health estimates that more than one in ten X-ray images is worthless and must be repeated. Moreover, many exams that are not repeated are of such poor quality that they are unusable, and thus constitute wasted exposure to the patient. A pilot study carried out in 1985 by Pennsylvania Blue Cross/Blue Shield noted rates of clinically unusable x-rays as high as 82% for some medical specialties.

3. Errors Resulting From Improper Treatment. In addition to the risks associated with radiation effects, there are also smaller risks from the **procedures associated with contrast studies and nuclear medicine administration.** Some diagnostic x-ray procedures require the introduction of a contrast medium into the body in order to highlight certain organs or arteries. The dangers of contrast medium examinations include the potential for inducing a stroke or causing nerve damage when the dye is being introduced into the body. Harm may also result from a radiologic technologist's improper documentation of the course of treatment. For example, it is the responsibility of the radiation therapy technologist to document the course and amounts of treatment in detail. A patient could be endangered if the therapist does these tasks poorly or leaves significant information undocumented or unreported.

• **Unsupervised practice and exercise of judgment.** Radiologic technologists do not practice independently but are employed by hospitals, other health care facilities, or independent practitioners. Consequently, a patient has little, if any, independence in selecting a radiologic technologist to provide radiologic services. Instead, he or she relies on the judgment of the employer to evaluate the qualifications and to select, or train, competent operators. Radiologic technologists perform procedures on patients only by prescription or under the direction of physicians who specialize in radiology (radiologists) or other authorized health care practitioners (dentists, chiropractors, etc). However, in some hospitals, clinics, and larger physician-run practices, while physicians have general responsibility for the procedures, they usually do not directly supervise technologists. Instead, daily supervision is provided by supervising technologists. Radiographers usually work alone with patients when taking diagnostic x-rays, a situation requiring the exercise of independent judgment in determining the correct methods of operating the x-ray machine to achieve the results desired by the prescribing physician.

Search for Evidence of Harm from Incompetent Radiologic Technologists

Instances of acute harm to consumers from incompetent or poorly trained radiologic technologists are difficult to gather because, in most instances, the harm from excess radiation is not always immediately visible, and may not be evident for years. The threat to public health is more from the cumulative, long-range effects of unnecessary low-level radiation exposure by unqualified practitioners.

There have been cases found during DHEC's X-ray equipment inspections that suggest that some operators are exposing patients to unnecessary radiation. According to DHEC, inspectors have found instances of unnecessary radiation exposure by machine operators, including improper collimation of the X-ray beam by the operator, improper equipment settings that resulted in excess radiation exposure, and operator unfamiliarity with the equipment. For example, during calendar year 1993, 84% of the medical facilities inspected by DHEC were cited for equipment violations. During 1993, DHEC inspected x-ray equipment at 307 medical facilities, and cited 435 violations. Operator-related violations accounted for 11% of the violations found. Chiropractors were cited for 18 (38%) of the operator-related violations, operators certified by the American Registry of Radiologic Technologists for 14 (29%), and non-certified operators for 15 (32%) of the operator violations.

DHEC reports that it has received no complaints within the last five years involving the improper operation of ionizing radiation sources. However, the existing reporting requirements for misadministration of radiation were not promulgated through regulation until April 1993. The Commission also found that while DHEC regulations call for registrants to maintain records of misadministration for three years, DHEC's inspection cycle for some settings is longer than three years. Therefore, inspectors may not have access to discarded records. The health licensing boards for licensed practitioners (physicians, dentists, chiropractors, etc.) have no records of disciplinary actions taken in regard to improper operation of ionizing radiation sources, although evidence was found of a complaint filed against a chiropractor for improper use of x-ray equipment.

Several physicians and radiologic technologists testifying before the Commission's Sunrise Subcommittee cited experiences with poor quality images produced by poorly trained radiographers. According to South Carolina Blue Cross/Blue Shield, in 1993, the State Health Plan, which covers state employees and their families, was billed for diagnostic x-ray procedures totalling over $23 million. Improving the quality of diagnostic images in this instance alone, could translate into potential savings for consumers and the insurance plan.

In a survey conducted during the course of this review, the Commission also found evidence of harm occurring in other states that already regulate radiologic technologists. Of the twelve states surveyed, all but two states reported receiving complaints against practitioners, primarily for unlicensed practice or performing tasks that they were not qualified to perform. Three states reported regularly imposing fines for violations of their radiologic technologist statutes. Texas (12,000 licensees) reported thirty disciplinary actions annually; New York (14,000 active licensees), between 10 and 20. One-third of the states surveyed reported that they have suspended licenses of radiologic technologists. One case involved the sexual misconduct of the licensee, and another case involved drug-impaired practice.

A series of articles appearing in the *Cleveland (Ohio) Plain Dealer* in 1992, cited several instances of harm from medical radiation, many of which involved operator errors. The paper found evidence that, nationally, at least 40 people died in the years 1975 to 1992 from acute medical overdoses of radiation and that hundreds more received significant radiation overdoses each year. Examples cited included:

- In Hawaii, a nuclear medicine technologist at Triplet Army Medical Center gave a dose of radioactive iodine-131 to a woman who had recently given birth, but forgot to ask whether she was breastfeeding. The woman's infant daughter ingested radioactive milk that subsequently destroyed the infant's thyroid gland.

- In Texas, a nuclear medicine technologist destroyed a patient's thyroid gland with a dose of 30 millicuries of iodine-131, unaware that the dose was 1,000 times greater than the prescribed dose of 30 microcuries.

- A 9-year-old in California died of radiation-induced injuries after he received repeated double doses of radiation during a course of radiation therapy for a tumor in his sinuses.

- An 82-year-old cancer patient receiving radiation therapy died when a piece of radioactive iridium-192 was accidentally left inside her body for four days.

- A 58-year-old radiation therapy patient received a 70% overdose of radiation to her body, when her dosage was incorrectly calculated.

CRITERION (2) PUBLIC'S ABILITY TO SELECT COMPETENT PRACTITIONER

Determine whether the practice of the occupation requires such a specialized skill that the public is not qualified to select a competent practitioner without assurance that minimum qualifications have been met.

To what degree can the public reasonably be expected to pass judgment on the quality and outcome of the professional services being rendered? In the case of radiologic services, to what extent can a consumer recognize whether an radiologic technologist has rendered, or will render, competent service?

Degree of Specialized Skill Required

> *"There is no way for a patient being x-rayed to know what dose he or she is receiving. Nor does the doctor know. The dose depends upon the machine being used and the way it is used -- the length of the exposure, the size of the beam, and the positioning of the film. All a patient can know is that if the doctor or technician is well-trained, and uses modern, well maintained equipment and the best procedures, the dose is likely to be within the acceptable range for that procedure."* (Caufield 1989)

As discussed earlier, the practice of radiologic technology encompasses a wide range of required knowledge and skills, depending on the procedures which the technologist is asked to perform. The tasks involved may range from a relatively uncomplicated x-ray of the chest to the more complex tasks associated with fluoroscopy, radiation therapy, and nuclear medicine. While the relative risks from diagnostic X-rays are minimal, proper training in operator technique is necessary to obtain the best quality image and to negate the need for retakes. At a minimum, radiographers must know and adhere to the principles of radiation protection for, not only the patient, but themselves and others; how to position patients to achieve a good quality image of the affected body part; how to select the appropriate film and screens; properly restrict the beam to the area of interest; exposure techniques; film processing; and principles of patient care and management.

Since all of the various factors--exposure, positioning, and beam size-must be determined in relation to the patient's age, sex, and body size, the amount of radiation that would be received by different patients, each getting the same x-ray procedure, may vary considerably. The U.S. Department of Health and Human Services' *1984 National Evaluation of X-Ray Trends Tabulations* revealed that while the median exposure for a chest x-ray is 15 millirems, patients may receive as little as 2 millirems, or as much as 253 millirems. In comparison, efforts to improve operator technique and to ensure better equipment have been demonstrated to reduce the average exposure of the patient by up to 40 percent.

Selection of Radiologic Technologists

Consumers do not purchase the services of a radiologic technologist directly. Instead, they rely upon the hiring practices of the hospital or physician employing them. While employers are required to "ensure that all operators are adequately instructed and competent in the safe use" of x-ray equipment, there are presently no restrictions on who may be employed to operate x-ray equipment. Advocates of regulations of radiologic technology testified before the State Reorganization Commission that the public assumes that persons taking x-rays are state-licensed. At present, employers may rely upon national certification programs, recommendations of others, and evaluation of an applicants' education and experience. Both state and federal government have classification systems to establish the necessary qualifications for individuals employed as radiologic technologists.

In South Carolina, approximately one-fifth of all radiologic personnel are employed in hospitals. While hospitals often employ privately-certified radiologic technologists, of particular concern are those instances where X-rays are taken in physicians' and chiropractors' private offices. Based on a survey of DHEC registrant files listing x-ray operators and their training, the Commission estimates that as many as one-third of the persons taking x-rays in these settings possess only minimal training to operate x-ray equipment. Receptionists and secretaries were sometimes listed as operators of x-ray equipment. The Commission also found evidence of where many of the operator errors were committed by licensed practitioners, whose on-the-job training for the unlicensed personnel under their supervision may be the only training these operators receive.

The State Reorganization Commission determines that patients and employers cannot easily determine whether radiologic personnel are competent and suitable practitioners prior to engaging their services.

The Commission concludes that there exists a low degree of consumer sophistication in regard to judging the quality of services that have been, or will be, rendered by radiologic technologists in South Carolina. The damaging effects of radiation overexposure or the need for retakes, resulting from operator error, may not be immediately visible to the patient. The education and training of operators varies widely. In the absence of state regulation, few methods presently exist that help reduce consumer uncertainty regarding the competence of a competent radiologic technologist. Medical radiation is applied by persons with a confusing array of titles: "x-ray technician," "radiologic assistant," "radiation technician," "medical assistant," and more. There is no visible indication on the machine of when it was last inspected by DHEC, nor is there any way for the patient to determine the extent of the operator's training in radiologic technology. Under the proposed legislation, radiologic technologists would be required to display their state-issued credential prominently in their place of employment. A system of title protection, while not a provision of the existing bill,

should also be incorporated into the bill to standardize and clarify titles associated with various radiologic personnel.

In the event that a physician or hospital employs an incompetent radiologic technologist, the Commission determined that the outcomes of poor performance could be irreversible or directly life-threatening, particularly in radiation therapy or nuclear medicine. In addition, while employers could be reasonably expected to employ a radiologic technologist who will not expose the patient to the risks and liability associated with harmful effects, regulation would provide employers and patients with added assurance that radiologic personnel have achieved a certain level of training and competence and are suitable practitioners. Regulation would provide a means of disciplining or removing from practice unsuitable practitioners, and discouraging those who may have lost their privileges in another state from relocating and applying for employment in South Carolina.

CRITERION (3) EXISTING NON-GOVERNMENTAL MEANS OF PROTECTION

Determine whether the public is or may be effectively protected by other means, such as academic credentials, certification by nongovernmental entity, or membership in an occupational association.

Hospital Accreditation Standards. Most hospitals in South Carolina are voluntarily accredited by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO). In order for a hospital to qualify for accreditation, the JCAHO requires a "qualified radiological technologist" for radiology services, and "qualified technologist" for radiation oncology services, but does not specify what it means by "qualified." According to the South Carolina Hospital Association, most hospitals in the State employ radiologic technologists certified by the American Registry of Radiologic Technologists.

Education and Training. Traditionally, most radiologic technologists were trained in the military or "on the job." Today, radiologic technologists may be formally trained in a college setting, or they may rely on training given by the supervising professional (physician, dentist,etc.) with whom they work. Formal education ranges from one to four years. A student may obtain either a two-year certificate (associate degree), or a four-year bachelor's degree. The two-year programs are more prevalent. Radiologic technologists interested in teaching or supervisory jobs, usually get bachelors' degrees. The curriculum for a radiologic technology two-year degree program covers such topics as human anatomy and physiology, exposure technique, radiographic technology, positioning of patients, darkroom procedures, fluoroscopic procedures, radiation protection, nuclear medicine, radiation therapy, and mobile radiography. One-year certificate programs are available for health professionals interested in changing careers, primarily nurses and medical technicians; or for radiographers seeking to specialize in a particular area, such as mammography or radiation therapy.

Professional Associations. The national professional organization for radiologic technologists is the American Society of Radiologic Technologists (ASRT). The Society has developed accreditation standards for educational programs in collaboration with the American Medical Association and the American College of Radiology (a physician specialist association). These standards are used to accredit educational programs in radiography and radiation therapy technology, nuclear medicine technology, and diagnostic medical sonography. In addition, the society established a private system of credentialing qualified radiologic technologists--the American Registry of Radiologic Technologists (ARRT), which has been in existence for almost 75 years.

Voluntary Certification of Radiologic Technologists. Many radiologic technologists seek voluntary certification from the American Registry of Radiologic Technologists (ARRT), which certifies applicants on the basis of education, experience, and examination scores. As of February 1993, there were a total of 3,000 radiologic technologist certificates in

good standing with the ARRT. Of this total: 2,590 were certified radiographers, 127 nuclear medicine technologists, and 95 radiation therapy technologists. The ARRT has developed examinations for each of these disciplines, as well as for specialty and limited categories, that assess the knowledge and cognitive skills required for intelligent performance of the major tasks required of a technologist at the entry level. Many states use these examinations for their licensing programs.

Overall, certified radiologic technologists account for a little less than half of the unlicensed persons providing radiologic services in South Carolina, according to estimates developed during the course of this Sunrise Review. The employment of certified persons varies with the occupational setting: approximately 90% of the radiologic technologists employed in South Carolina hospitals are registered or registry-eligible; in physicians' offices, almost half of the operators fall into this category. Certified radiologic technologists are mostly employed in larger physician-run clinics. Dentists, chiropractors, and podiatrists do not traditionally employ certified radiologic technologists.

In recognition that many outpatient settings are characterized by a relatively low-volume of x-rays, confined to limited areas of the body, and taken by personnel who take x-rays in addition to their other functions, the American Registry of Radiologic Technologists has developed a limited licensure examination, covering the tasks performed by someone having such a limited scope of practice. The examinations are designed to assess the knowledge and skills of persons whose practice is limited to either radiography of the chest, extremities, spine, skull, or lower extremities (podiatric). However, the exam is administered solely through contractual arrangements with state licensing authorities. Candidates may not apply directly to ARRT to take the limited scope examination, nor does ARRT issue any certification in conjunction with the examination.

The State Reorganization Commission concludes that, while a system of voluntary credentialing exists for radiologic technologists, the public cannot rely on the existing system alone to identify qualified radiologic technologists.

The practice of radiologic technology encompasses functions performed by radiographers, in a limited, general, or specialized scope of practice, such as mammography; nuclear medicine technologists; and radiation therapists. While a voluntary system of credentialing exists for most of these categories, it is not available for those radiographers with a limited scope of practice, and does not include a large number of radiologic personnel currently employed. Therefore, a state-issued credential is necessary to establish a central registry of those persons who have received the required training within each category of radiologic technology, and to provide a means by which persons may demonstrate the effectiveness of the training received through a system of competency testing. State regulation of radiologic technologists would provide those persons engaged in the limited practice of radiologic technology, particularly in

the offices of physicians, chiropractors, and podiatrists, with access to the limited licensure examination, and a state-issued credential.

CRITERION (4) CURRENT STATE AND FEDERAL LAWS

Determine whether current laws are ineffective or inadequate to protect the public's health, safety, and welfare and whether strengthening the laws would provide adequate protection to the public.

The awareness of the adverse health effects associated with ionizing radiation, including medical and dental x-rays, which already account for 90 percent of the annual population dose in the United States from controllable man-made sources, has led to laws and regulations at the state and federal level aimed at reducing unnecessary exposure to radiation in health care settings. Governmental efforts at reducing unnecessary medical x-rays have emphasized three areas: (1) inadequate or faulty equipment (2) poor techniques on the part of equipment users, and (3) x-ray examinations that may not be medically necessary.

Federal Statutes and Regulations.

Consumer-Patient Radiation Health and Safety Act of 1981. Through passage of this legislation, Congress strongly encouraged state regulation of radiologic technologists. The act requires the federal government to establish standards for accreditation and certification for persons who administer radiologic procedures and prepare a model state statute. State compliance is not mandatory. However, federal employees, such as radiologic technologists in Veterans' Administration hospitals, are subject to federal requirements. Standards for both accreditation of radiologic education programs and certification of radiologic personnel were issued by regulation in 1985. The standards address the five occupations specifically identified by the Act: radiographers, radiation therapy technologists, nuclear medicine technologists, dental hygienists, and dental assistants. These categories of professionals were identified as responsible for conducting the great majority of radiologic examinations and procedures. Exempted from the provisions are licensed practitioners of medicine, osteopathy, dentistry, pharmacy, podiatry, and chiropractic.

Mammography Quality Standards Act of 1992. Congress passed this legislation in the fall of 1992, requiring mammographers and mammographic facilities to meet strict federal standards. When the law goes into effect on October 1 of this year, it will make mammography the only medical diagnostic test to be federally regulated to insure its quality. After the effective date, mammography providers will be required to produce high-quality x-ray images and to employ only licensed or certified radiologic technologists as machine operators. Providers who do not comply will be subject to fines and can become ineligible to receive health insurance payments.

South Carolina Statutes and Regulations.

Regulation of X-ray Machinery. South Carolina's "Atomic Energy and Radiation Control Act" outlines the powers and duties of state agencies in regard to radioactive materials. The Department of Health and Environmental Control (DHEC) is designated as the agency responsible for the control and regulation of radiation sources. State law prohibits the operation of x-ray machines unless the equipment and installation meet the applicable requirements outlined in state regulations.

The Department of Health and Environmental Control's Bureau of Radiological Health is responsible for carrying out the mandate established in §13-7-10, *South Carolina Code of Laws, 1976,* to control and regulate the possession and use of x-ray equipment and other sources of ionizing radiation. The Bureau registers and inspects all facilities which use radioactive materials. Hospitals, academic institutions, industrial users, and Chem-Nuclear (low-level waste facility) are among the facilities registered. The Department also has the authority to exempt certain radiation sources or kinds of uses or users from regulation when the department makes a finding that the exemption of these radiation sources or kinds of uses or users will not constitute a significant risk to the health of the public. The Bureau's Division of Electronic Products is responsible for approving, registering, and performing inspections of all facilities in South Carolina that own x-ray machines. Machines that produce too much radiation can cause birth defects and cancer, and machines that emit too little can fail to diagnose diseases. The department employs inspectors who are responsible for checking the approximately 6,000 machines in the State.

In 1986, the General Assembly enacted legislation (Act 449) prohibiting the application of ionizing radiation to humans by anyone not certified by DHEC, and authorizing DHEC to issue regulations outlining examination and certification procedures. Amendments to the original bill exempted hospital employees. By 1991, when the legislation was scheduled for Sunset Review, DHEC had not established a program to certify machine operators. Instead, the DHEC Board, citing the provision's exemption of hospital employees and the hardship on rural practices regarding continuing education requirements, supported repeal of the legislation. DHEC proposed that revisions to existing Regulation 61-64 would provide an "equivalent level of public protection." The State Reorganization Commission voted to recommend the repeal of the provisions of Act 449, in accordance with the Sunset Act, with the recommendation that DHEC amend Regulation 61-64 "as appropriate, to ensure that all operators of sources of ionizing radiation are adequately instructed and competent in the use of x-ray equipment." The provisions of Act 449 of 1986 were subsequently repealed on June 30, 1992.

The regulations promulgated by DHEC to govern the possession and use of radioactive materials in South Carolina are contained in Regulation 61-63 (commonly referred to as Title A) and Regulation 61-64 (referred to as Title B). Provisions specifically governing the use and inspection of x-rays in the health professions are

contained in Part V of Regulation 61-64 (Title B). Regulations require that a registrant "assure that all x-ray machines under his control are operated only by individuals adequately instructed in safe operating procedures and competent in the safe use of the equipment." This general statement was made more detailed by recent revisions to the regulations, effective in April 1993. As a result of these revisions, the following provisions, relative to x-ray machine operators, are now in effect:

- Facilities are required to include training plans for operators in their initial registration application (2.3.2).
- Users of x-ray in the healing professions are now required to ensure that all operators receive, at a minimum, instruction in the following areas: radiation protection; darkroom techniques; machine safety; general operating procedures. Instruction must begin within 30 days of employment. ARRT-certified radiologic technologists, persons licensed by Board of Dentistry; and "other programs approved by the Department" are considered to have met the training requirements (4.2.3).
- Registrants are required to make written operating procedures available to all operators, and require operators to demonstrate familiarity with the procedures (4.2.4).
- Fluoroscopes must be personally monitored by supervising radiologist (4.2.15.4).
- Mammography technologists must be currently registered with the American Association of Radiologic Technologists, and obtain ten (10) hours of continuing education specifically in mammography, every two (2) years (4.10.3).
- Incidents of misadministration of radiation must be reported to DHEC (1.11).
- Minimum training requirements for operators of radiation therapeutic equipment (radiation therapy technologists) are established. Operators must receive the minimum training specified and "demonstrate competence" in performing other tasks, and possess one-month of machine-specific, on-the-job training (5.3.3).
- Violations of the regulation carry a civil penalty ranging from not more than $1,000 to $25,000, depending on the severity of the violation. The schedule of civil penalties is broken down into six "severity categories." Severity I category is the most severe, and imposing a penalty of $10,000 to $25,000 per violation; Severity VI category is the least severe, imposing a penalty of not more than $1,000 per violation. Violations involving overexposure resulting from use of an unqualified operator fall in the two most severe categories (1.13).

DHEC also has regulatory authority over the use of radioactive materials administered by nuclear medicine technologists. Regulations governing the supervision of the administration of nuclear medicine are found under Regulation 61-63 (Title A). DHEC does not regulate nuclear medicine technologists directly. Instead, they issue licenses to facilities that use radiopharmaceuticals. According to DHEC, there are 55 licensees in South Carolina. Approximately 30 of these are hospitals; other licensees are primarily cardiac physicians. Regulations specify that supervised individuals must be adequately instructed in radiation safety and require them to follow instructions of the supervising licensee. The licensee that supervises an individual is responsible for the acts and omissions of the supervised individual (4.7.5).

Regulation of Health Care Facilities. DHEC's licensing regulations for hospitals and facilities require x-ray personnel qualified by "education, training, and experience for the type of service rendered," but do not specify qualifications. A DHEC spokesperson with the Division of Health Facilities Certification stated that the qualifications required for compliance were those outlined in DHEC Regulations 61-63 and 61-64, discussed earlier.

Regulation of Standards of Practice. The **State Board of Dentistry** is the only health licensing board whose governing statute specifically refers to the radiation safety procedures of its licensees. In §40-15-190(8) of the *South Carolina Code of Laws, 1976,* "failure to provide adequate radiation safeguards" is one of the grounds for disciplinary action against a dentist, dental hygienist, or dental technician. Such a provision helps protect the public, by making it easier for patients who believe they have been harmed by unsafe radiation procedures to file a complaint against a dentist. Including similar language in the practice acts of chiropractors, physicians, and podiatrists would expand this measure of protection to include all professionals who are authorized to prescribe x-rays.

Regulation in Other States. Not all states regulate radiologic technologists. Voluntary compliance with the provisions of the federal "Consumer-Patient Radiation Health and Safety Act" has been a major factor in implementation of state licensing requirements. In 1987, 16 states licensed radiographers. By 1994, 30 states licensed radiographers, 22 licensed radiation therapy technologists, and 16 licensed nuclear medicine technologists, according to the Council of State Governments. The states which regulate radiologic technologists account for almost two-thirds of the nation's total population. California has the nation's most stringent X-ray regulations. Dentists are not required to be licensed, but California is the only state that requires physicians who use or supervise the use of X-ray equipment to be licensed, as well as radiologic technologists. While legislation is pending in ten states, there is no clear consensus among the states as to the need to regulate this profession. For example, Sunrise Reviews in Colorado and North Carolina, recommended against regulating radiologic technologists. In contrast, a 1990 Sunset Review by the State of Hawaii cited that there is a need to regulate radiologic technologists, since incompetent technologists can endanger patients by exposing them to unnecessary and harmful radiation.

The State Reorganization Commission concludes that, while current laws and regulations provide some measure of protection, the likelihood of public harm from incompetent radiologic technology practice could be further decreased by strengthening state regulation to include a system which would address the concerns regarding standards for training, competency, and registration of persons practicing as radiologic technologists.

Radiation's potentially harmful effects have made it an area of extensive government regulation. In regard to the use of radiation in the medical and dental professions, the main components in determining patient exposure are the radiation source (equipment or radiopharmaceutical), the physician, and the operator. Regulation

has traditionally focussed on controlling the radiation sources, and has only been incidentally concerned with ensuring that all operators are trained and competent. This regulatory situation led a former official with the Food and Drug Administration to characterize it as analogous to trying to improve highway safety by requiring automobiles to be registered and inspected, but not licensing automobile drivers. While DHEC regulations requiring that registrants "assure that all x-ray machines under his control are operated only by individuals adequately instructed in safe operating procedures and competent in the safe use of the equipment," perform a function very similar to licensure, the following concerns exist in regard to relying on the present system for regulating operator training and competency:

• *No Listing of Approved Operators.* Under the current system, it is difficult to establish the instruction and training of persons serving as approved machine operators. Registrants are required to provide a listing of machine operators, but this information is self-reported prior to the inspection, and may not accurately reflect operators who have been employed in the interim between inspections. DHEC is not required to, and does not, maintain a central registry of approved operators, so there is no way of tracking individual machine operators. According to the South Carolina Hospital Association's 1993 Allied Health Manpower Survey, radiologic technologists in the State have the highest turnover rate (21.8%) of any allied health profession. Given the profession's high rate of turnover, many operators may be employed and leave during the two to four-year interim between inspections. Some of the operator listings were missing from the DHEC registrant files, were incomplete, or did not specify the level of training of the operator. The lack of a central registry of medical radiologic personnel not only makes it difficult to verify the training received by operators, but may also have implications for tracking the occupational radiation exposure of these workers. A similar situation exists in regard to unlicensed dental assistants who are x-ray certified by the State Board of Dentistry. Dental assistants are not licensed by the Board. According to a Board spokesperson, once the Board dental assistant is x-ray certified, there is no continuous method of tracking their employment status. Many dental assistants, since becoming x-ray certified, have stopped working or have gone on to become dental hygienists.

• *Unclear Training Standards.* Concerns were expressed during the public hearing held by the Commission that the existing DHEC regulations, while specifying that instruction must begin within 30 days of employment, do not contain standards relating to who conducts the required training; how long the training should last; what learning objectives are to be met; or means for testing competency. DHEC relies on written proof that instruction has been received, but this may consist only of the certification of the registrant (employing hospital or physician) that an operator has received the required training on-the-job. In addition, acceptable training ranges from a one-day course to ARRT certification.

• *No Independent Verification of Operator Competency.* Except in the case of mammography technologists, existing DHEC regulations do not specify that testing is

required to certify an operator's competency following training. While DHEC inspections require a facility operator to demonstrate x-ray machine settings, these inspections are only incidentally intended to assess operator performance. The selection of the operator of the machine during an inspection depends on whom the registrant selects to serve as contact person and the operators' work schedules. Obviously, it is in the best interest of the registrant to select the most, not the least qualified, operator to accompany inspectors. According to DHEC staff, if a facility employs certified and noncertified persons, the certified person is usually the person selected to demonstrate the operation of the equipment. Consequently, less qualified operators may never be asked to demonstrate machines during an inspection.

- *Inspections Are Unsuitable Means for Judging Operator Competency.* DHEC inspections primarily emphasize registrants' compliance with regulations governing the possession, installation, calibration, and use of x-ray equipment--not the qualifications of machine operators. Compliance with the minimal training requirements is but one component of the regulatory program. In 1989, while considering proposed regulatory changes regarding machine operators, DHEC responded to a suggestion operator qualifications be reviewed during inspections. Such a review would be difficult, DHEC responded, since "...Inspections are an audit of conditions at the time of inspection and may not give an accurate picture of day-to-day operations. Also, our inspection program is currently severely understaffed and underfunded. The current inspection staff is unable to perform the required inspections within the established frequency, therefore many facilities have not been inspected in at least five years. This makes the determination of competency during inspections unfeasible." DHEC reports that hospitals are scheduled for annual inspections; physicians' offices are inspected every two years; chiropractors and podiatrists, every three years; and dentists' offices every four. However, DHEC acknowledges that this level of frequency is not always achieved. The Commission found evidence of some facilities that had been inspected at intervals as long as eight and nine years. Routine inspections are also announced to the registrant prior to the visit.

CRITERION (5) IMPACT ON THIRD-PARTY PAYMENTS

Determine whether the practitioner performs a service for others which would qualify for payment of part or all of those services by a third party if the practitioners were to be regulated by the state.

Most radiologic services, diagnostic and therapeutic, are already covered by most health insurers, and nothing in the proposed legislation mandates reimbursement of services, nor authorizes direct reimbursement of licensees. Federal mandates on mammography standards, effective October 1, 1994, will make Medicare/Medicaid reimbursement for mammograms contingent on private certification or state licensure of mammographers. DHEC regulations have addressed compliance with this provision by requiring that all mammographers in South Carolina be certified by the American Registry of Radiologic Technologists. A system of state licensure would also provide an effective means of ensuring an individual radiologic technologist's compliance with this mandate, as well as tracking compliance with continuing education requirements contained in its provisions.

The State Reorganization Commission determined that the proposed regulation will not mandate, nor otherwise authorize, third-party payments to radiologic technologists.

CRITERION (6) IMPACT ON COST OF GOODS

Determine whether regulation will increase the cost of goods.

Balanced against the desire for increased quality and safety in the taking of x-rays is the question of the ultimate impact regulation will have on the cost of providing those services to the consumer. Will regulation of the profession, in itself, result in unnecessarily high prices for goods and services offered by practitioners? The Commission evaluated the costs to the State to administer regulation of radiologic technologists. The Commission also sought evidence to indicate whether the proposed regulation would adversely affect the costs of goods and services by limiting competition, or otherwise imposing unreasonable barriers to entry into the profession.

Effects of Regulation

The proposed legislation would create a new state agency by establishing an independent seven-member "South Carolina Radiologic Technologists Board of Examiners," to license radiologic technologists who meet specific educational, examination, and experience requirements. The board would be comprised of four radiologic technologists, one public member, a medical radiation physicist, and a physician, all appointed by the Governor for three-year terms. The Board would be assigned responsibility for hiring staff, establishing licensing and examination fees, examining applicants, issuing biennial licenses, establishing standards for licensees and educational programs, investigating complaints and disciplining licensees.

The Board would have no direct control over the prices charged by radiologic technologists. However, Board regulations would impose costs on radiologic technologists such as initial licensing, examination, and renewal fees. If continuing education requirements were promulgated as a requirement for renewal of licenses, this would also impose additional costs. These costs may be passed on to the consumer, but it appears unlikely that the proposed regulation alone will significantly increase the costs of radiologic services. Many of these costs are already associated with existing regulations and hiring practices which rely upon the system of private certification available through the American Registry of Radiologic Technology, so the impact on costs will not come from regulation alone. If regulation results in the increased quality of x-ray work, it may, over time, have the potential to reduce the cost of services because time, personnel, and equipment will be used more efficiently, such as in avoiding the need for repeating diagnostic x-ray exams.

The costs of radiologic technology services are related to the supply of radiologic technologists. Under the provisions originally outlined in Senate Bill 636, many of the personnel now engaged in performing limited scope diagnostic x-rays would be prohibited from practicing. Such provisions would most likely result in increased costs for services, by forcing licensed practitioners to add or substitute a graduate of a

minimum 24 month course of study in radiography for current practitioners. However, this adverse impact could be significantly lessened if certain licensed professionals were exempted from regulation; and a system of limited licensure was included in any proposed legislation. The impact of regulation on the supply of practitioners, and the Commission's recommendations on decreasing the regulatory impact, are discussed in greater detail under Criterion 7 (page 36).

If provisions are included for the issuance of limited licenses, regulation also has the potential to decrease current training costs for this group of radiologic personnel. At present, the length and quality of training available for limited-scope practitioners varies widely, from on-the-job instruction lasting a few hours to seminars run by equipment vendors. Current regulations rely heavily on on-the-job training provided by the supervising licensed practitioner to limited-scope radiographers. The cost of training an employee on the job often requires the time and attention of the licensed practitioner, who may be reluctant to send employees to training courses outside, because of uncertainty regarding their quality. Oversight and standardization of limited-scope training by a Board has the potential to increase the number of quality training opportunities available. These training opportunities may substitute qualified instructors whose services are less expensive than the on-the-job training provided employees by licensed practitioners.

None of the states surveyed during the Sunrise Review process cited licensure as a factor in reducing the supply of available workers. A letter from a California health official stated:

> *"The contention of the Radiologic Health Branch is that there is no increase in cost of radiologic health care in California as a result of the certification law. The operational costs of the certification program are covered by individual application and renewal fees. Further, there is no evidence that California certification law has created any shortages of qualified individuals to perform X-ray technology. There is suggestive evidence that because of the certification law the quality of individuals who are performing X-ray technology has been considerably improved and with it the rate of repeated radiographs/films has been decreased. However, there are not hard data to substantiate this statement."*

Competition among health care providers can enhance consumer choice and the availability of services, as well as lower the overall cost of health care. To prevent adverse effects in the cost of health care, competition among practitioners should be encouraged to the maximum extent compatible with the public's health, safety, and welfare. To mitigate potentially anti-competitive effects, the Commission recommends the following concerns should be addressed in any future proposed legislation regulating radiologic technologists:

- The proposed legislation grants the Board the authority to promulgate regulations to establish a code of ethics. To avoid possible anti-competitive effects, the

board should adopt its own code of ethics, since codes of ethics written by a private professional organization may restrict competition among members of the group and inhibit entry by other qualified providers. Such provisions may benefit certain members of the regulated profession, but are often inconsistent with the best interests of the consuming public.

• The Board is also granted the authority to establish continuing education requirements which are the same requirements as the "American Registry of Radiologic Technologists." For the same reasons specified earlier, references to private organizations, particularly in regard to setting standards, should be removed. This does not preclude the Board from adopting standards that are identical, but leaves the decision to the Board's discretion, and not dependent on the changing standards of a private organization representing practitioners rather than the citizens of South Carolina.

Costs to Administer Regulation

The proposed board would consist of four members of the regulated profession, one consumer member, a medical doctor, and a medical physicist. To carry out its duties, the Board would collect revenues through licensing and other fees, which would be deposited in the State General Fund. The proposed legislation calls for revenue equal to 115% of appropriations. However, a proviso in the 1993-94 Appropriations Act shifted the funding source for POLAs currently within the Department of Labor, Licensing, and Regulation from the State General Fund to "Other Funds," and required them to generate **110% of their expenditures**. This provision should be amended to change the outdated funding provisions to those currently in existence for other POLAs.

TABLE 6. Proposed Schedule of Fees

	Fee
Examination and Initial License Fee	$100
Renewal (Biennial)	100
Temporary License	25
Late Fee	50
Duplicate License	25

There would be no impact to the General Fund of the State since fees would offset any appropriations. The State Budget Office estimates that a total appropriation of $117,500 would be required. Board members would be required to meet at least twice a year, and would receive mileage, per diem, and subsistence as provided by law for members of state boards and commissions, to be paid from the fees collected by the Board. According to the fiscal impact statement provided by the State Budget Office, board members' expenses would total $2,472. Examination costs account for $85,000 of

this estimate. An additional $11,750 to meet the 10% revenue requirement, brings the total revenue required to $129,250.

The Board's estimated revenue is $170,000 (145% of projected expenditures), based on 1,700 licensees remitting $100 per examination and initial licensing fee. The renewal fee would also be $100. Based on estimates developed regarding the number of radiologic personnel in the State, the Commission determines that these revenue estimates may be too low, since the actual number of licensees may be more than twice the projected figure of 1700 licensees. According to the American Registry of Radiologic Technologists, there are presently 3,000 registrations in good standing with ARRT in the three categories of licensure. A substantial number of these individuals will probably seek licensure in the first year, if regulation is implemented. If ninety percent of this number are licensed, it increases the projected number of licensees to 2,700. In addition, if the proposed legislation is amended to allow for the issuance of limited licenses, the number of potential licensees could increase by 700, to 3,400 licensees. Likewise, if the existing proposal is not amended to exempt dental hygienists or nurses, these candidates may increase the number of potential licensees as high as 5,000.

TABLE 7. Estimated Fiscal Impact

Estimated Expenditures	
Per Diem, Mileage, and Lodging	$2,472
Personal Service (1.5 FTE)	21,800
Employee Benefits	3,200
Examinations	85,000
Other Operating Expenses	5,028
Total Estimated Expenditures	**$117,500**
10% Revenue Requirement	11,750
TOTAL REVENUE REQUIRED	**$129,250**
Estimated Revenues	
License Fees (1700 licensees @ $100)	$170,000
Total Estimated Revenues	$170,000

The $100 license fee is considerably higher than that charged by other states that regulate this profession. According to the American Society of Radiologic Technologists, of the states that regulate this profession and have a two-year renewal period, only Maryland has a $100 application fee, and its renewal fee is $50. The initial licensing fees in the other states with biennial licenses range from $20 in Texas to $90 in Montana.

These regulatory agencies recovered between 77% and 200% of the annual cost of regulation.

The State Reorganization Commission determined that regulation of radiologic technologists should not adversely affect the cost of goods and services.

CRITERION (7) IMPACT ON SUPPLY OF PRACTITIONERS

Determine whether regulation will increase or decrease the availability or services to the public.

Will regulation adversely affect the supply of regulated practitioners? Evidence should also address the potential impact of regulation on: (a) the number of qualified practitioners, and (b) the concentration of practitioners in locations throughout the state.

Present and Projected Patterns of Radiologic Technologists

The South Carolina Employment Security Commission (ESC) ranks radiologic technologist as the ninth-fastest growing occupation in South Carolina today. The ESC estimates that, between 1986 and 2000, occupational employment for radiologic technologists (with formal training) will have grown by slightly over 80 percent. The median wage for radiologic technologists in South Carolina in 1990 was slightly over $24,500. Nationally, the U.S. Labor Department has predicted that the number of medical imaging jobs would increase by 66 percent between 1988 and 2000, creating at least 70,000 more jobs by the year 2000.

Thousands of job openings exist across the country for technologists in medical settings and particularly, in radiation therapy, reported the *New York Times* in 1991. The supply of trained people has not kept up with the explosion in the use of imaging equipment. Instead, the supply has dwindled in the face of declining numbers of high school graduates, budget cuts that curtailed career-counseling programs, and concerns with exposure to AIDS and other diseases in hospitals. The proliferation of freestanding imaging centers has also generated employers' competition for practitioners. Hospitals are raising wages by 10 percent annually to compete with higher offers from a rapidly growing number of independent imaging centers. In New York City, for example, where the average radiologic technologist may earn $26,000, a technologist at an imaging center may command twice this figure. Average pay scales in South Carolina are several thousand dollars lower than in New York, where living expenses are higher.

According to the S.C. Hospital Association's "1993 Allied Health Manpower Shortage Survey", radiation technician is the third most utilized allied health professional in South Carolina hospitals. The American Hospital Association identifies a vacancy rate of 7% as a baseline used to define a manpower shortage. Radiation technician has the third highest vacancy rate, at 13%, and nuclear medicine technicians (NMTs) have the sixth, at 8.5%. Forty-two percent of vacancies for radiation technicians take longer than 90 days to fill. Radiation technicians also have the highest turnover rates at 21.8%, perhaps reflecting the fierce employer competition for these employees. Most new hires for this group come from other hospitals. X-ray technicians experienced a 26.3% increase in average wages between 1989-1993; NMTs, a 30.6% increase. Whether licensing standards would contribute to this shortage is doubtful, since the demand by hospitals

appears to be for persons who already have the required training or certificates, or associate degrees or bachelors' degrees. When hospitals were asked by the same survey to name the greatest deterrents to successful recruitment in their facilities, hospitals stated the lack of available candidates, the location of their facility, and competition with other hospitals. Licensure was listed near the bottom, cited as a deterrent by less than 2% of the respondents. The estimate that approximately 12% of registered radiologic technologists are not currently employed points to a potential labor pool from which hospital can also direct recruitment efforts to alleviate any shortage of workers.

While the Board of the Department of Health and Environmental Control did not take a formal position on the proposed regulation, they testified at the Commission's Sunrise Subcommittee hearing that "several of our Board members expressed concerns about requiring all doctor's and dentist's offices to employ licensed Radiologic Technologists, especially where very limited radiologic procedures, i.e. chest x-rays and dental x-rays were performed. Licensed radiologic technologists would, in all likelihood, command higher salaries than are commensurate with duties required in these limited settings. This, in turn, may translate into higher costs for these procedures."

The proposed bill does not unreasonably restrict migration of practitioners into the state, since the Board would be allowed to grant licenses without examination to persons holding a license in another state, if the standards in the other state are determined to be at least as stringent as those established by the Board. A December 1990 report from the S.C. Select Committee on Health Care Cost-Containment cited a critical shortage of trained radiologic technologists in rural areas of the state. According to the S.C. Society of Radiologic Technologists, there are qualified radiologic technologists residing in every county of South Carolina. Table 8 details a portion of this distribution.

TABLE 8
DISTRIBUTION OF REGISTERED RADIOLOGIC TECHNOLOGISTS IN S.C.
2,842 Total - March 1994

Ten Counties With Largest Number (56% of total State population)		Ten Counties With Smallest Number (5% of total State population)	
Charleston	350	Barnwell	8
Richland	239	Clarendon	8
Spartanburg	236	Fairfield	8
Lexington	217	Marlboro	5
Greenville	192	Jasper	4
Anderson	183	Saluda	4
Florence	144	Allendale	3
York	136	Lee	3
Aiken	134	McCormick	3
Horry	102	Hampton	2
Totals	1831 (64% of R.T.s)		48 (2% of R.T.s)

Are the proposed standards more restrictive than necessary to ensure safe and effective practice? Some restrictions on practice are already in place through existing

regulation and hiring practices, particularly in hospitals. Consequently, the radiation therapists and nuclear medicine technologists currently employed would most likely meet the qualifications outlined in the proposed regulation. However, licensure is the most restrictive system of state regulation, and since the proposed regulation would eventually allow the performance of radiologic procedures only by persons meeting minimum post-secondary educational requirements, as many as 47% of personnel now engaged in taking limited scope diagnostic x-rays may be prohibited from practicing, as the bill is now written. Radiographers, particularly those now working in practitioners' private offices and clinics, comprise the largest group by far that will be affected by the proposed regulation. Based on the Commission's findings presented in the table on page 11 of this report, there are over 7,000 persons currently operating x-ray machines in various health settings statewide. Included in this figure are a variety of people, with a wide range of training and experience: licensed practitioners; unlicensed, but credentialed radiologic technologists; and other unlicensed personnel, such as receptionists and medical technicians. Dental and hospital facilities alone account for 84% of the total number of operators. The provisions of the legislation may be broader than necessary to protect the public from harm. The impact of regulation could be lessened significantly, without risk to the public, if licensed dental hygienists and nurses were exempted from regulation; and a system of limited licensure were included in the proposed legislation, as discussed below.

Limited, or restricted, licensure. In many outpatient settings, x-ray examinations are low volume or limited scope procedures. Consequently, there are many machine operators in South Carolina who perform x-rays in addition to their other duties, and do not possess the training required to be certified as radiologic technologists. A system of limited licensure for these practitioners would alleviate any potential shortage, a particular concern in rural areas of the State. Estimates included in a 1985 study of radiographer credentialing found that these radiographers perform one in four of the diagnostic x-ray procedures in private offices and clinics and a little more than one in three in other facilities. Overall, about 16 percent of the diagnostic x-ray procedures are performed by these operators.

Limited licenses are issued by nineteen of the states that regulate this profession. A limited license would authorize a person to conduct diagnostic radiology examinations limited to the performance of specific procedures or applications of ionizing radiation to specific parts of the body. For example, chest x-rays are a common procedure in many physicians' offices. Podiatrists require x-rays of the feet and ankles; chiropractors' offices take x-rays of the skull and spine. Incorporating a system of limited licensure into the bill would not require a physician to employ a radiologic technologist, but would establish training, competency, and testing standards for these operators. In addition to dental assistants, there are currently at least 700 operators in other settings who do not meet the proposed educational requirements, but could qualify for limited licensure. In response to requests from several states, the American Registry of Radiologic Technologists has developed examinations covering the tasks performed by someone having a scope of practice limited to radiography of the extremities, the chest,

skull/sinus, spine, and lower extremities. The American Chiropractic Registry of Radiologic Technologists also offers a limited x-ray certificate for chiropractic assistants.

Exemptions. Nurses and dental hygienists are the licensed professionals who would be most affected by the enactment of the bill as written, since they will have to meet qualifications or discontinue the operation of the machines. These are personnel who typically are employed in the offices of dentists and physicians to take x-rays incidentally to their other duties.

Nurses (particularly in small, rural practices) may be called upon to perform x-ray examinations. While nursing education does not include specific radiologic training, nurses performing radiologic procedures are subject to the State Board of Nursing's regulatory provisions governing "expanded role nursing," in which nurses are required to receive additional training prior to assuming expanded duties to meet a perceived need, and are already subject to disciplinary action by the Board for incompetent practice.

Dental hygienists receive training in dental radiography within the standard curriculum of dental hygiene programs. The exposure and processing of dental radiographs, including considerations of radiation hygiene and safety, accounts for 10 percent of the national board examination for dental hygienists. As in the case of nurses, dental hygienists are subject to disciplinary action by their licensing board.

While dental assistants are unlicensed personnel, the State Board of Dentistry has promulgated regulations requiring that dentists certify to the Board that their chairside-trained assistants are competent in taking x-rays. While not specifically required by statute or regulation, unlicensed dental personnel taking x-rays must also pass a written radiation safety exam, offered by the South Carolina Dental Association, as part of the certification process. According to a Board of Dentistry employee, the Board has x-ray certified over 1900 dental assistants in South Carolina through this process. Once x-ray certification is issued, the Board does not update information on the employment status of certificants, except through reports on dentists' annual licensure renewal forms. Therefore, the actual number of certified assistants still active cannot be clearly determined, and information on this group as a whole is difficult to gather. The Board employee stated that since becoming x-ray certified, many dental assistants have quit or changed jobs, or have returned to school and become licensed dental hygienists.

The State Reorganization Commission determined that a system of regulation that includes exemptions for certain licensed practitioners, and a system of limited licensure, would not significantly decrease the availability of services.

CRITERION (8) IMPACT ON PRACTITIONER COMPETENCY

Determine whether regulation will assure the competency of practitioners of the occupation.

State regulation of professions and occupations exists to assure that all practitioners possess a minimum level of knowledge and competence. Criterion Eight seeks to determine whether regulation of the profession would be a continuing and effective remedy to the problems identified under Criterion One.

Correlation Between Credentialing and Competency.

Reaction to Congressional and Food and Drug Administration (FDA) support for national standards for credentialing radiologic technologists has generated much debate in the United States on the effects of regulation on practitioner competency. Proponents of credentialing have argued that all operators of x-ray equipment should be able to demonstrate basic knowledge and skills in the use of radiation. Opponents have typically argued that existing standards on equipment are sufficient. While a number of studies have attempted to correlate the relationship of radiologic technologists' education and training with their performance, the results are contradictory and inconclusive, primarily because of the nature and limitations of available data and conditions.

Information on radiologic technologist training and performance is similarly limited in South Carolina. In an attempt to assess the current status of radiologic technologists' performance, the Commission examined records of inspections of medical facilities registered with DHEC to possess x-ray equipment. The data in these files, although not collected specifically for the purpose of assessing operator competency, nonetheless represent one of the only existing sources of information on radiologic technologists' training and performance in South Carolina. Medical facilities registered with DHEC to possess x-ray equipment are inspected periodically. Each registrant is required to provide a listing of all approved operators and their training. Inspectors cite violations related to technical problems and operating procedures of x-ray equipment, as well as "operator-controlled" violations related to exposure levels that are too high or too low, and those involving improper collimation of the x-ray beam (failure to restrict beam only to area under study). The Commission staff examined registrant files to determine if the incidence of operator-related violations between January 1990 and March 1994 was higher in healthcare settings that employed primarily non-credentialed persons. Operators were classified in two categories: those credentialed by the American Registry of Radiologic Technologists, and possessing the qualifications required by the proposed legislation, were designated as "R.T.s;" non-credentialed operators were classified as "Non-R.T.s." The "Non-R.T." category was further broken down by licensed practitioner, other licensed personnel, or unlicensed personnel. The results of this survey are displayed in the table below. If the performance of operators was the same, it would

be expected that the machines being demonstrated for inspectors in each setting would incur operator-controlled violations at the same rate. Hospital x-ray machines, whose operators were listed as credentialed persons, incurred the lowest operator violations. In physicians' offices, half of the machine operators were non-credentialed, but they incurred a disproportionate 62% of the operator violations. While the machines in chiropractic offices accrued violations at the highest rate, the operators were listed as licensed chiropractors, who are allowed to prescribe, as well as perform x-rays as part of their scope of practice. These findings appear to suggest slightly better performance of credentialed operators in settings which employ them.

TABLE 9
OPERATOR VIOLATIONS
BY NON-CERTIFIED RADIOLOGIC TECHNOLOGISTS

SETTING	# OF MACHINES INSPECTED	% OF MACHINES W/ OPERATOR VIOLATIONS	% OPERATOR VIOLATIONS BY NON-RTs	TYPE OF OPERATOR VIOLATIONS BY NON-R.T.s	
				Collimation	Exposure
Dentists	2,440	66 (3%)	100%	8%	92%
Hospitals	1,165	7 (< 1%)	0%	0%	0%
Physicians	550	47 (8%)	62%	89%	11%
Chiropractors	353	44 (12%)	98%	39%	61%
Podiatrists	32	2 (6%)	100%	100%	0%

Establishing Initial Competency of Practitioners.

Scope of Regulation. The proposed regulation would prohibit any person, other than one licensed under its provisions, or a licensed physician, podiatrist, dentist, chiropractor, osteopath, from using ionizing radiation on humans for diagnostic or therapeutic purposes. It would also prohibit anyone from employing an unlicensed person as a radiologic technologist. Licensed radiologic technologists would be prohibited from using ionizing radiation except under the direction, supervision, and prescription of a licensed physician, dentist, podiatrist, chiropractor, or osteopath. "Licensed practitioners" (defined in the bill as physicians, podiatrists, chiropractors, osteopaths, and dentists) are exempt from the licensure requirements. Resident physicians and students enrolled in schools of medicine, podiatry, chiropractic, osteopathy, dentistry, and radiologic technology are also exempt, provided they use ionizing radiation only under the supervision of a licensed practitioner or licensed radiologic technologist. There are no specific provisions in the bill to protect the use of the title "radiologic technologist" or initials that may be used to represent the title.

Grandfathering. All licensees would be required to have passed an examination, except during a period of two years from the effective date of the Act, when the Board must

issue a license, without examination, to any person who has been employed for a minimum of three of the immediately preceding five years as a radiologic technologist or dental radiographer. The educational requirements may also be waived by the Board to allow licensure of persons who have worked as a technologist for one of the three years preceding the effective date of the Act, upon passing a proficiency examination conducted by the Board.

Assurance of Minimum Qualifications. The qualifications required for admission to examination by the proposed licensing board are: an applicant must be at least eighteen years old and hold a high school diploma or its equivalent. In addition, the applicant must have completed a minimum of a twenty-four month educational program in radiography, radiation therapy, or nuclear medicine technology, that meets standards approved by national accrediting agency; and must not have been guilty of any of the acts that would be grounds for disciplinary action. In lieu of its examination, the Board may accept any of the following as fulfillment of the examination requirement, provided standards are as stringent as those established by the Board:

(1) current certificate of the American Registry of Radiologic Technologists or other recognized national voluntary credentialing body; or,

(2) current certificate, registration, or license issued by another state;

The Board must issue a license, valid for two years, to applicants who pass the examination, or otherwise qualify. The Board is authorized to issue nonrenewable temporary licenses, pending examination results. Holders of licenses must display them in each place of regular employment.

Assuring Continued Competency. A system of regulation would assure continued competency through establishment of a formal system of handling complaints against the conduct of radiologic technologists. A range of disciplinary actions would be available, including revocation and suspension of a state credential, effectively preventing the person from continuing to practice the occupation. The Commission found evidence in other states of radiologic technologists who had been disciplined for impaired practice, sexual misconduct, and exceeding the scope of their licensure.

The proposed regulation grants to Board the authority to establish continuing education requirements through regulation. There is no specific reference to the number of hours required. Continuing education is currently mandated for mammographers (10 hours every two years). A continuing education requirement will enhance clinical skills and ensure that licensees are kept up to date with rapidly changing imaging technologies. Beginning in 1995, all radiologic technologists wishing to maintain their registration with the American Registry of Radiologic Technologists will be required to earn 24 continuing education credits every two years. Opponents stated that these requirements would create a hardship for rural practitioners, who would not have access to continuing education opportunities. Proponents counter that continuing education credit can be obtained from attendance at conferences, directed readings, home study

courses, 11 educational seminars that are held across the nation, as well as programs at hospitals and schools.

State regulations currently require radiographers who perform mammograms (x-rays of the breast) to be qualified by education, experience, and examination, and to complete continuing education requirements. Requiring one group of radiologic technologists performing a specific radiologic procedure to meet competency standards, while not imposing similar requirements on radiologic technologists performing similarly risky procedures, may result in different levels of care being delivered to patients.

The State Reorganization Commission concludes that strengthening regulation of radiologic technologists will have a positive effect on the competency of practitioners.

As detailed under Criterion One, incompetent or poorly trained radiologic personnel may endanger patients by exposing them to unnecessary radiation, by producing poor quality images that may result in missed diagnoses, or by performing invasive procedures improperly. It is reasonable to assume that the chances of such incidents occurring would increase if radiologic technologists have not learned basic technical information regarding equipment operation, radiation safety precautions, patient positioning, or human anatomy. In recognition of the positive effect of training on machine operators, DHEC has required registrants of x-ray machines to assure that all operators are adequately instructed and competent in the use of the machines. However, as discussed under Criterion Four, the current system of regulation does not include a comprehensive system of objective competency assurance. While it would be difficult to prove whether credentialed practitioners are more competent than non-credentialed ones, it appears reasonable to assume that requiring minimum standards for training, as well as examining radiologic technologists on the knowledge gained from such training, would have a positive effect on radiologic technologists' job performance overall. As a 1985 study of the impact of credentialing on operator performance stated, upon concluding that minimum standards of knowledge and competence may have a positive effect on radiation protection practices,"... In short, we should not expect the credentialing process to correlate with or to assure the **best** job performance, but only to help prevent the **worst** performance by those entering the field." A system of regulation would also help assure continued competency through establishment of a formal system of handling complaints against the conduct of radiologic technologists. A range of disciplinary actions would be available, including revocation and suspension of a state credential, effectively preventing the person from continuing to practice the occupation.

As discussed under Criterion Seven, there is no provision for limited licensure in the bill. Regulation should take into account the scope and volume of x-ray examinations performed in different settings, and acknowledge that the amount and type of training required in order to produce a competent radiologic technologist in one setting may differ from that of a radiologic technologist called upon to perform a wide range of

examinations. A significant number of x-ray machine operators in South Carolina have no formal training in radiologic technology. Traditionally, most radiologic technologists used to be trained in the military or on the job. Today, radiologic technologists may rely on on-the-job training given by the supervising professional (physician, dentist,etc.) with whom they work. If a Board of Radiologic Technologists is established, standards for on-the-job training of limited licensees should be developed as an examination prerequisite. The adequacy of the on-the-job training depends heavily on the knowledge, skill, and teaching ability of the supervising professional (physician, etc.), whose formal education is more likely to have covered x-ray interpretation rather than the proper techniques for taking them. The high percentage of operator violations incurred by currently licensed practitioners is cause for concern, and some means of addressing this situation should be developed by the respective licensing boards and DHEC.

CRITERION (9) REGULATION THROUGH EXISTING STATE AGENCY

Determine whether regulation can be provided through an existing state agency or under supervision of presently licensed practitioners.

Proposed Means of Administering State Regulation

The proposed legislation would create a new state agency by establishing an independent seven-member "South Carolina Radiologic Technologists Board of Examiners," to license radiologic technologists who meet specific educational, examination, and experience requirements. The board would be comprised of four radiologic technologists, one public member, a medical radiation physicist, and a physician, all appointed by the Governor for three-year terms. The Board would be assigned responsibility for hiring staff, establishing licensing and examination fees, examining applicants, issuing biennial licenses, establishing standards for licensees and educational programs, investigating complaints and disciplining licensees.

Alternatives for Administration Within Existing Agency

Traditionally, the most common pattern found in the states for administering occupational regulation, once enacted, has been an autonomous or semi-autonomous board made up of members of the regulated profession. Increasingly, however, states have moved towards placement of licensing boards within a common or central agency of state government in the interest of achieving greater administrative efficiency and public accountability. Effective in February 1994, as a result of the State Restructuring Act passed last year by the General Assembly, the administrative functions of forty of the South Carolina's Professional and Occupational Licensing Agencies (POLAs) were centralized under a newly reorganized Department of Labor, Licensing, and Regulation. One effect of the statutory changes involved in restructuring was that the Director of the Department of Labor, Licensing, and Regulation, not the Board, assumed responsibility for appointing employees to carry out the Boards' administrative responsibilities. Most of South Carolina's health-related licensing boards are now located within this Department.

DHEC's existing radiation protection program, within the Bureau of Radiologic Health, offers another alternative for placement of the Board, since both programs are designed to protect the public from the harmful effects of radiation. DHEC Bureau of Radiological Health staff's knowledge about radiation, radiation safety, and equipment would also contribute to any regulatory program in this area. However, DHEC chose not implement the provisions of earlier legislation (Act 449 of 1986), which prohibited the application of ionizing radiation to humans by anyone not certified by the Department of Health and Environmental Control. In addition, as discussed under Issue 4, the Bureau staff's primary responsibility is conducting inspections of users of radioactive materials in medical, as well as industrial, settings, and does not readily accommodate

the examination, licensure, and disciplinary functions of a licensing board as well as placement within the Department of Labor, Licensing, and Regulation would. A DHEC official testified at the hearing that inspectors would continue to check that operators were properly trained, and that they have specific training on the equipment being used. Such inspections would provide registrants with an additional incentive for enforcement of licensing provisions; as well as provide DHEC inspectors with visible evidence of an operator's licensure status.

The State Board of Medical Examiners currently houses an advisory committee for the purpose of certifying respiratory therapists in South Carolina. However, since radiologic technologists' services are prescribed by other licensed health professionals such as chiropractors and dentists, placement of a regulatory agency under the aegis of the Board of Medical Examiners may present a conflict of interests.

The State Reorganization Commission concludes that, should a Board of Radiologic Technologists be established, the Board should be located within the existing Department of Labor, Licensing, and Regulation.

RECOMMENDATIONS

The State Reorganization Commission recommends that the General Assembly enact legislation to license radiologic technologists in South Carolina.

The provisions of Act 572 of 1988 specify that, in determining any recommendation for the regulation of an occupation, the State Reorganization Commission must recommend regulation only if it is necessary to protect the health, safety, or welfare of the public. Based on its evaluation using the nine Sunrise criteria, the State Reorganization Commission concludes that the unregulated practice of radiologic technologists presents a clear and recognizable danger. Therefore, regulation of the profession is in the public interest.

Under the provisions of the Sunrise Act, the State Reorganization Commission, in recommending regulation, must recommend the least extensive and restrictive form of regulation consistent with the public interest, and whether regulation should be assigned to an existing state agency or a newly-created board. When licensure is recommended, the Commission must also recommend what qualifications are specified for licensure and describe the activities that may be engaged in by persons pursuing the occupation. The Commission's recommendations in each of these three areas are outlined below.

Recommended Form of Regulation

The State Reorganization Commission recommends the establishment of a system of licensure of radiologic technologists to protect the health, safety, and welfare of South Carolinians.

State licensure of radiologic technologists will allow the administration of ionizing radiation to humans for diagnostic or therapeutic purposes, only by persons licensed or exempted under statutory requirements. In imposing licensure on a profession, the State grants permission to persons meeting predetermined qualifications, and passing a examination to demonstrate competency, to have the exclusive use of an occupational title **and** the exclusive right to engage in an occupation.

Under the provisions of the Sunrise Act, the State Reorganization Commission must recommend licensure only if the other means of regulation listed in the Sunrise Act are inadequate to protect the public. Existing regulations of the Department of Health and Environmental Control governing the inspection of facilities and practitioners using sources of ionizing radiation indirectly regulate radiologic technologists, and contain elements that resemble components of a licensure program. However, the Commission has determined that the current regulatory structure was not intended to, nor does it,

provide assurance of radiologic technologists' competency. However, degrees of regulation contained in the Sunrise Act that are less stringent than licensure would, in some instances, such as in the case of existing mandatory certification requirements for mammographers, reduce or eliminate existing protective measures. Therefore, the State Reorganization Commission has determined that state licensure of radiologic technologists is the only form of regulation that offers the following elements necessary to ensure the protection of the public from the hazards of incompetent or unqualified practice of radiologic technology:

- *Clear, Consistent Standards for Radiologic Technologist Education Programs.* A board should be assigned responsibility for the development of minimum standards for radiologic technologist education programs in each category of licensure; approval of programs that meet the prescribed standards; and denial or withdrawal of approval of education programs that fail to meet the prescribed standards. Minimum standards for "on-the-job" training and shorter-term training for limited licensees should also be adopted.

- *Independent Verification of Practitioner Competency Through Use of Valid Testing.* All licensees should have demonstrated their knowledge and competency in radiologic technology by passing a valid and reliable examination. The Board should develop or adopt examination standards, and exam candidates. Examination results of other states or recognized credentialing organizations should be accepted, provided the examinations meet or exceed the standards established by the Board.

- *Central Registry of Qualified Radiologic Technologists.* Under existing conditions, the absence of a central listing of radiologic technologists makes it difficult to verify the number, location, and training of practitioners. Licensure of radiologic technologists will not only provide consumers and employers with information on qualified practitioners, but also has the potential to improve tracking of the occupational radiation exposure of practitioners, and to provide reliable statistical information on practitioners that can be used in health manpower projections and planning.

- *Consistent Nomenclature for Radiologic Technologists.* Since only those who meet the qualifications may legally use designated titles and initials, licensure will assist the public in identifying competent radiologic technology practitioners. The Board should be authorized to prescribe appropriate titles for use by licensees and to limit the use of such titles.

- *Disciplinary Sanctions Against Incompetent or Unsafe Practitioners.* Licensure of radiologic technologists will protect by public by providing a means for disciplining or removing persons from practicing who pose a threat to public health or safety. The Commission recommends that the proposed legislation be amended to expand the grounds for disciplinary action to include the incompetent

or negligent practice of radiologic technology, failure to observe radiation safety principles, and the use of titles by unauthorized persons.

Recommended Assignment of Regulation

The State Reorganization Commission recommends that responsibility for licensure of radiologic technologists should be assigned to a newly-created "Board of Radiologic Technologists," housed within the Department of Labor, Licensing, and Regulation.

The Board should consist of four radiologic technologists, one from each category of licensure; one consumer member; a physician member who has special knowledge of radiology, radiation oncology, or nuclear medicine; and a medical radiation physicist.

The Department of Labor, Licensing, and Regulation currently houses virtually all of South Carolina's professional licensing agencies, including other health-related boards. The recent consolidation of administrative functions within the Department should provide the new Board with the benefits of the collective experience of other boards in regard to licensing, examination, and disciplinary issues. The provisions of the bill should therefore contain appropriate provisions similar to those governing other professional licensing boards administered through the Department of Labor, Licensing, and Regulation, including granting the Director of the Department the authority to employ Board personnel, and changing wording relating to Board funding.

Recommended Qualifications for Licensure

The State Reorganization Commission recommends the enactment of licensure standards for the following four categories of practitioners: radiographer, limited-practice radiographer, nuclear medicine technologist, and radiation therapist.

The proposed legislation would have required successful completion of a minimum 24-month course of study in each category of licensure. Instead, provisions specifying education and training should be worded broadly enough to reflect the varying types and length of training commensurate with the range of duties performed by different categories of licensees.In developing its regulations, standards, and policies governing educational and examination requirements for licensure, the Board should follow the "Standards for the Accreditation of Educational Programs for and the Certification of Radiologic Personnel" included in Part 75 to Title 42 of the *Code of Federal Regulations*, which address three of the proposed categories of licensure: radiographers, radiation therapists, and nuclear medicine technologists. The development of these standards involved a thorough analysis of each of these occupations, and will ensure consistency in terminology and licensure requirements with other States.

One concern expressed in the debate over radiologic technologist regulation is that regulation will exacerbate existing shortages of qualified radiological services personnel, specifically in the offices of private practitioners, whose volume of x-ray examinations

are relatively low. To avoid this potential effect of regulation, the proposed bill should also grant the Board the authority to grant limited licenses to persons whose performance consists of radiographic examinations is limited to specific areas of the body, such as the chest or extremities.

Grandfathering Provisions. The proposed bill would allow existing practitioners who have been employed as radiologic technologists for three of the five years preceding the effective date of the Act to be "grandfathered" (without examination) for a period of two years following the effective date of the licensure act. The bill would have also allowed the Board to license persons who have worked as a technologist for one of the three years preceding the effective date of the Act, upon passing a proficiency examination conducted by the Board. To alleviate concerns over persons who have not demonstrated their competency by passing an examination, these provisions should be changed to allow persons employed as radiologic technologists within two years of the effective date of the Act, and do not otherwise qualify for licensure, to be admitted to an appropriate proficiency examination administered by the board, and upon demonstration of competency issued a license.

Exemptions. Dental radiographers and nurses, who are currently under the jurisdiction of other licensing boards, should be added to list of exemptions. However, the Commission recommends that in order to achieve a consistent level of protection to the public, the State Board of Dentistry should strengthen its existing x-ray certification program for unlicensed dental employees by promulgating regulations regarding specific standards for x-ray educational programs for unlicensed personnel, examination requirements, and a system of maintaining a current registry of all persons who have been successfully x-ray certified. The Commission is also concerned over the percentage of operator violations cited by DHEC against licensed practitioners. The General Assembly may wish to amend the practice act of each health profession in which practitioners are authorized to employ x-rays, to require specific grounds for disciplinary action against practitioners who fail to observe adequate radiation safety practices, a provision that is currently contained only in the Dental Practice Act.

BILL SYNOPSIS
S. 636: Medical Radiation Health and Safety Act

SECTION ONE. Statement of findings.

SECTION TWO. Major provisions. The bill adds Chapter 62 to Title 40 of the *South Carolina Code of Laws 1976*, as amended, to "establish minimum standards of education and to provide for the appropriate examination and licensure of persons operating medical and dental equipment emitting ionizing radiation."

40-62-10. Title. The short title of the bill is the "Medical Radiation Health and Safety Act."

40-62-20. Definitions.

40-62-30. Requirement for licensure. The bill prohibits any person, other than one licensed under this chapter, or a licensed physician, podiatrist, dentist, chiropractor, osteopath, from using ionizing radiation on humans for diagnostic or therapeutic purposes. This section also prohibits anyone from employing an unlicensed person as a radiologic technologist. Licensed radiologic technologists are prohibited from using ionizing radiation expect under the direction, supervision, and prescription of a licensed physician, dentist, podiatrist, chiropractor, or osteopath.

40-62-40. Persons not subject to provisions of chapter. "Licensed practitioners" (defined in the bill as physicians, podiatrists, chiropractors, osteopaths, and dentists) are exempt from the licensure requirements. Resident physicians and students enrolled in schools of medicine, podiatry, chiropractic, osteopathy, dentistry, and radiologic technology are also exempt, provided they use ionizing radiation only under the supervision of a licensed practitioner or licensed radiologic technologist.

40-62-50. Creation of board; membership; method of appointment. An independent, seven-member "South Carolina Radiologic Technologists Board of Examiners" is created, with members appointed by the Governor. The board is composed of four radiologic technologists, a consumer member, a medical radiation physicist, and a physician licensed in South Carolina and having an interest in the field of radiation health services. Nominations for qualified members may be submitted to the Governor by any individual, association, or organization.

40-62-60. Terms of board members; appointment and removal; expenses. Board members serve three-year terms, except for the initial appointees, whose terms are staggered. Members are limited to two consecutive three-year terms. The Governor may remove any board member for causes outlined in this section. Board members receive

no salary, but are entitled to the usual mileage, subsistence, and per diem provided by law to members of State boards and commissions.

40-62-70. Board meetings. The Board must meet at least twice annually, and as other times upon the call of the chair.

40-62-80. Expenditure of funds and employment of staff by board. The Board is authorized to employ staff and expend its funds as necessary for administering and enforcing the provisions of this chapter.

40-62-90. Revenues and income; assessments, fees, or licenses; annual report. These provisions for remitting revenues and income to the State Treasurer, and levying fees and assessments are in accordance with Chapter 5 of Title 11 of the *South Carolina Code of Laws 1976*, as amended, which applies to other Professional Occupational Licensing Agencies as well.

40-62-100. Annual report. This section requires an annual report by the Board in accordance with the provisions of Chapter 73, Title 40.

40-62-110. Powers and duties of board. The Board is authorized to administer and enforce the provisions outlined in this chapter, including but not limited to the following: issuing regulations in accordance with the Administrative Procedures Act; evaluating the qualifications of applicants; supervising examinations; issuing licenses to qualified applicants; establishing criteria and standards for educational programs in radiologic technology; holding hearings as may be required; establishing ethical standards of practice, and setting fees by regulation. The Board is responsible for establishing licensure standards for four categories of licenses: radiographer, radiation therapist, nuclear medicine technologist, and temporary license holder. The Board may also promulgate by regulation, continuing education requirements as a condition for the renewal of licenses.

40-62-120 and 130. Examinations. Prior to being admitted for examination by the Board, an applicant must be at least eighteen years old and hold a high school diploma or its equivalent. In addition, the applicant must have completed a minimum of a twenty-four month educational program in radiography, radiation therapy, or nuclear medicine technology, that meets standards approved by national accrediting agency; and must not have been guilty of any of the acts that would be grounds for disciplinary action outlined in §40-62-170.

40-62-140. Waiver of examination. In lieu of its examination, the Board may accept any of the following as fulfillment of the examination requirement, provided standards are as stringent as those established by the Board:

(1) current certificate of the American Registry of Radiologic Technologists or other recognized national voluntary credentialing body;

(2) current certificate, registration, or license issued by another state.

40-62-150. Issuance of licenses; display of license by holder. The Board must issue a license, valid for two years, to applicants who pass the examination, or otherwise qualify. The Board is authorized to issue nonrenewable temporary licenses, pending examination results. Holders of licenses must display them each place of regular employment.

40-62-160. Renewal and reinstatement of licenses. Licenses are to be renewed every two years. The Board may make renewal contingent upon completion of continuing education requirements to be established by regulation. A lapsed license may be reinstated as long as no more than two years have passed since the licensee has ceased practice. Upon revocation of a license, re-application to the Board may be made no sooner than two years after the Board's order.

40-62-170. Complaints; grounds for disciplinary action. The Board may, upon its own motion, and shall upon the written complaint of an aggrieved person, investigate the activities of an applicant or licensee who is guilty of the acts outlined in this section.

40-62-180. Investigation of complaints. The Board is authorized to investigate complaints, issue subpoenas, and administer oaths.

40-62-190. Hearings. This section provides for all hearings to be held in accordance with the provisions of the Administrative Procedures Act.

40-62-200. Cease and desist orders. This section authorizes the Board to issue cease and desist orders upon sufficient evidence that a person is violating a provision of this chapter.

40-62-210. Penalties for violation of chapter. Violations of this chapter are a misdemeanor, punishable by a fine of not more than three hundred dollars or imprisonment not to exceed six months, or both.

40-62-220. Termination date of board. This section schedules the Board for Sunset Review, terminating the Board on June 30, 1999, unless reauthorized under the provisions of the Sunset Act (Act 608 of 1978).

SECTION THREE. Temporary Fees. This section establishes a temporary fee schedule until such fees can be set by regulation of the Board, in accordance with the Administrative Procedures Act. Licensure and renewal fees are set at $100.

SECTION FOUR. Grandfathering provisions. For a period not to exceed two years from the effective date of the Act, the Board must issue a license, without examination, to any person who has been employed for a minimum of three of the immediately preceding five years as a radiologic technologist or dental radiographer. This section also waives the educational requirements by allowing the Board to license persons who have

worked as a technologist for one of the three years preceding the effective date of the Act, upon passing a proficiency examination conducted by the Board.

SECTION FIVE. Effective date. The act takes effect upon the approval of the Governor.

A BILL

TO AMEND TITLE 40, CODE OF LAWS OF SOUTH CAROLINA, 1976, BY ADDING CHAPTER 62 SO AS TO ENACT THE MEDICAL RADIATION HEALTH AND SAFETY ACT; TO CREATE THE SOUTH CAROLINA RADIOLOGIC TECHNOLOGISTS BOARD OF EXAMINERS; TO PROVIDE FOR ITS MEMBERS, POWERS, AND DUTIES; TO ESTABLISH LICENSING REQUIREMENTS, PENALTIES, AND FEES.

Be it enacted by the General Assembly of the State of South Carolina:

SECTION 1. The General Assembly finds that in the interest of public health, the citizens of this State should be protected from excessive and improper exposure to ionizing radiation. It is the purpose of this act to establish minimum standards of education and to provide for the appropriate examination and licensure of persons operating medical and dental equipment emitting ionizing radiation.

SECTION 2. Title 40 of the 1976 Code is amended by adding:

"CHAPTER 62

Radiologic Technologists

Section 40-62-10. This chapter may be cited as the 'Medical Radiation Health and Safety Act'.

Section 40-62-20. As used in this chapter:
(1) 'Board' means the South Carolina Radiologic Technologists Board of Examiners.
(2) 'License' means a certificate issued by the board authorizing the licensee to use radioactive materials or equipment emitting ionizing radiation on humans for diagnostic or therapeutic purposes in accordance with the provisions of this chapter.
(3) 'Licensed practitioner' means a person licensed to practice medicine, dentistry, podiatry, chiropractic, or osteopathy in this State.
(4) 'Nuclear medicine technologist' means a person, other than a licensed practitioner, who prepares and administers radiopharmaceutical agents to humans for diagnostic and therapeutic purposes.
(5) 'Radiation therapist' means a person, other than a licensed practitioner, who applies radiation to humans for therapeutic purposes.
(6) 'Radiographer' means a person, other than a licensed practitioner, who applies radiation to humans for diagnostic purposes.

(7) 'Radiologic technologist' means a person who is a radiographer or radiation therapist, or nuclear medicine technologist, licensed under this chapter.
(8) 'Temporary license' means a certificate issued by the board, authorizing an applicant to use radioactive material or equipment emitting ionizing radiation on humans for diagnostic or therapeutic purposes, when the applicant's licensure or re-licensure is pending before the board and when the issuance may be justified by special circumstances as determined by the board.

Section 40-62-30. (A) No person, other than a licensed practitioner, or a radiologic technologist licensed under this chapter, may use ionizing radiation or equipment emitting or detecting ionizing radiation on humans for diagnostic or therapeutic purposes.
(B) No person knowingly may employ as a radiologic technologist a person required by this chapter to hold a license who does not hold a license issued under this chapter.
(C) No person holding a license issued under this chapter may use radioactive substances or equipment emitting or detecting ionizing radiation on humans for diagnostic or therapeutic purposes unless under the direction and supervision of a licensed practitioner and unless so directed by prescription of a licensed practitioner.

Section 40-62-40. (A) Nothing in this chapter limits, enlarges, or affects the practice of a licensed practitioner.
(B) A resident physician or a student enrolled in and attending a school or college of medicine, osteopathy, chiropractic, dentistry, podiatry, or radiologic technology who applies ionizing radiation to humans while under the supervision of a licensed practitioner or direct supervision of a licensed radiologic technologist is not required to be licensed under this chapter.

Section 40-62-50. There is created the South Carolina Radiologic Technologists Board of Examiners which consists of seven members appointed by the Governor. All members must be residents of this State. Four of the members must be radiologic technologists, one representative of each modality, with at least five years' experience each; one member must be a consumer; one member must be a physician who is licensed to practice in South Carolina who has a special interest and knowledge in diagnostic radiology, radiation oncology, or nuclear medicine; and one medical radiation physicist. The radiologic technologists initially appointed to the board must be eligible for licensure pursuant to this chapter; thereafter, radiologic technologists appointed to the board must be licensed pursuant to this chapter. An individual, group, or association may nominate qualified individuals to the Governor for his consideration.

Section 40-62-60. The members shall serve for terms of three years and until their successors are appointed and qualify; except that of the members first appointed to the board, three shall service for three years, three shall serve for two years,
and one shall serve for one year, and until their successors are appointed and qualify. Vacancies shall be filled for an unexpired term in the manner provided by original appointment. No person may serve as a member of the board for more than two

consecutive three-year terms, except that if a person is appointed to fill an unexpired term on the board, the person may be reappointed for two additional three-year terms. The Governor, after notice and opportunity for hearing, may remove a member of the board for neglect of duty, incompetence, revocation or suspension of licensure, or other dishonorable conduct. Members
of the board shall receive mileage, subsistence, and per diem provided by law for members of state boards and commissions for each day actually engaged in the duties of the office. These expenses must be paid from the fees received by the board under this chapter.

Section 40-62-70. The board shall meet at least twice a year and at other times upon the call of the chairman. Four members of the board constitute a quorum, but no action of the board is valid unless authorized by the affirmative vote of a majority of the members present. Each year the board shall select from its membership a chairman, vice-chairman, and secretary to serve one-year terms and until their successors are elected.

Section 40-62-80. The board may employ staff as necessary for the performance of its duties under this chapter and may expend its funds for any purpose the board considers necessary for the proper performance of its duties under this chapter.

Section 40-62-90. All revenues and income from licenses, examination fees, sale of commodities and services, and income derived from any other board source or activity must be remitted to the State Treasurer as collected when practicable, but at least once each week and must be credited to the general fund of the State. All assessments, fees, or licenses must be levied in an amount at least equal to one hundred fifteen percent of the amount appropriated in the annual general appropriations act for the board.

Section 40-62-100. The annual report required by Chapter 73 must be prepared and filed by the board in accordance with that chapter.

Section 40-62-110. The board:
(1) shall administer and enforce this chapter;
(2) shall promulgate regulations, in accordance
with the Administrative Procedures Act and after consultation with the public and other concerned parties, to carry out the purposes of this chapter, including, but not limited to, regulations relating to the establishment of ethical standards of practice for persons holding a license issued under this chapter;
(3) shall establish the licensure standards for a radiographer (R), radiation therapist (T), nuclear medicine technologist (N), and temporary license holder (L). Persons holding these licenses must be recognized by this nomenclature;
(4) shall have the responsibility of evaluating the qualifications of, supervising the examinations of, and making the appropriate recommendation regarding the issuance of licenses to qualified applicants;
(5) shall conduct hearings and keep records and

minutes necessary to carry out its functions and shall provide notice of all hearings authorized under this chapter pursuant to the Administrative Procedures Act.
(6) shall establish license and examination fees by regulation;
(7) may establish continuing professional education requirements which are the same requirements as the American Registry of Radiologic Technologists.

Section 40-62-120. The board shall admit to examination for licensure an applicant who shall pay a nonrefundable fee established by the board and submit satisfactory evidence, verified by oath or affirmation, that the applicant:
(1) at the time of application is at least 18 years of age;
(2) has successfully completed four years of high school or its equivalent;
(3) has successfully completed a minimum 24 month course of study in radiography, nuclear medicine technology, or radiation therapy approved by the National Accrediting Agency;
(4) has not, before or during the pendency of an application to the board, been guilty of any act, omission, condition or circumstance which would provide cause for disciplinary action under this chapter.

Section 40-62-130. (A) An applicant for licensure shall pass a licensure examination designated and approved by the board which covers the basic subject matter of radiologic technology, skills, and techniques.
(B) The board shall hold an examination at least every six months at times and places within the state of South Carolina as the board considers necessary and appropriate.
(C) An applicant who fails the examination may reapply for the examination provided the applicant complies with regulations established by the board.
(D) Each application for examination for licensure must be accompanied by the fee prescribed by the board.

Section 40-62-140. (A) The board may accept, in lieu of its own examination, a current certificate by the American Registry of Radiologic Technologists or other recognized national voluntary credentialing body, issued on the basis of an examination satisfactory to the board, if the standards of the issuing body are at least as stringent as those established by the board.
(B) The board may accept, in lieu of its own examination, a current certificate, registration, or license as a radiologic technologist issued by another state, if the standards in the other state are at least as stringent as those established by the board.

Section 40-62-150. (A) The board shall issue a license to an applicant who has successfully passed the board examination or has otherwise been qualified under this chapter and has paid the prescribed fees. The license is valid for two years from the date of its issuance.
(B) Upon application for examination for initial licensure, the board may issue a temporary license to a graduate of an approved school who meets the qualification for licensure, pending result of the first licensing examination scheduled by the board

following the applicant's graduation. The temporary license expires thirty days after the board gives written notice of the results of the examination held following the issuance of the temporary license. A temporary license may not be renewed or another issued to the same person.

(C) Holders of a license under this chapter shall display the official license document or a verified copy in each place of regular employment.

Section 40-62-160. (A) A license issued under this chapter must be renewed every two years without examination upon application for renewal on a form prescribed by the board. The applicant is responsible for obtaining, completing, signing, and forwarding the renewal application to the board with the required fee. Renewal of a license issued under this chapter may be contingent upon the fulfillment of continuing education requirements as promulgated in regulation by the board in accordance with the Administrative Procedures Act.

(B) The board may deny an application for renewal for any reason which would justify the denial of an original application for a license. An application for renewal is considered delinquent and subject to a late fee if it is not received within thirty days after the due date.

(C) A radiologic technologist whose license has lapsed and who has ceased activities as a radiologic technologist for not more than two years may have this license reinstated upon payment of the renewal fee established by the board. The board may require, as a condition for reinstatement, submission of evidence satisfactory to the board that the applicant has fulfilled continuing education requirements as promulgated by the board.

(D) When the license of a person has been revoked, reapplication to the board may be made no sooner than two years after the date of the board's order revoking the license.

Section 40-62-170. (A) The board may, upon its own motion, and shall, upon the written complaint of an aggrieved person, investigate the activities of an applicant or a person licensed under this chapter and may deny, suspend, revoke, or otherwise restrict a license or impose either a public or private reprimand, or other discipline, if the board finds an applicant or licensed radiologic technologist:

(1) is guilty of fraud or material deception in the procurement or holding of a license;

(2) has been convicted of a felony in a court of competent jurisdiction, either within or outside of this State, unless the conviction has been reversed and the holder of the license discharged and acquitted; or if the holder has been pardoned with full restoration of civil rights, in which case the license must be restored;

(3) has knowingly aided or abetted a person, who is not a medical radiologic technologist or otherwise authorized by this chapter to perform the duties of a license holder under this chapter;

(4) has undertaken or engaged in any practice beyond the scope of duties permitted a license holder under this chapter;

(5) has impersonated a licensee or former license holder or is performing duties of a radiologic technologist under an assumed name;

(6) has sustained any medical problem, disability, or addiction which, in the opinion of the board, would impair professional competence;

(7) has interpreted a diagnostic image for a licensed practitioner, a patient, the patient's family, or the public;

(8) has applied ionizing radiation to humans without a prescription from a licensed practitioner;

(9) has applied ionizing radiation to humans without the direction and supervision of a licensed practitioner;

(10) has failed to pay any applicable fees;

(11) has violated a law of another state regulating radiologic technologists while visiting or residing in that state;

(12) has violated any provision of this chapter or regulation promulgated under this chapter.

Section 40-62-180. For the purposes of an investigation or proceeding under this chapter, the board or a person designated by the board may administer oaths and affirmations, subpoena witnesses, take testimony, and require the production of documents or records which the board considers relevant to the inquiry. In the case of refusal to obey a subpoena issued to a person, the court of common pleas, upon application by the board, may issue an order requiring the person to appear before the board, produce documentary evidence, and give other evidence concerning the matter under inquiry.

Section 40-62-190. (A) Before the board imposes on a licensee a sanction permitted by this chapter or denies issuance of a license to an applicant, the board shall provide a hearing in accordance with Article 3, Chapter 23 of Title 1, the South Carolina Administrative Procedures Act.

(B) The date of the hearing may not be less than thirty or more than one hundred twenty days after
the date the licensee or applicant is notified of the charges.

(C) If a licensee or applicant fails to appear at a hearing after reasonable notice, the board may proceed to hear the evidence against the licensee or applicant and take action as if the licensee or applicant had been present. A notice of hearing or final decision of the board in a disciplinary proceeding must be served upon the licensee or applicant by personal service or by certified mail, return receipt requested, to the last known address of record on file with the board.

(D) A decision by the board to revoke or suspend a license or certification or to restrict, limit, or otherwise discipline a licensee must be by majority vote of the total membership of the board. A disciplinary action is subject to review by the circuit court upon petition filed by the licensee within thirty days from the date of delivery of the board's decision to the licensee.

(E) A person who has exhausted all administrative remedies available within this chapter and who is aggrieved by a final decision of the board is entitled to judicial review in accordance with Article 3, Chapter 23 of Title 1, the South Carolina

Administrative Procedures Act. The review is limited to the record established by the board hearing.

(F) No stay or supersedeas may be granted for more than six months pending appeal from a decision by the board to revoke, suspend, or otherwise restrict a license.

Section 40-62-200. (A) When the board has sufficient evidence that a person is violating a provision of this chapter, the board, in addition to all other remedies, may issue a cease and desist order prohibiting a person from violating the provisions of this chapter. The cease and desist order is final ten days after it is issued unless the person to whom the order is issued requests a hearing before the board.

(B) The violation of a cease and desist order of the board issued under subsection (A) subjects the person violating the order to further proceedings before the board, and the board may impose a fine not exceeding three hundred dollars for each transaction constituting a violation of the order. Each day's violation constitutes a separate violation.

(C) Initial judicial review of the decision of the board entered pursuant to this section is available solely in the circuit court of the county of domicile of the board.

(D) Nothing in this section may be construed to prohibit the board from seeking remedies otherwise available by statute without first seeking a cease and desist order in accordance with this section.

Section 40-62-210. A person who violates a provision of this chapter, or a regulation promulgated or order issued pursuant to this chapter, is guilty of a misdemeanor and, upon conviction, must be fined not more than three hundred dollars or imprisoned not more than six months, or both.

Section 40-62-220. The South Carolina Radiologic Technologists Board of Examiners is subject to review under Chapter 20, Title 1, and the programs, functions, and regulations of the board must be terminated as provided in Chapter 20, Title 1, on June 30, 1999, unless reauthorized by law."

SECTION 3. The following fees are in effect until fees are set in regulation promulgated pursuant to the Administrative Procedures Act by the South Carolina Radiologic Technologists Board of Examiners as created in Section 40-62-50, as contained in Section 2 of this act:

(1) Examination and initial license fee	$100.00
(2) License renewal fee	100.00
(3) Temporary license fee	25.00
(4) Late fee	50.00
(5) Duplicate license	25.00

SECTION 4. (A) For two years after this act's effective date, upon application and the payment of a fee equivalent to that required for the written examination and initial

licensing fee, the South Carolina Radiologic Technologists Board of Examiners, as established in Section 40-62-50, as contained in Section 2 of this act, shall issue a license without examination to a person who has been employed as a radiographer, nuclear medicine technologist, or radiation therapist for a minimum of three years of the immediately preceding past five years.

(B) A proficiency test must be conducted by the South Carolina Radiologic Technologists Board of Examiners at a time and place designated by the board for those individuals who have worked as a technologist one of the past three years immediately before this act's effective date. Those individuals receiving a satisfactory score as determined by the board must be issued a license to practice radiologic technology.

SECTION 5. This act takes effect upon approval by the Governor.

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