Patient Care in Medical Imaging

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As students progress through their coursework to become radiologic technologists, they learn conventional procedures and protocols. However, there are many requirements for the profession that students might not be aware of until they are further in their coursework, and they might be surprised to learn of these expectations. For those interested in careers in the radiologic sciences, understanding patient care expectations is essential. Patient care in radiography encompasses[1]:

- communication
- confirming pregnancy status
- infection control, including universal precautions
- patient assessment
- protection from unnecessary radiation exposure
- patient safety

In addition, radiologic technologists care for patients in several settings, such as the radiology department, hospital room, outpatient facility, surgical center, and physician's office, and they encounter patients of all ages, cultures, socioeconomic backgrounds, and levels of care. Therefore, patients require care based on the individual.

Education

Two documents are involved in radiologic technologists' education. The first is the Radiography Curriculum, published by the American Society of Radiologic Technologists (ASRT).[2] The other is the Radiography Examination Content Specifications, published by the American Registry of Radiologic Technologists (ARRT).[3]

ASRT Radiography Curriculum

This document was created to provide fundamental knowledge to entry-level radiographers.[2] The curriculum establishes a foundation of essential information while also offering the possibility to acquire skills that radiologic technologists can use for years.[2]

The document is divided into preprofessional core content, optional content, and medical imaging and radiologic sciences resources.[2] The preprofessional core content includes educational content that is essential for entering the radiography profession. Subject areas include anatomy and physiology, radiation physics, patient care, positioning, and radiation safety. Each section includes learning objectives that can be used for program assessment. The learning objectives can be used for each course or for the program. Optional content is available for programs that elect to enrich the curriculum with advanced topics that satisfy their program's mission or the requirements of their local employment market. This content often is included in the curriculum of baccalaureate programs. The medical imaging and radiologic sciences resources section includes a list of references and study materials available in the profession.

The ASRT Radiography Curriculum is a guiding document of the profession; it functions as a guideline for educators to plan their programs and ensures

that future radiologic technologists are prepared and educated to match the profession's standards.[2] In the radiologic sciences, educators must teach the fundamental clinical skills that employers expect of graduates and make sure that students are prepared to take the certification examination offered by the ARRT.[4] This curriculum provides flexibility to meet the needs of local communities and satisfies the requirements for accreditation standards and the ARRT examination. The curriculum also provides a foundation for transitioning to baccalaureate studies and lifelong learning.[2]

The curriculum was created to ensure that graduates have the technical skills delineated in the ASRT Practice Standards for Medical Imaging and Radiation Therapy[5] related to patient care, the graduate should provide quality patient care for all members of a diverse society and understand the challenges of providing direct patient care in a health care setting. Patient care content in the ASRT Radiography Curriculum includes the fundamental principles of venipuncture, pharmacology, and dispensing intravenous medications and contrast agents.[2] Student radiographers can perform venipuncture if they are supervised. The patient care content also provides the principles of delivering quality patient care, including respect for the psychological and physical needs of the patient and their family. Routine and emergency patient care procedures are described, along with infection control procedures and methods.[2]

ARRT Examination Content Specifications: Radiography

The ARRT radiography certification exam assesses the skills and knowledge needed to perform the responsibilities commonly required of entry-level radiographers.[4] The ARRT regularly evaluates the job responsibilities typically required of radiographers. This certification exam consists of 4 main content categories: patient care, safety, image production, and procedures.[4] As with the ASRT Radiography Curriculum, the patient care section includes infection control.

Applicants who wish to take the exam must comply with the ARRT Examination Requirements for Obtaining Certification and Registration and the ARRT Rules and Regulations.[3,6] ARRT delineates the clinical competency requirements students must achieve during their education program. The purpose of the didactic (ie, in the classroom or laboratory setting) competency requirements is to confirm that students had the chance to acquire essential knowledge, apply theory from the classroom into clinical practice, and improve affective and critical-thinking skills needed to determine professional competency.[4] Students must successfully complete all coursework for subjects listed in the ARRT Radiography Examination Content Specifications, which are the same subjects in the nationally recognized ASRT Radiography Curriculum.[2,4] Accredited radiography programs typically offer education and experience beyond the minimum requirements mentioned in the content specifications.

The purpose of the didactic and clinical competency requirements is to validate that radiologic technologists certified by the ARRT have shown competency in performing the essential clinical responsibilities of a radiologic technologist.[4] Competent performance of classroom knowledge and clinical skills provides a foundation for acquiring the full range of skills typically required in various clinical settings. Clinical competence demonstrates that the student has performed the procedure effectively and independently during their education program. A list of imaging procedures is included in the requirements.[4]

Also, graduates must be certified in cardiopulmonary resuscitation and prove competence in 9 patient care activities. Activities include assessment of 5 vital signs (blood pressure, temperature, pulse, respiration, pulse oximetry), as well as sterile and medical aseptic technique, venipuncture, patient transfer, and care of patient medical equipment (eg, oxygen tank, intravenous tubing).[4]

Considerations When Positioning Patients

Technologists should consider a patient's level of comfort toward touch and personal space and use effective patient communication when positioning patients.[7] Radiologic technologists can establish a connection with the patient through a friendly communication style and a pleasant attitude. These qualities help

technologists work successfully with people of all ages, cultures, and socioeconomic backgrounds.

Touch

While positioning patients for procedures, the radiologic technologist frequently touches the patient.[7] Although touching is necessary during the procedure, it can be awkward and uncomfortable for the patient and the radiologic technologist. Some patients are uncomfortable with being touched, and touch might occur in a sensitive area such as the breast. Therefore, explaining to the patient that it will be necessary to touch them is best.

Many commonly used patient care models include the traditional framework of patient history, examination, diagnosis of the illness, and formation of a treatment plan.[7] The radiologic technologist has an essential responsibility in examining the patient while performing imaging procedures. The technologist must become comfortable touching patients. In the clinical examination, feeling with the fingers and hands is referred to as *palpation*. Although palpation is a fundamental part of the diagnostic study, it must be performed with care and sensitivity. The most common reasons patients are uncomfortable with palpation during an examination are the invasion of personal space and feelings of unease regarding the sex of the technologist.[8]

Part of a patient's challenge is not knowing how each medical professional will treat them, especially when they are in pain, anxious, and vulnerable.[7] Touch during medical procedures can be calming or upsetting. Contact can be tenderly and delicately administered or harshly, inconsiderately, or, at worst, incompetently performed.

Privacy, Personal Space, and Intimate Examinations

Patients coming for imaging procedures can feel hesitant or uncomfortable about the procedure.[9] Many radiography examinations require a patient to change into a hospital gown, which can cause embarrassment. There should be a private place for the patient to change into the hospital gown.[7,10] The radiologic technologist or radiation therapist does not help the patient change clothes unless requested. If the patient cannot remove his or her clothing, a family member typically accompanies the patient to the appointment. The best practice is to keep the patient covered with a sheet or blanket to respect privacy.[9]

Radiologic technologists likely will encounter patients with cultural, religious, ethnic, or other worries concerning being examined by a health care provider who is not the same sex.[8,11] If this occurs, the patient has the right to refuse the procedure and should not feel pressured into continuing. If possible, a technologist of the same sex as the patient should perform the procedure. If someone is not readily available, the patient might need to reschedule their appointment.

Establishing a professional boundary when imaging patients during examinations is crucial because these examinations can be distressing and uncomfortable for patients.[10,11] When a radiologic technologist images a patient, they must be thoughtful about what the patient might consider intimate. Intimate examinations typically include areas of the genitalia, breasts, and rectum. However, they can involve any procedure where it is necessary to palpate anatomy or be in the patient's personal space. Also, what is considered intimate can differ among patients based on the individual and their culture.[10] Examinations that could be considered intimate include:

- angiographic procedures that enter through the femoral artery
- cystography and voiding cystourethrography
- echocardiogram for a female patient
- endorectal MR imaging
- endovaginal sonography
- hip or pelvic examinations
- insertion of a catheter or barium enema tip
- mammography
- procedures involving the male genitalia
- sonography of the abdomen or groin area
- urethrograms

Patient Communication

Communication with the patient is a vital part of the patient-technologist encounter.[7,8] A patient might not understand why a particular examination has been ordered or have information on how the examination will be performed and the equipment that will be used. The radiologic technologist must describe the

examination to the patient, including the purpose of the procedure, in terminology, the patient can understand, and allow the patient to ask questions.[4,7] The examination description must include what the procedure involves so the patient knows what to expect, including the possibility of discomfort or pain. If the patient is provided with this information before the examination, it can alleviate some of their fear or anxiety regarding the procedure.

For all radiology examinations that involve palpating the patient in a sensitive area that could be deemed intimate or where these sensitive areas might be uncovered, a description must be provided to the patient before beginning the procedure.[7] The description should include the area to be touched and the reasoning. For example, during a radiography examination of the pelvis, the radiologic technologist might start with, "I will need to press on your waist so that I can position you correctly to make sure I get a good image of your pelvis." An example relating to radiation therapy would be, "I will need to insert an applicator in your vagina to determine the correct size of the brachytherapy applicator for your treatment." This description should be provided when the patient is sitting before the patient lies down on the table, so the patient does not feel pressured to comply and to avoid misunderstanding. However, the patient might decide to stop the examination. Technologists should be mindful of signs of concern or uneasiness and be prepared to provide a chaperone if requested.[10]

Conversations with the patient should be related to the procedure, and radiologic technologists should maintain a positive and professional demeanor.[7,11,] Sometimes, during a procedure (eg, vaginal sonography), the technologist needs to ask the patient about symptoms they are experiencing. Questions should be strictly technical. Because of pain and discomfort, some patients might be unable to complete the procedure.[7] Protocols recommend stopping the study and talking with the patient to discover the problem and determine possible options after the patient has dressed.

Voiding Cystourethrography

More commonly performed on pediatric patients, a voiding cystourethrogram is a radiography procedure that uses fluoroscopy to image the bladder and urinary tract and involves the insertion of a catheter.[12] A voiding cystourethrogram can be used to check for blockages or abnormalities of the urethra, evaluate chronic urinary tract infections, determine whether antibiotics were beneficial, and identify vesicoureteral reflux (a condition in which urine flows in the wrong direction from the bladder to the kidneys).

Voiding cystourethrography is performed in the radiology department, often by a team of pediatric nurses, technologists, and radiologists devoted to ensuring the child's experience is as pleasant as possible.[12] Experienced health care providers use strategies to distract the child and comfort them during examinations. The radiologic technologist frequently inserts the catheter before the pediatric radiologist arrives to perform the procedure.

Procedure

The radiographer assists the patient onto the examination table.[12] The patient must change into a hospital gown; no other garments are allowed. The patient is instructed to lie on their back. Female patients arrange their legs in a frog position. The voiding cystourethrography team is aware of the sensitivity of the anatomy being examined and helps make the patient comfortable. The radiologic technologist dons gloves and cleans the anatomy before the procedure begins. The technologist or radiologist then gently inserts a small catheter into the opening of the urethra. The catheter is secured, a urine sample is collected, and the contrast agent flows into the catheter to fill the child's bladder. Using fluoroscopy, the radiologist obtains images of the patient's bladder filling and emptying. If the patient can follow directions, the technologist requests that they urinate.

Barium Enema Examinations

Another sensitive procedure is a barium enema, which visualizes defects or irregularities in the colon such as[12]:

- abdominal pain
- constipation
- inflammatory bowel disease
- prolonged diarrhea

- rectal bleeding
- sudden difference in bowel practices
- unexplained weight loss
- unusual lesions

A barium enema introduces a contrast media, barium, into the rectum through an enema tip.[12] The barium fills the colon, resulting in a distinct outline of the large intestine. Air might be used to inflate the intestine to enhance the visualization of anatomy in the images.[13]

Procedure

Before a barium enema, the patient changes into a hospital gown.[12] The procedure is performed by a radiologist specializing in diagnostic imaging, and a radiologic technologist typically assists with the procedure. At the start of the procedure, an image is obtained of the abdomen to ensure the intestine is clean. Next, the patient lies on their side on the examination table, and the radiologic technologist inserts a lubricated enema tube into the patient's rectum. A bag of barium is connected to the tubing of the enema tip to deliver the barium solution into the colon. The radiologic technologist instructs the patient to move into position for different projections of the colon. Several images are obtained of the intestines from multiple angles and with the patient in various positions.

Pregnancy Protocols

A sensitive conversation that takes place in radiology departments multiple times a day is asking whether the patient might be pregnant.[7,14] Radiation exposure during pregnancy could have critical consequences on the fetus. Therefore, verifying pregnancy status before imaging women of childbearing age can protect against these consequences. Radiology centers use different methods of pregnancy screening. Facilities typically offer the patient a pregnancy test. Some protocols include obtaining written consent from the patient and verifying awareness of possible risks from imaging an unborn child.[7] Therefore, the standard practice is to ask any girl or woman of childbearing age whether she might be pregnant before the image is taken.

If a patient has a radiographic examination and later discovers she is pregnant, the protocol is that the medical physicist calculates the absorbed radiation dose from the images that were taken.[15] The typical radiation dose during radiographic imaging is considered a safe level. The American College of Radiology has published standards for imaging potentially pregnant women (see **Figure**).

Some radiology examinations deliver higher levels of radiation exposure to reproductive organs during imaging of the pelvic region.[7,15] These examinations include computed tomography, angiography of the abdomen and pelvis, and hysterosalpingography. When the physician orders these procedures, the recommendation is that the patient undergo a pregnancy test no more than 72 hours before the procedure.[14] A positive result can cause the procedure to be delayed, modified, or canceled if the procedure was not ordered because of an emergency. A negative result should not substitute for asking the patient about the possibility of pregnancy.

Infection Control

Needlestick wounds, airborne illnesses, contact with blood or bodily fluids, and other contaminations present potential dangers for clinicians who work in a patient care setting.[16] Radiologic technologists are exposed to blood, other bodily fluids, and infectious diseases caused by pathogens.[7,16]

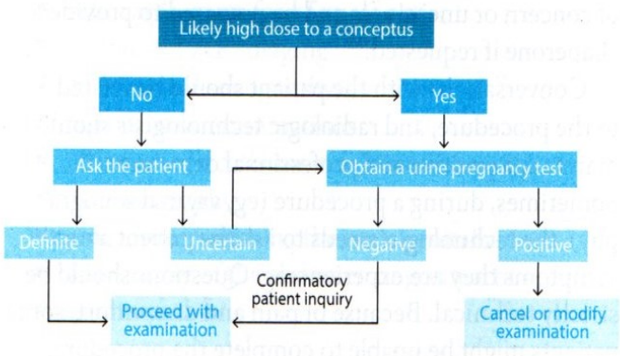

Figure. *American College of Radiology guidelines for imaging potentially pregnant women. Reprinted under the Creative Commons Attribution 3.0 Unported license. Abushouk AI, Sanei Taheri M, Pooransari P, Mirbaha S, Rouhipour A, Baratloo A. Pregnancy Screening before Diagnostic Radiography in Emergency Department; an Educational Review.* Emerg (Tehran). *2017;5(1):e60. creativecommons.org/licenses/by/3.0/*

Imaging examinations often are used to diagnose infectious diseases and to image associated complications caused by pathogens. Radiologic technologists must be aware of the possibility of encountering infectious diseases when performing their job.[7] They learn how infectious agents are spread and the protocols to stop the spread of infectious diseases.[16] Also, radiologic technologists are familiar with radiographic examinations and associated findings for different illnesses.[7] Infectious diseases that radiologic technologists might encounter include COVID-19, Ebola virus, tuberculosis, methicillin-resistant *Staphylococcus aureus*, meningitis, hepatitis, *Clostridium difficile*, and measles.[7,17] Infectious diseases can lead to severe infections, some of which are possibly fatal.[7,17] Through their education program, radiologic technologists learn how to protect themselves if they encounter these diseases.

The radiology department must actively participate in infection control measures because it is a busy area that regularly involves patients with communicable diseases.[16,18] Consequently, it can be a chief location of contamination and spread of illness among health care workers and patients inside the department. Radiology departments have developed policies for multiple modalities for imaging patients with transmissible and possibly deadly infections.[16] Infection control protocols that apply to the imaging department and the radiologic technologist include contact precautions and confirming that all personnel follow the established policies.[18]

Universal Precautions

Infectious diseases often spread through physical contact. Therefore, handwashing is the best method to prevent the spread of contagious illnesses.[7] Hospitals and imaging centers must encourage compliance by educating employees on the proper practice of handwashing. Also, facilities must provide sinks and handwashing products for employees to use.

In 1985, the Center for Disease Control, now known as the *Centers for Disease Control and Prevention (CDC)*, introduced universal precautions, primarily in response to the HIV epidemic, but they can be used for any infectious disease.[19] Universal precautions are a set of recommendations created to prevent the spread of bloodborne pathogens through exposure to blood and other potentially infectious materials.[5,76] The CDC advocates precautions for stopping the increase of infectious diseases. These safeguards should be used during the care of patients, regardless of their disease state. Universal precautions are an approach to infection control founded on the concept that all bodily fluids, including blood, secretions, and mucus membranes, might contain transferrable agents.[19] Therefore, the radiologic technologist must treat all patients as if they are contagious.

Universal precautions include hand washing and wearing personal protective equipment, with handwashing being the most effective method to stop the spread of disease.[7,19] Personal protective equipment, which includes face shields or goggles, masks, gowns, gloves, and bouffant caps, is used as a barrier to protect the skin, mucous membranes, airway, eyes, and clothing.

Conclusion

Patients benefit from the essential diagnostic information and treatment provided by radiologic technologists. Technologists also benefit from dynamic routines, working in a variety of settings, increased employment opportunities, and being a member of a profession to be proud of. Not only are radiologic technologists working with a diverse patient population and making sure patients receive the information and assistance they need, but they also are essential members of the health care team. New technologists enter a highly respected profession.

For those interested in radiography careers, understanding the many expectations of patient care is essential. Patient care in radiography encompasses many facets, including patient assessment, communication, patient safety, and protecting the patient from unnecessary radiation exposure. Radiologic technologists must learn to take care of patients of all ages and at many different levels of care.

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References

1. What do radiologic technologists do? American Registry of Radiologic Technologists. Accessed May 15, 2022. https://www.arrt.org/pages/about-the-profession/learn-about-the-profession/what-do-radiologic-technologists-do
2. Radiography Curriculum. American Society of Radiologic Technologists. Published 2022. Accessed May 13, 2022. https://www.asrt.org/educators/asrt-curricula/radiography/radiography-curriculum
3. ARRT Examination Requirements for Obtaining Certification and Registration. American Registry of Radiologic Technologists. Revised January 1, 2022. Accessed April 13, 2023. https://assets-us-01.kc-usercontent.com/406ac8c6-58e8-00b3-e3c1-0c312965deb2/b17eabdf-48bc-4d89-b809-2a9ae243da47/arrt-examination-requirements.pdf
4. Examination Content Specifications: Radiography. American Registry of Radiologic Technologists. Published January 1, 2022. Accessed April 13, 2023. https://www.arrt.org/pages/arrt-reference-documents/by-document-type/examination-content-specifications
5. The ASRT Practice Standards for Medical Imaging and Radiation Therapy. American Society of Radiologic Technologists. Published June 26, 2022. Accessed May 13, 2022. https://www.asrt.org/main/standards-and-regulations/professional-practice/practice-standards-online
6. American Registry of Radiologic Technologists. *ARRT Rules and Regulations*. Published September 1, 2022. Accessed April 13, 2023. https://assets-us-01.kc-usercontent.com/406ac8c6-58e8-00b3-e3c1-0c312965deb2/9a510c39-a4cd-47ba-8478-0cf56244b6e1/arrt-rules-and-regulations.pdf
7. Patient Interactions. In: Adler AM, Carlton R, Stewart, K. *Introduction to Radiologic and Imaging Sciences and Patient Care*. 8th ed. Elsevier; 2023:141-155.
8. Response to patient's personal and physical needs. In: Ehrlich RA, Coakes DM. *Patient Care in Radiography*. 10th ed. Elsevier; 2021:300-305.
9. Oakley PA, Harrison DE. X-ray hesitancy: patients' radiophobic concerns over medical x-rays. *Dose Response*. 2020;18(3):15593 25820959542. doi:10.1177/1559325820959542
10. Physical Examination. In: Niedzwiecki B, Pepper J. *Kinn's The Medical Assistant: An Applied Learning Approach*. 15th ed. Elsevier; 2023:463-497.
11. Patient Coaching. In: Niedzwiecki B, Pepper J. *Kinn's The Medical Assistant: An Applied Learning Approach*. 15th ed. Elsevier; 2023:505-506.
12. Digestive System: Salivary Glands, Alimentary Canal, and Biliary Canal. In: Rollins, JH, Long, BW, Curtis, T. Merrills Atlas of Radiographic Positioning and Procedures. Vol 2. 15th ed. Elsevier; 2023:221-242.
13. Barium enema. Mayo Clinic. Published 2022. Accessed May 12, 2022. https://www.mymlc.com/health-information/tests-and-procedures/b/barium-enema2/
14. Abushouk AI, Sanei Taheri M, Pooransari P, Mirbaha S, Rouhipour A, Baratloo A. Pregnancy screening before diagnostic radiography in emergency department; an educational review. *Emergency (Tehran)*. 2017;5(1):e60.
15. Practice parameters and technical standards. American College of Radiology. Published 2021. Accessed May 13, 2022. https://www.acr.org/Clinical-Resources/Practice-Parameters-and-Technical-Standards
16. Nyirenda D, Williams R, Ten Ham-Baloyi W. Infection control recommendations for radiology departments in Malawi. *Health SA*. 2019;24:1035. doi:10.4102/hsag.v24i0.1035
17. Specific laws and regulations governing the control of communicable diseases. Centers for Disease Control and Prevention. Updated March 29, 2022. Accessed May 12, 2022. https://www.cdc.gov/quarantine/specificlawsregulations.html
18. Ilyas F, Burbridge B, Babyn P. Health care-associated infections and the radiology department. *J Med Imaging Radiat Sci*. 2019;50(4):596-606.e1. doi:10.1016/j.jmir.2019.07.011
19. Broussard IM, Kahwaji CI. Universal precautions. StatPearls. Updated December 15, 2021. https://www.ncbi.nlm.nih.gov/books/NBK470223/Accessed May 1, 2022.

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