Fluoroscopy Education Requirements Present Practice Barrier: A Collaborative Solution

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ABSTRACT

Institutions are challenged to provide education in order to adhere to evolving practice requirements. In May 2013, the Iowa Supreme Court ruled that supervision of fluoroscopy by a licensed provider was within the scope of practice for advanced registered nurse practitioners. The Iowa Board of Nursing issued a ruling requiring advanced registered nurse practitioners supervising fluoroscopy to obtain education in radiation safety in 4 specific content areas. This article describes the development of an educational course in radiation safety for the supervision of fluoroscopy preventing a potential barrier to nurse practitioner practice.

Keywords: fluoroscopy, health policy, nurse practitioner

The increased use of diagnostic and interventional medical imaging in the United States has led to increased exposure of ionizing radiation to the population. This increased exposure is highlighted in Report No. 160 from the National Council on Radiation Protection and Measurement (NCRPM), Ionizing Radiation Exposure of the US Population.[1] The NCRPM Report No. 160 led the Food and Drug Administration (FDA) to draft initiatives requiring the reduction of radiation exposure from medical imaging. These initiatives included expanding the principles of justification and optimization and improved the regulation of the production of fluoroscopy machines. The machine regulations required the reduction of ionizing radiation scatter produced by fluoroscopy machines.[2] As these machines have become safer, using fluoroscopy for multiple diagnostic, medical, and surgical treatment modalities has become prevalent. Because of the increasing use of medical imaging in treatment procedures, regulatory agencies are continually reviewing and requiring increased education in radiation safety for advanced practice providers. These education requirements are meant to improve patient and occupational safety but can be a barrier to practice if the practitioner is unable to obtain the required education. This article describes the development of an online, asynchronous educational course in radiation safety for the supervision of fluoroscopy that resulted from the Iowa Board of Nursing (IBON) implementing additional education requirements. The engagement of interprofessional collaboration from departmental experts provided the course content, education methods, and a process to identify and track providers needing the radiation safety education required for credentialing and privileging.

BACKGROUND

In May 2013, the Iowa Supreme Court ruled that supervision of fluoroscopy by a licensed provider was within the scope of practice for advanced registered nurse practitioners.[3] The term *advanced registered nurse practitioner* is synonymous with advanced practice registered nurse (APRN) in the state of Iowa. Although this court case was initially brought forth over certified registered nurse anesthetist (CRNA) scope of practice, the ruling affected all APRN practice of fluoroscopy in the state of Iowa. This ruling, although substantive in sustaining the scope of

practice of APRNs, also highlighted the need for additional education in radiation safety. The IBON issued a ruling (7.2[2]) requiring APRNs supervising fluoroscopy to obtain education in radiation safety in 4 specific content areas (Table 1). The ruling was issued in June 2014, and the audit process began in January 2015.[4] APRNs in Iowa and their employers needed to identify sources of available radiation safety education and develop a process to make this education accessible to the providers for adherence to the new ruling.

DANGERS OF IONIZING RADIATION EXPOSURE

Fluoroscopy is an invaluable tool that provides real-time visualization of anatomy and anatomic function.[5] Fluoroscopy is a form of ionizing radiation and has destructive potential to tissue. Ionizing radiation produces positively and negatively charged ions when passed through matter such as tissue. The transition of these ions through tissue can cause damage to normal tissue through the disruption of normal protein bonds at the molecular level.[6] Harmful effects of ionizing radiation include damage to the skin, hair loss, cataracts, and cancer.[7] Of the various forms of diagnostic imaging, fluoroscopy has the potential to expose the patient and health care provider to a relatively high radiation dose because the primary absorption medium of the ionizing radiation is tissue.[5,6] The operator of the fluoroscopy machine must balance between adjusting the amount of energy from the fluoroscopy unit to obtain a quality image and minimizing the amount of energy to prevent patient and health care provider tissue damage.[5] Health care practitioners using fluoroscopic imaging have a responsibility to promote occupational and patient safety through remaining knowledgeable about the dangers of ionizing radiation and methods to safely control its use.[8]

Table 1. Iowa Board of Nursing Supervision of Fluoroscopy 7.2(2)

An advanced registered nurse practitioner (ARNP) shall be permitted to provide direct supervision in the use of fluoroscopic X-ray equipment pursuant to:

a. The ARNP shall provide direct supervision of fluoroscopy pursuant to the following provisions: (1) Completion of an educational course including content in radiation physics, radiobiology, radiological safety and radiation management applicable to the use of fluoroscopy, and maintenance of documentation verifying successful completion.

Promotion of Decreased Radiation Exposure Through Education

In 2009, the NCRPM released Report No. 160, which showed that Americans are exposed to ionizing radiation from medical procedures 7 times greater than previously reported in the early 1980s.[1] According to this report, medical exposure constituted almost half of the total radiation exposure of the US population from all sources including natural radiation in soil, radon gas, and radiation from space. The NCRPM report has improved the information surrounding harmful radiation effects from medical imaging. In the early 1990s, the response to the NCRPM Report No. 160 combined with a spike in the reported harmful effects of radiation exposure led to the Initiative to Reduce Unnecessary Radiation Exposure from Medical Imaging by the FDA.[2] Through this initiative, the FDA outlined 2 principles of radiation protection to promote patient and occupational safety. These 2 principles include justification and dose optimization. The first principle of justification states that the imaging procedure will do more good than harm to the individual patient. The second principle of dose optimization adheres to the recommended practice of the As Low as Reasonably Achievable technique. The As Low as Reasonably Achievable technique states that medical imaging examinations should be adjusted to administer the lowest radiation dose that yields a quality image for diagnosis or intervention. The FDA initiative has brought to light the importance of educating all health personnel in these specific principles.

Education of Physician Operators of Fluoroscopy

The interventional radiology discipline has shown increasing education of physicians in the principles of justification, and optimization has decreased the total amount of fluoroscopy time. The decrease in fluoroscopy time is significant because the shorter time leads to a subsequent decrease in patient and health care provider radiation exposure.[5] Other studies in interventional radiology have shown increasing education with mini–hands-on courses in

radiation-sparing techniques is efficacious in reducing radiation dose to patients and ancillary staff.[9,10] Recently, it has been shown that online educational course work can also affect a decrease in patient radiation dose.[6] The literature supports that educating fluoroscopy operators will assist in decreasing radiation exposure from fluoroscopy. Although these studies can provide direction in developing course work, there is still a gap in establishing a precedent for education requirements for supervisors of fluoroscopy versus operators of fluoroscopy.

Lack of Uniform Education Requirements

The FDA promotes collaboration in areas of appropriate use and education of providers for radiation exposure; however, the regulatory authority of the FDA strictly applies to imaging equipment and manufacturers. Statements by the FDA such as "States and/or accreditation organizations may have additional requirements that go beyond the Centers for Medicare & Medicaid Services requirements" indicate individual states or accreditation organizations have a responsibility to establish requirements for minimizing radiation exposure.[2] As such, currently, individual states and licensing boards determine the appropriate radiation safety education needed for supervision of fluoroscopy.

Because of the individualization of state parameters in developing education curriculum, there is no uniform agreement on the amount or topics needed for education of fluoroscopy supervisors.[11] The American College of Radiology (ACR) in collaboration with the American Association of Physicians has published technical standards for the management of fluoroscopy; however, these have been denoted by the ACR as educational tools and not intended to be a legal standard of care.[12] Because of the statement by ACR that the standards were denoted as educational only, the Iowa Supreme Court in *Iowa Medical Society and Iowa Society of Anesthesiologists v Iowa Board of Nursing* concluded that ACR recommendations are not to be taken as a legal standard of care.[3,11] The lack of recognized national standards has propelled states to establish educational requirements independently. This has led to varying regulations among states in the requirements of education for fluoroscopy supervision. Because of the lack of uniform educational requirements, the implementation of education on radiation safety for fluoroscopy supervision needs further direction.

INTERPROFESSIONAL COLLABORATION

The National Academy of Medicine has provided evidence regarding the benefits of interprofessional collaboration and recently studied how to measure the impact of interprofessional education on collaborative practice and patient outcomes.[13] Institutions facing additional demands for the education of health care practitioners can consider interprofessional collaboration to develop educational course work to meet these demands. In January 2015, the University of Iowa Hospitals and Clinics (UIHC) needed to address the new IBON ruling (7.2[2]) requiring additional radiation safety education for nurse practitioners supervising fluoroscopy. Because of the lack of national and state educational standards for fluoroscopy supervisors, an interdisciplinary team of radiation safety experts, professional radiation safety educators, professional nursing educators, and advanced practice provider administrators convened to develop an online, asynchronous course that would provide safe, quality patient and employee best practices and meet the IBON radiation safety education requirements. Early collaborative discussions highlighted an institutional requirement for physician nonoperators of fluoroscopy to participate in an online educational course of fluoroscopy education. The IBON defined the 4 content areas in radiation safety education but had not set an expectation of the number of education contact hours under each content label (Table 2). The collaboration of the experts allowed a discussion that defined objectives for each content area and an expectation that a 1-hour online course similar to the physician nonoperator course would be sufficient radiation safety education for fulfilling IBON requirements (Table 3). This interprofessional collaboration was valuable in providing a rigorous educational program with a valid assessment of knowledge via an online post-test. The collaboration of experts also established a

Table 2. Radiation Safety for Fluoroscopy Supervision

Course modules
1. Radiation physics
2. Radiobiology
3. Radiation safety
4. Radiation management
Rules, regulations, and registration

process for identifying and tracking providers supervising fluoroscopy.

The UIHC already had an online educational platform for compliances and competencies that provided the resources for the provision of the radiation safety course. The use of the UIHC online platform required minimal additional manpower and zero additional funding allocation. This platform was sufficient for educating the UIHC advanced practice providers, but the online course would not be accessible by outside advanced practice providers in need of additional radiation safety education. The resources in man power and funding allocation would be prohibitive to develop a secure platform that allowed outside health care providers to access the online course.

DEPARTMENTAL COLLABORATION

In an attempt to disseminate the educational content statewide, the UIHC nursing education department granted permission for the course work to be available via an online portal within the University of Iowa College of Nursing (UI CON). Despite the permission to offer the course via UI CON, the College of Nursing had no available online platform to register students from outside the University of Iowa without using the office of the registrar, requiring additional student fees and the establishment of an Iowa e-mail account and an Iowa student persona. UI CON began researching other colleges and departments for an established platform that would allow anyone to access the course online without a student registration fee, remain secure, maintain education records, and administrate the course. The UI Center for Conferences had a platform previously built and was willing to partner with UI CON to host the course, administrate, and maintain educational course records with minimal additional funding. Through this partnership, the radiation safety course was approved by UI CON for a 0.1 continuing education credit and made available online for any advanced practice provider in need of additional education in radiation safety.

Table 3. Radiation Safety for Fluoroscopy Supervision

Course objectives
Radiation physics
1. State the differences between ionizing and nonionizing radiation and be able to identify the medical imaging modalities using each type of radiation.
2. Describe how x-rays are produced and the effect of the inverse square law.
Radiobiology
1. State the concepts to accurately predict which tissues will be most susceptible to the detrimental effects of ionizing radiation.
2. State the biological effects of radiation on tissue.
3. State the difference between stochastic and nonstochastic effects.
Radiation safety
1. Understand the ALARA (as low as reasonably achievable) concept in terms of time, distance, and shielding.
2. State the appropriate safe distance and shielding methods.
3. Be able to apply the inverse square law to effectively reduce one's radiation exposure
4. Understand the maximum annual dose of occupational ionizing radiation.
Radiation management
1. State the agencies involved in regulation, requirements, and policy making regarding fluoroscopy.
2. State the regulatory requirements for dosimeters and proper placement for dosimeters.
3. Describe the method for obtaining a dosimeter and answering questions regarding dosimeter readings, reports, and radiation safety.

DISCUSSION

It has been well-documented that additional education in radiation safety in the use of fluoroscopy is indicated to promote patient and occupational safety and improve adverse outcomes. The IBON added additional education requirements for APRNs supervising fluoroscopy based on these findings and in accordance with the Iowa Supreme Court ruling. As a CRNA, the ability to alleviate a potential barrier to practice was extremely important for all CRNAs and APRNs in Iowa. The collaboration between radiation safety and educational experts in various departments to develop educational course work for APRNs was a solution to remove a potential barrier to advanced nursing practice. Through the formation of an interprofessional collaborative team of experts, the safe practice of fluoroscopy will positively impact both patient safety and occupational safety. This education will provide advanced practice providers the knowledge needed for preventing radiation-induced complications. The provision of ongoing education for advanced practice providers will also prepare the profession in the state of Iowa for future regulations in the area of radiation safety. As national regulatory agencies continually improve the recommendations for the safe use of radiation, Iowa APRNs will be able to update and accommodate the existing education programs for providers working in medical imaging modalities. Through the successful efforts of this project, advanced practice providers can be confident they are providing safe, quality patient care; ensuring their own clinical safety; and remaining knowledgeable about current and future proposed medical imaging regulations and are in accordance with their licensing body. JNP

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