



UNC  
SCHOOL OF MEDICINE

*Radiologist Assistant Program*



The University of North Carolina at  
Chapel Hill  
Radiologist Assistant Program  
(MASTERS IN RADIOLOGIC SCIENCE)  
PROGRAM

INFORMATION PACKET FOR  
PROSPECTIVE and CURRENT  
RADIOLOGY PRACTICE PRECEPTORSHIP



THE UNIVERSITY  
of NORTH CAROLINA  
at CHAPEL HILL

DIVISION OF RADIOLOGIC SCIENCE  
ALLIED HEALTH SCIENCES  
BONDURANT HALL, SUITE 3050  
CAMPUS BOX 7130  
321 S. COLUMBIA STREET  
CHAPEL HILL, NC 27599-7130

T 919.966.5146  
F 919.966.6951  
[www.med.unc.edu/ahs/radisci](http://www.med.unc.edu/ahs/radisci)

## INTRODUCTION

This packet was designed to help familiarize radiologists with the radiologist assistant profession as defined by the American College of Radiology (ACR), the American Society of Radiologic Technologists (ASRT) and the American Registry of Radiologic Technologists (ARRT). This packet will cover the history of this emerging profession along with its perceived benefit to the field of radiology. In addition, it will define the role of the radiology practice mentor. Additional information may be obtained by contacting the UNC-Chapel Hill Division of Radiologic Science directly:

Joy J. Renner, M.A., RT(R), FAEIRS  
Associate Professor and Director  
University of North Carolina at Chapel Hill  
School of Medicine  
CB #7130 UNC-CH Bondurant Hall  
321-A South Columbia St.  
Chapel Hill, NC 27599-7130  
919-966-5147  
[Joy\\_renner@med.unc.edu](mailto:Joy_renner@med.unc.edu)

Kenya Haugen, D.M., R.T.(R)  
Clinical Assistant Professor  
University of North Carolina at Chapel Hill  
School of Medicine  
CB #7130 UNC-CH Bondurant Hall  
321-A South Columbia St.  
Chapel Hill, NC 27599-7130  
210-862-0575  
[kenya\\_haugen@med.unc.edu](mailto:kenya_haugen@med.unc.edu)

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## History

On March 9-10, 2002, a Radiologist Assistant Advisory Panel consisting of representatives from the ACR, ASRT, ARRT, state regulatory agencies, radiologic science education programs, radiology practitioner assistants (RPAs) and a medical imaging manufacturer met in Washington, D.C., to discuss the impending shortage of radiologic technologists and radiologists. They met to explore issues regarding the possible development of an advanced practice for radiologic technologists. This panel published a consensus statement (See Appendix I) regarding the educational preparation, roles and responsibilities, experience, level of supervision and level of regulatory oversight of the radiologist assistant.

On June 1, 2002, the Board of Chancellors of the American College of Radiology reviewed the consensus statements and agreed to pursue the concept of a radiologist assistant. Charles D. Williams, M.D., FACR, Chairman of the ACR Human Resources Commission released this statement in support of the development of the Radiologist Assistant Profession:

First, providing a pool of well-qualified and well-educated radiologist assistants will help radiology practices manage the current shortage of radiologists by allowing radiologists to more efficiently handle ever increasing patient workloads," he said. "The radiologist assistant also will give technologists a needed opportunity for advancement and career enhancements - two items that should help ameliorate the technologist shortage. Having a career path to the radiologist assistant will help retain more of the practicing technologists and attract more individuals to the radiologic technology profession.

[http://www.asrt.org/content/RTs/SpecialtySpecific/RadiologistAssistant/RA\\_Statement\\_From\\_ACR.aspx](http://www.asrt.org/content/RTs/SpecialtySpecific/RadiologistAssistant/RA_Statement_From_ACR.aspx)

On Oct. 22, 2002, the leadership of the ACR and the ASRT held a meeting

to discuss the potential roles and responsibilities of the RA. In May 2003, during the ACR's 80<sup>th</sup> Annual Meeting, the American College of Radiology Council approved a policy statement regarding the roles and responsibilities of the RA as jointly developed by the ACR and the ASRT. As noted in the LARS Summer 2003 Insights summation of the ACR 80<sup>th</sup> Annual Meeting:

A policy statement regarding the role and responsibility of a radiologist assistant was approved. The RA is identified as an "advanced-level radiologic technologist" who works under the supervision of a radiologist to enhance patient care by assisting the radiologist in the diagnostic imaging environment. As perceived, the RA will not interpret radiological examinations and will transmit observations of diagnostic images only to the supervising radiologist. The development of the RA will create a professionally appealing career path that will encourage more to enter the field. "We [ACR] feel that this will produce a worthwhile outcome that will allow us to address our critical workforce needs while ensuring the highest level of care for our patients."  
(<http://www.larad.org/insights/Summer%202003%20Insights.pdf>)

## **RA Role Delineation**

To begin to define the role and education requirements for the RA, the ARRT developed a job analysis survey regarding RA roles and levels of supervision. This survey was administered to a random sample of radiologists and all RPAs. Radiologists rated 80 clinical activities and documented whether the activity should be considered for the RA scope of practice and if so, what level of radiologist supervision should correspond with this activity. **It is important to note that current Entry-Level Clinical Activities document supersedes the previous RA Role Delineation and it can be found in Appendix II.**

After administering the survey in January 2004, The ARRT appointed Advisory Committee comprised of four radiologists, two radiologist assistant program directors, two Radiology Practitioner Assistants, a physicist and liaisons from the ASRT, compiled the results. A draft of the role delineation was then posted at the ARRT website to solicit additional feedback. Feedback resulted in further refining of the Role Delineation and in January 2005 and it was approved by the ARRT Board of Trustees. **The most recent version of the Role Delineation is called “Entry-Level Clinical Activities” and it can be found in Appendix II. In addition, the most recent version of the ARRT specifications for the RA certification exam and be found in Appendix III.**

## **Who is a Radiologist Assistant?**

A radiologist assistant (RA) is an advanced practice radiologic technologist who works under the supervision of a radiologist. The primary role of an RA is to enhance patient care by assisting the radiologist with patient assessment, patient management and radiological procedures. The RA also makes initial observations of diagnostic images but does not provide an official interpretation in the form of a written report (Advanced Practice Advisory Panel, 2002).

An RA must be an ARRT-certified radiographer who has successfully completed an advanced academic program encompassing a nationally recognized radiologist assistant curriculum and a radiologist directed clinical preceptorship (Advanced Practice Advisory Panel, 2002).

## **The UNC-Chapel Hill Radiologist Assistant (Masters in Radiologic Science) Program**

The UNC-Chapel Hill Radiologist Assistant Program was developed over a two year period with the intent of being consistent with the national curriculum developed by the American Society of Radiologic Technologists (ASRT) and the American College of Radiology (ACR) and in accordance with the American Registry of Radiologic Technologists (ARRT) certification requirements.

The UNC-Chapel Hill RA program is 54 credit hours and 24 months in length (See Appendix IV for the “RA Course Sequence Grid”-a curriculum outline by semester and Appendix V for course descriptions). The program combines distance education and web-based instruction with a radiologist directed clinical preceptorship. This clinical preceptorship includes a minimum of 1824 clinical hours and is completed off-campus. Students, with program faculty input, must identify and secure a radiology practice to serve as preceptors. This radiology practice must include American Board of Radiology (ABR) certified radiologists who are willing to instruct and assess the competence of the RA student(s) working and learning under their supervision.

In addition to the distance education courses and clinical preceptorship, 1-2 on-campus seminars are required per semester (totals - 6 per year and 12 for the program). These sessions provide students the benefit of face-to-face contact with faculty and to enhance critical thinking and analysis skills related to radiological procedures and images. These sessions also give students the opportunity to network with other RA students and faculty.

## **Radiologist Preceptor Responsibilities**

The preceptor group must include ABR certified radiologists who are willing to supervise, instruct and assess the competence of the RA student(s). The practice will be assigned a contact person, the Clinical Coordinator, from the university to assist in the planning of clinical rotations and to consult on any issues regarding preceptorship. The practice provides the name of a primary liaison to promote open lines of communication between the practice and the university. In addition, the imaging facility will sign an Affiliation Agreement with the University and the radiology practice will sign a Memorandum of Understanding with the Division (See Appendix VI for a SAMPLE agreement).

While all radiologists in the group are ultimately responsible for the education and supervision of the RA student(s), the practice in conjunction with the program will determine clinical rotations and specific preceptor assignments. One model may include having one primary liaison and then supportive preceptors for each area of clinical competency.

The Radiologist Assistant Clinical Competency list can be seen in Appendix VII. The ARRT has designed evaluation instruments that are user-friendly and not time consuming.

The preceptor group is responsible for maintaining open lines of communication regarding the RA student(s) progress. The group is responsible for supervising, teaching and guiding the student during all interactions with patients and documenting successful completion of competencies as outlined by the ARRT (See Appendix VII). The preceptor will be filling out evaluation forms each semester that assess the student's performance for that particular semester. The preceptor will also fill out a comprehensive



clinical evaluation form (RASER) at the end of the program that assesses the student's performance over the course of the 2 years. In addition, the preceptor, as well as other radiologists in the group, will be filling out competency forms for different procedures.

## **UNC-Chapel Hill Division of Radiologic Science Responsibilities**

### ***Assignment of Division Contact Person***

Each preceptor group will be assigned a contact person from the UNC-Chapel Hill Division of Radiologic Science. This person will be available to assist in planning the preceptor clinical model and to answer any questions that might arise during the preceptorship. The Clinical Coordinator is the primary point of contact – Leslie Meredith who can be reached at [leslie\\_meredith@med.unc.edu](mailto:leslie_meredith@med.unc.edu) or 919 949 8499. The Program Director is always available as well at [jrenner@med.unc.edu](mailto:jrenner@med.unc.edu) or 919 357-4586

### ***Admissions and Record Keeping***

The UNC Division of Radiologic Science will be responsible for admissions, dismissals, graduation and certification procedures. In addition, grade submissions and calculations along with the associated record keeping will be handled by UNC-Chapel Hill.

### ***Immunization and Health Requirements***

The Division will be responsible for assuring each student has the proper initial training such as OSHA Safety and HIPAA training. The preceptor group may conduct additional training as required by their clinical sites. The Division will assure the student has obtained the immunizations required by the University and clinical sites (See pg. 58). The preceptor group may request other requirements as specified by its clinical sites.

### ***Assignment and Monitoring of Radiation Badges***

If requested, the Division of Radiologic Science will assign and monitor radiation badges which are exchanged on a quarterly basis. The Division's contact person will send a monitoring and control badge to each student and it is the student's responsibility to return the badges to the Division when requested. Most students utilize the radiation monitoring available at their clinical sites and submit the quarterly report to the Clinical Coordinator.

### ***Liability Insurance***

Students enrolled in the Division of Radiologic Science are covered by the UNC-Chapel Hill School of Medicine Professional Liability Fund. The University maintains adequate professional liability insurance for each student in an amount not less than \$1,000,000 per occurrence/\$3,000,000 annual aggregate. Students are financially liable for damage to patient property not covered by the Liability Fund. This policy only covers students fulfilling clinical assignments for the program and does NOT cover students during work for pay. This liability insurance is not insurance covering injury to the student.

## How the Radiologist Assistant Profession will benefit the Radiology Practice

It is noted that the ACR supports the development of the Radiologist Assistant profession:

ACR officials believe the development of the radiologist assistant position will relieve some of the time pressures experienced by radiologists due to ongoing workforce shortages, thereby permitting them to devote available resources to more productive patient care tasks.

(ACR Approves Statement on Radiologist Assistant Functions. Retrieved on April 15, 2005 from [http://www.acr.org/s\\_acr/doc.asp?TrackID=&SID=1&DID=16006&CID=969&VID=2&RTID=0&CIDQS=&Taxonomy=False&specialSearch=False](http://www.acr.org/s_acr/doc.asp?TrackID=&SID=1&DID=16006&CID=969&VID=2&RTID=0&CIDQS=&Taxonomy=False&specialSearch=False))

The RA will assist the radiologist in handling the ever increasing patient workloads. This health care professional will assist with radiologist workflow thereby reducing patient wait times and subsequently increasing patient satisfaction. Some ways that the RA will assist with workflow include:

- Communicating with referring physicians
- Performing follow-up contacts and evaluations with patients
- Becoming a liaison with the department and staff related to image quality
- Performing studies that require much time
- Orienting new radiologists to the practice
- Marketing of the practice
- Completing documentation and paperwork as required

Each of these responsibilities will assist the practice in providing more efficient, higher quality patient care and will allow radiologists more time for image interpretation.

## **Appendix I: Consensus Statements from the Advanced Practice Advisory Panel**

**The Radiologist Assistant: Improving Patient Care While Providing Work Force Solutions  
March 9-10, 2002, Washington, D.C.**

### **The Radiologist Assistant: Improving Patient Care While Providing Work Force Solutions**

**Consensus Statements from the Advanced Practice Advisory Panel  
March 9-10, 2002, Washington, D.C.**

#### **Introduction**

The radiology community faces many challenges today, including increased patient demand, a growing shortage of radiologists and radiologic technologists, and the rapid expansion of new technology. In this fluctuating environment, it may be time for the radiology workplace to introduce a new type of radiologic technologist, a person whose advanced clinical skills can extend the role of the radiologist. Working with the supervision of a radiologist, an advanced-level radiologic technologist could take responsibility for patient assessment, patient education and patient management; perform fluoroscopy and other radiology procedures; and make initial image observations. By assuming responsibility for these tasks, the advanced-level technologist would improve productivity, increase patient access to radiologic services, and enhance the overall quality of patient care.

On March 9-10, 2002, an Advanced Practice Advisory Panel met in Washington, D.C., to explore key issues surrounding the development of an advanced clinical role for radiologic technologists. Members of the advisory panel included representatives from the American College of Radiology, the American Society of Radiologic Technologists, the American Registry of Radiologic Technologists, state regulatory agencies, radiologic science educational programs, and a medical imaging manufacturer. The panel also included two radiology practitioner assistants (RPAs).

The advisory panel represented a broad base of stakeholders, each of whom has unique concerns regarding the development of an advanced clinical role for radiologic technologists and the eventual incorporation of such a technologist into the radiology workplace. The goal of the panel members at their March 9-10 meeting was to reach consensus on key issues concerning the educational preparation, experience, roles and responsibilities, level of supervision and level of regulatory oversight of the advanced radiologic technologist. The panel wrote 12 consensus statements addressing these and other issues. Each consensus statement is presented below, accompanied by relevant discussion that took place at the panel's March 9-10 meeting.

#### **Consensus Statement on Title and Definition**

- The advisory panel recommends the title of "radiologist assistant" for the radiologic technologist working in an advanced clinical role. The panel supports the following definition of radiologist assistant:

A radiologist assistant is an advanced-level radiologic technologist who enhances patient care by extending the capacity of the radiologist in the diagnostic imaging environment. The radiologist assistant is an ARRT-certified radiographer who has completed an advanced academic program encompassing a nationally recognized radiologist assistant curriculum and a radiologist-directed clinical preceptorship. With radiologist supervision, the radiologist assistant performs patient assessment, patient management, fluoroscopy and other radiology procedures. The radiologist assistant also makes initial observations of diagnostic images, but does not provide an official interpretation (final written report) as defined by the *ACR Standard for Communication: Diagnostic Radiology*.

Discussion: Panel members agreed the title "radiologist assistant" most accurately reflects the nature of the relationship between the radiologist and the radiologic technologist working in an advanced clinical role. The title clearly places the technologist's professional role and clinical responsibilities within the radiology environment.

The panel noted that fewer than 100 advanced-level radiologic technologists in the United States have been certified by the Certification Board for Radiology Practitioner Assistants and are known as “radiology practitioner assistants.” The panel believes that the inclusion of the word “practitioner” in the job title is potentially misleading to the public and other health professionals, as it implies that the individual is an assistant to any medical practitioner, not just to radiologists. The title “radiologist assistant” clearly links the advanced-level technologist to the radiologist. The radiologist assistant supplements or extends the radiologist’s role.

The ACR Task Force on Human Resources supports the concept of the “radiology extender.” In a 2001 paper, the task force encouraged the ACR Commission on Human Resources to work with the ASRT to develop a curriculum and a job description for the job title, with the understanding that “the radiology extender is not a primary interpreter of imaging studies.”<sup>1</sup> In the definition it drafted, the advisory panel emphasized that the radiologist assistant does not provide an official interpretation of any imaging examination and performs his or her duties with the supervision of a radiologist.

#### **Consensus Statement on the Need for a Radiologist Assistant**

- The need to develop a radiologist assistant is supported by several factors in the radiology environment, including the growing shortage of radiologic technologists and radiologists, the soaring demand for medical imaging procedures, and the radiology community’s desire to enhance the overall quality of patient care. The advisory panel believes the introduction of the radiologist assistant will have a positive impact in each of these areas, and it encourages the development and establishment of this profession.

Discussion: The concept of an advanced-level radiologic technologist is not new; educational programs to produce them were first developed in the early 1970s. However, there was little support for those programs because the need to introduce a nonphysician clinician into the

radiology environment could not be clearly demonstrated at the time. Today, work force shortages of radiologists and radiologic technologists have dramatically altered the picture.

There are approximately 226,000 registered radiographers in the United States today, but this number is inadequate to meet the demand for their services. According to a survey conducted by the American Hospital Association<sup>3</sup> in the fall of 2001, the vacancy rate for medical imaging technologists is the highest of any health profession. The survey reported a 15.3 percent vacancy rate for imaging technologists, which means that nearly one out of every seven jobs cannot be filled. By comparison, the vacancy rate for registered nurses was 13 percent and the rate for pharmacists was 12.7 percent.

In November 2001, the U.S. Bureau of Labor Statistics released employment projections for the nation.<sup>3</sup> The Bureau predicts the country will need 75,000 more radiologic technologists in 2010 than it did in 2000. The job openings represent positions that will be created as the result of growth in the profession, as well as positions that will become vacant when today's technologists retire or change careers.

Unfortunately, people are not entering the profession fast enough to meet the BLS's projections. The number of people taking the radiography certification examination offered by the American Registry of Radiologic Technologists declined from 10,629 in 1994 to only 7,434 in 2001. Meanwhile, many of the radiologic technologists practicing today will retire in the next 10 to 15 years. The average age of a radiologic technologist is 41 – one of the oldest averages among the allied health professions – and 17 percent of the profession is older than 51.<sup>4</sup>

The radiologist community faces a similar work force problem: Not enough people are entering the specialty, and too many are leaving. The number of radiology residents dropped from 4,236 in 1994 to 3,600 in 1999.<sup>5</sup> In addition, many radiologists are retiring early or nearing

typical retirement age. There are approximately 25,000 practicing radiologists in the United States, and nearly 40 percent of them are older than 50.<sup>5</sup>

Because of the increased number of retirements and the decreased number of residents, the American College of Radiology's Task Force on Human Resources estimates that the number of radiologists is rising by only 2 percent per year. Their workload, meanwhile, is increasing 6 percent per year as measured by relative value units.<sup>1</sup>

While the number of radiologists and radiologic technologists remains stagnant, demand for their services is soaring. A large part of the increased demand is being driven by the aging patient population. By 2030, the U.S. population aged 65 and older will double and the population aged 85 and older will triple. As the population ages, demand for health care services, including radiology, will rise dramatically. One study predicted a 140 percent increase in annual imaging procedures among the Medicare population by 2020.<sup>6</sup>

The introduction of a radiologist assistant could be an innovative, cost-effective way to address efficiency and productivity issues related to shortages of radiologists and radiologic technologists. By taking a lead role in patient assessment and management and by performing procedures such as fluoroscopy, the radiologist assistant could reduce the amount of time required of radiologists, allowing them to focus on the medical requirements of interpretation.

By making radiology workflow more efficient, the radiologist assistant also will improve patient access to radiologic care. Fifty-six percent of imaging department managers who responded to a September 2000 survey by U.S. Radiology Partners said that shortages of radiologists and radiologic technologists are limiting patient access to tests and delaying turnaround times.<sup>7</sup> Incorporation of radiologist assistants can improve efficiency and productivity, permitting greater numbers of patients to be examined or treated.



Finally, the advisory panel also noted that development of a career pathway for radiologist assistants could serve as a potential recruitment and retention tool for the radiologic technologist profession, which has suffered from declining interest in recent years. Advanced-level radiologic technologists have been working in the United Kingdom for nearly 30 years. According to a report by Rebecca Clemens, a radiographer at East Surrey Hospital, Redhill, England, these technologists have enhanced job satisfaction, improved recruitment, enhanced self-esteem, stronger professional confidence and increased morale.

The advisory panel believes that introduction of the radiologist assistant into the career path for radiologic technologists will make the field more appealing to potential recruits and also will facilitate upward mobility among current technologists, leading to increased employee tenure. The radiologist assistant, as an advanced career path, presents radiologic technologists with a unique opportunity for professional growth.

#### **Consensus Statements on Educational Preparation**

- The advisory panel recommends that the educational preparation for the radiologist assistant should be a minimum of a baccalaureate degree. The panel recommends that the course of study follow a prescribed curriculum that contains both academic and clinical components. The clinical portion of the radiologist assistant's education should consist of a preceptorship with a radiologist.
- The advisory panel encourages the development of a standardized national curriculum for radiologist assistant programs.
- The advisory panel recommends that a national certification process be developed so that graduates of radiologist assistant programs can prove their competency upon completion of their education.

Discussion. The advisory panel noted that the academic and clinical education of the radiologist assistant must be sufficient in scope to allow a graduate to assume responsibility for performing

fluoroscopy and other selected radiology procedures with radiologist supervision. The graduate also must be prepared, through rigorous academic and clinical education, to make initial image observations and report their observations to the supervising radiologist. These responsibilities distinguish the radiologist assistant from the radiologic technologist.

The advisory panel asked the American Society of Radiologic Technologists to develop a standardized curriculum for radiologist assistant educational programs. The panel recommended that the curriculum include coursework in patient assessment, patient management, patient education, pharmacology, radiation safety, radiobiology, health physics, pathophysiology and clinical pathways. The curriculum also should include instruction in specific radiology examinations and procedures, as well as instruction in the initial observation of images and the communication of observations to the supervising radiologist. Each component of the academic program should be supplemented by a formal clinical preceptorship with a supervising radiologist.

Panel members volunteered to serve as advisors during the curriculum development process. Acknowledging that it is important to introduce significant numbers of radiologist assistants into the clinical environment as soon as possible, the panel also encouraged educational institutions throughout the country to develop programs to educate radiologist assistants.

Finally, the panel recommended that a national certification method be developed so that radiologist assistants can demonstrate that they are competent to provide the care they offer when they enter the profession. The panel suggested that the certification method be based upon a standardized national examination, and that appropriate credentials be awarded to individuals who pass the examination.

### Consensus Statements on Roles and Responsibilities

- The panel agreed that the radiologist assistant should have three primary areas of responsibility, all performed with the supervision of a radiologist:
  1. Take responsibility for patient assessment, patient management and patient education.
  2. Evaluate image quality, make initial image observations and communicate observations to the supervising radiologist.
  3. Perform selected radiology procedures including, but not limited to, fluoroscopy.
  
- The panel agreed that the following responsibilities are not within the roles and responsibilities of the radiologist assistant:
  1. The radiologist assistant does not interpret images. The supervising radiologist retains responsibility for final image interpretation.
  2. The radiologist assistant does not make diagnoses. The supervising radiologist retains responsibility for preparing a final written report.
  3. The radiologist assistant does not prescribe medications or therapies.

Discussion. In determining the appropriate roles and responsibilities for the radiologist assistant, the advisory panel emphasized that it was not the tasks themselves, but the higher levels of accountability, responsibility and knowledge that will define the radiologist assistant's role. The radiologist assistant not only will perform each function competently, but also will understand how that activity fits into the entire continuum of a patient's care. The radiologist assistant is unique because of his or her ability to enhance the quality of care each patient receives. The radiologist assistant also could facilitate patient risk management processes.

Members of the panel emphasized that the radiologist assistant will work at all times with the supervision of a radiologist. The radiologist assistant is intended to be a supplement to, not a substitute for, the radiologist. The supervising radiologist will retain responsibility for final image interpretation and for preparing a final written report, as defined by the *ACR Standard for Communication: Diagnostic Radiology*.<sup>8</sup>

### **Consensus Statement on Supervision Level**

- The advisory panel recommends that the radiologist provide an appropriate level of supervision for the radiologist assistant. This level of supervision should be consistent with the educational preparation and experience level of the radiologist assistant, and may change over time as the radiologist assistant gains more expertise.

Discussion. The advisory panel noted that the radiologist assistant must always work with the supervision of a radiologist. However, the panel recognizes that the level of supervision may change as the radiologist assistant acquires more skills, experience and confidence. The panel believes this consensus statement allows for evolution, growth and progress on the part of the radiologist assistant and gives the radiologist discretion to determine an appropriate level of supervision.

### **Consensus Statements on Regulation**

- The advisory panel believes that the radiologist assistant is an enhancement of the radiologic technology profession. Because of this status, the radiologist assistant is covered under existing radiologic technologist statutes as well as under state medical practice acts that authorize radiologists to delegate the performance of tasks with their supervision. For these reasons, the panel believes that separate state certification or licensure is not necessary for the radiologist assistant.
- The advisory panel acknowledges that regulations in some states prohibit some of the proposed roles and responsibilities of the radiologist assistant. The panel recommends that the American College of Radiology and the American Society of Radiologic Technologists develop materials to promote the role of radiologist assistants in all states as set forth in this document. The panel encourages the ACR and the ASRT to conduct these efforts in collaboration with the National Society of Radiology Practitioner Assistants.

Discussion: Panel members noted that 38 states partially or fully license radiologic technologists. In those states, an additional license would not be necessary for radiologist assistants because the job is an extension of the radiologic technologist profession. In the 12

states that do not license radiologic technologists, the radiologist assistant should be recognized as an “advanced” role for the radiologic technologist, a previously acknowledged health care occupation.

#### **Consensus Statements on Other Issues**

- The advisory panel encourages the ASRT to evaluate its code of ethics for radiologic technologists to determine if additional content is needed to address the expanded roles and responsibilities of radiologist assistants.

Discussion. It is important for any health profession to have a code of ethics that clearly outlines the profession’s philosophy and values. The code should express the radiologic assistant’s ethical responsibilities to patients, to his or her health care colleagues and to society as a whole. The code should serve as constant guidance for the professional conduct of the radiologist assistant.

- The advisory panel endorses the incorporation of radiologist assistants into the *ACR Standards*.

Discussion. As a collection of official statements reflecting the position of the American College of Radiology, the *ACR Standards* are the recognized authority on radiology practice. The panel believes that inclusion of the radiologist assistant into the *ACR Standards* would confer legitimacy on the profession and serve as recognition of the role radiologist assistants can play as part of the radiology team.

#### **Conclusion**

The professions of radiology and radiologic technology are more than 100 years old, yet they continue to evolve and progress. Every decade has brought improvements in safety, technology and the delivery of quality patient care. Today, as radiology strives to meet the challenges brought on by increasing patient demand and growing work force shortages, the time is right to introduce a health care professional who can extend the role of the radiologist by functioning as an advanced-level radiologic technologist. The introduction of the radiologist assistant into the health care system represents an innovative, cost-effective way to meet patient needs while also improving the quality, efficiency and productivity of radiologic care.

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**Appendix: Advanced Practice Advisory Panel Participants**

*Panel Facilitator:* Sal Martino  
Executive Vice President and Chief Academic Officer  
American Society of Radiologic Technologists, Albuquerque, N.M.

Michael DeVecchio, B.S., R.T.(R)  
Technical Director, Department of Radiology, Brigham and Women's Hospital, Boston, Mass.  
Chairman of the Board, American Society of Radiologic Technologists

Bill Finerfrock  
Capitol Associates, Washington, D.C.

John Gray, R.T.(R)  
Executive Director, Arizona Board of Medical Radiologic Technology, Phoenix, Ariz.

Douglas N. Hornsby, M.D.  
Radiology Management Fellow  
Brigham and Women's Hospital/Harvard Medical School, Boston, Mass.

John W. Larsen, B.S., RPA, R.T.(R)(M)(QM)  
St. Mary's Hospital, Grand Rapids, Mich.  
President, National Society of Radiology Practitioner Assistants

Leonard Lucey, J.D., LL.M.  
Legal Counsel and Senior Director, Standards and Accreditation  
American College of Radiology, Reston, Va.

Eileen Maloney, M.Ed., R.T.(R)(M), FASRT  
Director, Radiography Program, Passaic County Community College, Paterson, N.J.  
Vice President, American Society of Radiologic Technologists

Lynn May  
Chief Executive Officer, American Society of Radiologic Technologists, Albuquerque, N.M.

Jim Morrison  
Assistant Executive Director, American College of Radiology, Reston, Va.

Joseph J. Palma, M.B.A.  
Senior Vice President of Marketing and Sales, E-Z-EM Inc., Westbury, N.Y.

Kevin Powers, M.P.A., R.T.(R)(M)  
Director of Education, American Society of Radiologic Technologists

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Jerry Reid, Ph.D.  
Executive Director, American Registry of Radiologic Technologists, St. Paul, Minn.

Joy J. Renner, M.A., R.T.(R)  
Associate Professor  
Director, Division of Radiologic Science  
School of Medicine, University of North Carolina at Chapel Hill

Anita Slechta, M.S., R.T.(R)(M)  
Professor, Radiologic Technology  
Health Science Department, California State University, Northridge

Allen Terrell, M.S., R.T.(R)(MR)  
Director of Imaging Services, River Region Health System, Vicksburg, Miss.  
President, American Society of Radiologic Technologists

William M. Thompson, M.D.  
Duke University Medical Center, Durham, N.C.

Charles D. Williams, M.D., FACR  
Chairman, Department of Radiology, Tallahassee Memorial Hospital, Tallahassee, Fla.  
Member, Board of Chancellors, American College of Radiology  
Chairman, Commission on Human Resources, American College of Radiology

Joann T. Yokley, RPA, R.T.(R)(CV)(M)  
High Point Radiological Services  
High Point, N.C.



## **Appendix II: Entry Level Clinical Activities (formerly Radiologist Assistant Role Delineation)**



# Registered Radiologist Assistant

## Introduction

Discussions among the American College of Radiology (ACR), the American Society of Radiologic Technologists (ASRT), and The American Registry of Radiologic Technologists (ARRT) culminated in 2003 with a consensus statement that defines the Registered Radiologist Assistant (R.R.A.) as an advanced-level radiographer who works under the supervision of a radiologist to promote high standards of patient care by assisting radiologists in the diagnostic imaging environment. Under radiologist supervision, the R.R.A. performs patient assessment, patient management, and selected clinical imaging procedures. Certification and registration as an R.R.A. does not qualify the R.R.A. to perform interpretations (preliminary, final, or otherwise) of any radiological examination.<sup>1</sup> The R.R.A. may make and communicate initial observations only to the radiologist.

The ARRT expanded this consensus definition to delineate more fully the entry-level role of a radiologist assistant and introduced the R.R.A. certification and registration program based upon a practice analysis in 2005. The R.R.A. program requirements include certification and registration in radiography (i.e., R.T.(R)(ARRT), experience as a radiographer, as well as radiologist assistant specific educational, ethics, and examination standards. Details are available on ARRT's website ([www.arrt.org](http://www.arrt.org)).

## Purpose of this Document

In order to develop certification and registration standards, ARRT first identifies a core set of activities that individuals should be qualified to perform at entry into that role. The list of entry-level clinical activities is then used to create ARRT examination development and education requirements for certification and registration. The Entry-Level Clinical Activities (ELCA) is not intended as a scope of practice. Inclusion of activities in ELCA does not indicate that the activities may be legally performed in all states by those certified and registered nor that the activities, if performed, are eligible for reimbursement under current CMS regulations. State, institutional, and employer requirements should be consulted to determine the specific role allowed in an individual situation. Similarly, exclusion of activities from ELCA is not to be interpreted as prohibiting the performance of the activities provided that state, institutional, and employer requirements support the performance of the activities and that appropriate education, training, and competency assessment have been completed for the procedures. For all ARRT disciplines it is assumed that the requirements for certification and registration serve as the foundation for developing qualifications to perform additional procedures.

## Initial Role Delineation Development

ARRT published the initial role delineation in 2005. It was developed based upon a survey of radiologists and radiology practitioner assistants (RPAs) conducted in early 2004. Radiologists were asked to rate clinical activities as to whether the activity could be performed by an appropriately prepared radiologist assistant and, if so, the suggested level of radiologist supervision. RPAs were asked to indicate if they performed the activities and, if so, the level of supervision they received.

An ARRT Advisory Committee composed of four radiologists, two R.R.A. educational program directors, two RPAs, one physicist, and organizational liaisons reviewed the survey responses. A draft description of the role of a radiologist assistant was produced. Additional refinements were made by the Advisory Committee based upon organizational and community feedback. The ARRT Board of Trustees adopted the *R.R.A. Role Delineation* in January 2005 and eligibility requirements and examination content specifications were developed based upon the Role Delineation and approved in June 2005. The Role Delineation document was later renamed ELCA.

<sup>1</sup>ACR ASRT Joint Policy Statement - Radiologist Assistant: Roles and Responsibilities (2003).



## Updates to the R.R.A. Certification and Registration Program

ARRT's certification and registration requirements are periodically updated to incorporate changing practice patterns and expectations. Revisions to ELCA are first suggested by the ARRT committee members, which consists of a combination of ACR appointed radiologists, AAPM appointed physicists and ARRT appointed R.R.A.s and educators. Typically a draft survey is created by the committee members and reviewed by the Inter-Societal Commission on Radiologist Assistants (ICRA). ICRA is composed of representatives of ACR, ASRT, and ARRT along with the participation of representatives from the Society of Radiology Physician Extenders. Once approved, the survey is administered to Radiologist Extenders identified from ARRT's database, a sample of ACR radiologists, and radiologists who work with Radiologist Extenders. The survey results are reviewed by the ARRT committee members and ICRA to identify possible updates to ELCA. The ARRT Board of Trustees makes the final decision on changes to ELCA. This update process is repeated at least every five years and more frequently if needed.

## Most Recent Practice Analysis

The most recent update cycle has been completed. Based on survey results, committee input, and feedback from ICRA, six new clinical activities were added to ELCA and two existing clinical activities were removed. Editorial changes were made and the ARRT Board of Trustees approved the document in January 2017 for July 2018 implementation. The *Content Specifications for the Registered Radiologist Assistant* and the *Didactic and Clinical Portfolio Requirements for Certification and Registration as a Registered Radiologist Assistant* are updated to reflect the changes to ELCA.

## Conclusion

The clinical procedures included in ELCA reflect procedures performed by a significant percentage of radiologist extenders and which radiologists were generally comfortable delegating to an R.R.A. under their supervision. The survey identified many procedures that were being performed by some radiologist extenders, but not by a sufficient percentage to warrant inclusion in ELCA. Exclusion from this document is not intended to limit the procedures performed by an R.R.A. provided that appropriate education, training, and competency assessment have been documented for those procedures and provided that state, institutional, and employer requirements support the performance.

Radiologist supervision of R.R.A.-performed procedures is assumed. The ARRT test development and education requirements for certification and registration assume that the level of supervision for entry-level R.R.A.s will be at the direct level for clinical procedures. Direct supervision<sup>2</sup> is defined as the radiologist present in the radiology facility and immediately available to furnish assistance and direction throughout the performance of the procedure, but not required to be present in the room when the procedure is performed. The assumption of a specific level of supervision is intended to assist in the development of entry-level certification and registration requirements. The actual level of radiologist supervision for an R.R.A. in practice will depend upon the R.R.A.s experience as well as state, institutional, and employer requirements. Best practice for all exams requiring consent includes the radiologist meeting the patient.

It is expected that R.R.A.s who perform procedures other than those listed in ELCA will have received appropriate training and competency assessment on these procedures to assure patient safety and quality imaging. The additional clinical education and competence assessment should be documented within the individual R.R.A.s portfolio. All activities should be performed in compliance with state, institutional, and employer requirements.

<sup>2</sup>This definition of direct supervision is based upon that of the Centers for Medicare & Medicaid Services (CMS).



<b>Clinical activities</b>		<b>Content Categories</b>
		Legend: PC = Patient Care, S = Safety, P = Procedures
1.	Review the patient's medical record to verify the appropriateness of a specific exam or procedure and report significant findings to radiologist.	PC.1.D.
2.	Assist the radiologist in determining whether indications meet the ACR Appropriateness Criteria® when advising those who order examinations.	PC.1.D.
3.	Interview patient to obtain, verify, or update medical history.	PC.1.A.2.
4.	Explain procedure to patient or significant others, including a description of risks, benefits, alternatives, and follow-up.*	PC.1.D., PC.1.C.2., PC.1.C.2.C.
5.	Participate in obtaining informed consent.*	PC.1.A.2.
6.	Determine if patient has followed instructions in preparation for the exam (e.g., diet, premedications).	PC.1.C.2.A.2.
7.	Assess risk factors that may contraindicate the procedure (e.g., health history, medications, pregnancy, psychological indicators, alternative medicines). (Note: Must be reviewed with radiologist.)	PC.1.C., PC.1.D., PC.1.E.
8.	Perform and document a procedure-focused physical examination, analysis of data (e.g., signs and symptoms, laboratory values, significant abnormalities, vital signs) and reporting of findings to the supervising radiologist for the following systems or anatomical areas:	PC.1.F., PC.1.G., PC.1.L.
	a. abdominal	P.1.
	b. thoracic	P.2.A., P.2.C.
	c. cardiovascular	P.2.B.
	d. musculoskeletal	P.3.A.
	e. peripheral vascular	P.4.B.
	f. neurological	P.4.A.
	g. endocrine [separated from neurological]	P.3.B.
	h. breast and axillae	P.2.D.
9.	Monitor ECG and recognize abnormal rhythms.	P.2.B.2.B.
10.	Perform urinary catheterization.	PC.1.J.
11.	Perform venipuncture.	PC.1.H.1.
12.	Monitor IV therapy for flow rate and complications.	PC.1.H.2., PC.1.H.3.
13.	Participate in the administration of moderate/conscious/sedation.	PC.2.C.2.
14.	Observe and assess patients who have received moderate/conscious/sedation.	PC.2.C.2.
15.	Assess patient's vital signs and level of anxiety/pain and inform radiologist when appropriate.	PC.1.D., PC.1.E.,
16.	Recognize and respond to medical emergencies (e.g., drug reactions, cardiac arrest, hypoglycemia) and activate emergency response systems, including notification of the radiologist.	PC.1.F., PC.2.D.3.

\* Patient must be able to communicate with the radiologist if he/she requests or if any questions arise that cannot be appropriately answered by the radiologist assistant.



<b>Clinical activities</b>		<b>Content Categories</b>
		Legend: PC = Patient Care, S = Safety, P = Procedures
17.	Administer oxygen as prescribed.	PC.1.I.
18.	Operate a fixed/mobile fluoroscopic unit.	S.1.G.1.A.
19.	Document fluoroscopy time and radiation dose.	S.1.G.1.B.
20.	Explain effects and potential side effects to the patient of the pharmaceutical required for the examination.	PC.2.
21.	Administer contrast agents and radiopharmaceuticals as prescribed by the radiologist.	PC.2.D.
22.	Administer medications (EXCLUDING contrast agents and radiopharmaceuticals) as prescribed by the radiologist.	PC.2.
23.	Monitor patient for side effects or complications of the pharmaceutical.	PC.1.F., PC.1.K.1., PC.2.A.3., PC.2.A.3., PC.2.B., PC.2.C., PC.2.D.
24.	Advocate for patient radiation safety and protection:	
	a. assess the patient's radiation dose history	S.1.A.
	b. provide radiation procedure exposure and cumulative dose education	PC.1.A.2.C.5.
	c. recommend alternative procedures based on patient radiation dose	PC.1.D.1., S.1.B.
25.	Perform procedures in compliance with Standards of Care, facility and regulatory requirements, and ARRT Standards of Ethics.	PC.1.A., S.1.F.
26.	Perform the following GI and chest examinations and procedures including contrast media administration and operation of appropriate imaging equipment:	
	a. esophageal study	P.1.B.
	b. swallowing function study	P.1.B.
	c. upper GI study	P.1.B.
	d. post-operative study	P.1.B.
	e. small bowel study	P.1.B.
	f. enema with barium, air, or water soluble contrast	P.1.B.
	g. nasogastric/enteric and orogastric/enteric tube placement	P.1.B.
	h. t-tube cholangiogram	P.1.C.
	i. CT colonography	P.1.B.
	j. chest fluoroscopy	P.2.A.
27.	Perform the following GU examinations and procedures including contrast media administration and operation of appropriate imaging equipment:	
	a. antegrade urography through an existing catheter (e.g., nephrostography)	P.1.D.
	b. cystography, not voiding	P.1.D.
	c. retrograde urethrography or urethrocystography	P.1.D.



<b>Clinical activities</b>		<b>Content Categories</b>
		Legend: PC = Patient Care, S = Safety, P = Procedures
	d. voiding cystography/cystourethrography	P.1.D.
	e. loopography through an existing catheter (neobladder study)	P.1.D.
	f. hysterosalpingography - imaging only	P.1.E.
	g. hysterosalpingography - procedure and imaging	P.1.E.
28.	Perform the following invasive nonvascular procedures with image guidance including contrast media administration and needle or catheter placement:	
	a. therapeutic bursa aspiration and/or injection	P.3.
	b. diagnostic joint aspiration	P.3.
	c. therapeutic joint injection	P.3.
	d. arthrography (radiography, CT, and MR)	P.3.
	1. shoulder	
	2. elbow	
	3. wrist	
	4. hip	
	5. knee	
	6. ankle	
	e. lumbar puncture	P.4.
	f. lumbar puncture for myelography	P.4.
	g. cervical, thoracic, or lumbar myelography – imaging only	P.4.
	h. thoracentesis with or without catheter	P.2.C.
	i. placement of catheter for pneumothorax	P.2.C.
	j. paracentesis with or without catheter	P.1.A.
	k. abscess, fistula, or sinus tract study	P.1.A.
	l. injection for sentinel node localization	P.2.D.
	m. breast needle localization	P.2.D.
	n. percutaneous drainage with or without placement of catheter (excluding thoracentesis and paracentesis)	P.1.A.
	o. change of percutaneous tube or drainage catheter	P.1.A.
	p. biopsy	
	1. thyroid biopsy	P.3.B.
	2. superficial lymph node	P.4.B.
	3. liver (random)	P.1.A.
29.	Perform the following invasive vascular procedures with image guidance including contrast media administration and needle or catheter placement:	
	a. peripheral insertion of central venous catheter (PICC) placement	P.2.B.
	b. insertion of non-tunneled central venous catheter	P.2.A.
	c. insertion of tunneled central venous catheter	P.2.A.



<b>Clinical activities</b>		<b>Content Categories</b>
		Legend: PC = Patient Care, S = Safety, P = Procedures
	d. port injection	P.2.A.
	e. extremity venography	P.4.B.
30.	Perform CT post-processing.	S.1.G.2.
31.	Perform MR post-processing.	S.1.G.3.
32.	Evaluate images for completeness and diagnostic quality, and recommend additional images as required (general radiography, CT, and MR). (Note: Additional images only in the same modality such as additional CT cuts.)	P.
33.	Review imaging procedures, make initial observations, and communicate observations only to the radiologist.	P.
34.	Record initial observations of imaging procedures following radiologist approval.	PC.1.L.
35.	Communicate radiologist's report to appropriate health care provider consistent with the ACR Practice Parameter for Communication of Diagnostic Imaging Findings.	PC.1.D.
36.	Provide physician-prescribed pre- and post- care instructions to patients.	PC.1.
37.	Perform follow-up patient evaluation, and post-procedure care, and communicate findings to the radiologist.	PC.1.
38.	Document procedure and post-procedure evaluation in appropriate record.	PC.1.L.
39.	Document patient admission and/or discharge summary for review and co-signature by radiologist.	PC.B.D.
40.	Participate in quality improvement activities within radiology practice.	S.1.G.4.
41.	Assist with data collection and review for clinical trials or other research.	S.1.G.4.
42.	Assist the radiologist in presenting at multi-disciplinary conferences (e.g., tumor boards and case conferences).	PC.B.D.

## **Appendix III: ARRT Content Specifications for the Radiologist Assistant Examination**





# Registered Radiologist Assistant

The purpose of the *Registered Radiologist Assistant (R.R.A.)* examination is to assess the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of Registered Radiologist Assistants at entry into the profession. The tasks typically performed were determined by administering a comprehensive practice analysis survey to a nationwide sample of radiologists and radiologist extenders. The *Registered Radiologist Assistant Entry-Level Clinical Activities (ELCA)* inventory may be found on the ARRT's website ([www.arrt.org](http://www.arrt.org)).

The *Examination Content Specifications for the Registered Radiologist Assistant* identifies the knowledge areas underlying performance of the tasks on the *Registered Radiologist Assistant Entry-Level Clinical Activities (ELCA)* inventory. Every content category can be linked to one or more activities on the ELCA inventory.

The following table presents the major content categories and subcategories covered on the examination. The number of selected response test questions in each category are listed in bold and number of test questions in each subcategory in parentheses. Specific topics within each category are addressed in the content outline, which makes up the remaining pages of this document. In addition, the case study essay section of the examination requires candidates to respond to essay questions concerning the procedures listed in *Attachment A*, which can be found at the end of this document.

This document is not intended to serve as a curriculum guide. Although ARRT programs for certification and registration and educational programs may have related purposes, their functions are clearly different. Educational programs are generally broader in scope and address the subject matter that is included in these content specifications, but do not limit themselves to only this content.

Content Categories	Selected Response Points	Case Study Points <sup>1</sup>
<b>Patient Care</b>	<b>60</b>	
<i>Patient Management (34)</i>		
<i>Pharmacology (26)</i>		
<b>Safety</b>	<b>25</b>	
<i>Patient Safety, Radiation Protection and Equipment Operation<sup>2</sup> (25)</i>		
<b>Procedures<sup>3</sup></b>	<b>115</b>	
<i>Abdominal Section (43)</i>		
<i>Thoracic Section (29)</i>		
<i>Musculoskeletal and Endocrine Sections (20)</i>		
<i>Neurological, Vascular, and Lymphatic Sections (23)</i>		
<b>Total Number<sup>4</sup></b>	<b>200</b>	
<b>Testing Time Allowed</b>	<b>3.5 hours</b>	<b>2.5 hours</b>

<sup>1</sup> The examination contains two case studies from the list of procedures on *Attachment A*. Each case is followed by four to six essay questions worth 3 or 6 points each. A case may also include a few selected response questions (e.g., multiple choice). Refer to *Overview of CBT* at [www.arrt.org](http://www.arrt.org) for additional details.

<sup>2</sup> SI units will become the primary (principle) units of radiation measurement used on the R.R.A. examination in July, 2018.

<sup>3</sup> The Procedures section includes patient assessment and pathophysiology. Procedures may also refer to appropriate imaging.

<sup>4</sup> The exam includes an additional 20 unscored (pilot) questions.



## Patient Care

### 1. Patient Management<sup>1</sup>

#### A. Ethics

1. AHA Patient Care Partnership (Patient's Bill of Rights)
2. informed consent and patient education
  - a. patient competence
    1. cognitive impairment
    2. competence assessment
    3. mental status
    4. medication
  - b. surrogate consent
    1. health care power of attorney
    2. family
  - c. informed consent components
    1. explanation of procedure
    2. risk versus benefit
    3. alternatives and options to current procedure
    4. refusal of procedure and implications
    5. radiation exposure and cumulative dose education
  - d. pre- and post-procedure care instructions
3. definitions
  - a. morals
  - b. values
  - c. ethics
4. ASRT Practice Standards
5. ARRT Standards of Ethics

#### B. Medical Law

1. definitions
  - a. negligence and malpractice
    1. gross
    2. contributing
  - b. standard of care
  - c. assault and battery
  - d. false imprisonment
  - e. slander and libel
  - f. elements of tort law
2. legal doctrines
  - a. respondeat superior
  - b. res ipsa loquitur
  - c. foreseeability
  - d. personal liability
  - e. Good Samaritan Law

#### C. Patient Communication

1. psychosocial support
  - a. communication skills and issues
  - b. cultural awareness
  - c. social support structures
2. patient interview
  - a. verification
    1. patient identification and correct procedure
    2. patient preparation
    3. pregnancy status
  - b. medical history
    1. chief complaint
    2. present illness
    3. past medical/surgical/psychological history
    4. family history
    5. personal and social history
    6. review of systems
    7. medications (\*e.g., prescribed, OTC, natural)
    8. allergy history
3. factors affecting communication
  - a. speech, hearing and language ability
  - b. cognitive disorders
  - c. drug and/or alcohol effects

#### D. Medical Data Review

1. indications for procedure (e.g., ACR Appropriateness Criteria®)
2. contraindications for procedure
3. laboratory values
4. prior diagnostic studies
5. current medications
6. previous history (e.g., vital signs, nurses/physicians notes)
7. assessment of vital signs, height, and weight
8. disabilities

#### E. Psychological and Cognitive Status

1. cognitive abilities
2. emotional stability

\* The abbreviation "e.g.," is used to indicate that examples are listed in parenthesis, but that it is not a complete list of all possibilities.

(Patient Care continues on the following page.)

<sup>1</sup> Includes adaptations for pediatric, geriatric, and special needs populations.



## Patient Care (continued)

- F. Patient Monitoring and Assessment (prior to, during, and post-procedure)
  - 1. physical status
  - 2. emotional status
  - 3. cardiac and pulmonary monitoring
  - 4. medical emergencies
    - a. cardiac arrest
    - b. hyper/hypoglycemia
    - c. seizure
    - d. respiratory arrest
    - e. shock
    - f. stroke
- G. Common Laboratory Tests, Analysis, and Significance
  - 1. CBC
  - 2. electrolytes (sodium, potassium, bicarbonate, chloride, calcium)
  - 3. pancreatic and cardiac enzymes
  - 4. albumin and total protein
  - 5. coagulation profile
  - 6. liver function
  - 7. renal function
  - 8. glucose
  - 9. culture and sensitivity
  - 10. cytology and histopathology
- H. Infection Control
  - 1. sterile technique
  - 2. standard precautions (including mechanisms of disease transmission)
- I. Intravenous Therapy
  - 1. venipuncture
  - 2. flow rate monitoring
  - 3. complications
- J. Oxygen Therapy
  - 1. level (flow rate)
  - 2. devices
  - 3. indications and contraindications
- K. Urinary Catheterization
  - 1. technique
  - 2. complications
  - 3. contraindications
- L. Procedure Complications (Non-Contrast)
  - 1. infection
  - 2. hemorrhage
  - 3. pneumothorax
  - 4. perforation (GI or GU)
  - 5. respiratory distress
  - 6. aspiration
  - 7. vasovagal reaction
  - 8. pulmonary edema
  - 9. vascular injury or occlusion
  - 10. seizures
  - 11. pain
  - 12. neurologic deficit
  - 13. stroke
  - 14. cardiac arrest
  - 15. radiation injury
  - 16. physical injury
  - 17. death
- M. Medical Records
  - 1. components of documentation
    - a. types of documentation for patient chart
    - b. electronic and paper records
    - c. fluoroscopic and image documentation
  - 2. techniques and procedures for documentation
  - 3. document development and administration
    - a. examination findings
    - b. exceptions from established protocol or procedure
    - c. patient's questions and concerns
    - d. information regarding patient care, the procedure, and final outcome
    - e. diagnostic/therapeutic procedure and patient data
    - f. radiologists' reports to referring physician
    - g. direct communication with referring physician
    - h. discharge summary
    - i. incident reports

(Patient Care continues on the following page.)



## Patient Care (continued)

### 2. Pharmacology

#### A. Terminology

1. regulations
  - a. Food and Drug Administration (FDA)
  - b. Drug Enforcement Agency (DEA)
  - c. controlled substances
2. identifying names
  - a. generic
  - b. trade
  - c. United States Pharmacopoeia (USP)
3. drug characteristics
  - a. actions
  - b. synergisms
  - c. side effects
  - d. adverse reactions
4. dosage
  - a. loading
  - b. maintenance
  - c. therapeutic dose
  - d. lethal dose
5. safe dosage calculation
  - a. ratio
  - b. proportion
  - c. pediatric
  - d. geriatric
6. administration (e.g., oral, rectal, intravenous)
7. adverse event

#### B. General Medications: Classifications, Indications, and Contraindications

1. anti-infective drugs
  - a. antibiotics
  - b. antiviral
  - c. antifungals
2. cardiovascular drugs
  - a. antihypertensive
    1. calcium channel blockers
    2. beta blockers
    3. ACE inhibitors
  - b. vasoconstrictors
  - c. vasodilators
  - d. anti-arrhythmics
  - e. vascular drugs
    1. coagulation modifiers
    2. thrombolytics
3. gastrointestinal drugs
  - a. anti-reflux agents
  - b. hypomotility (glucagon)
  - c. cholecystokinetic (cholecystokinin)
  - d. antiemetics
4. anti-inflammatory drugs
  - a. analgesics
  - b. nonsteroidal anti-inflammatory drugs (NSAIDs)
  - c. corticosteroids
5. endocrine drugs
  - a. diabetic medication
  - b. anti-hypoglycemic (glucagon)
  - c. insulin
  - d. thyroid medications
6. diuretics
7. neurologic and psychotropic drugs
  - a. anticonvulsants
  - b. antiparkinsonians

(Patient Care continues on the following page.)



## Patient Care (continued)

### C. Anesthetics and Sedation

1. local anesthetics<sup>2</sup>
  - a. short acting
  - b. long acting
2. moderate sedation
  - a. American Society of Anesthesiologists (ASA) definitions
  - b. ASA guidelines
    1. history and physical
    2. intra-procedure
    3. post-procedure
    4. discharge scoring system
      - a. motor activity
      - b. respirations
      - c. standing blood pressure
      - d. consciousness
      - e. oxygen saturation
  - c. equipment
  - d. medications<sup>2</sup>
    1. fentanyl
    2. morphine
    3. meperidine
    4. diazepam
    5. midazolam
    6. lorazepam
    7. naloxone
    8. flumazenil

### D. Contrast Media (ACR Manual on Contrast Media)

1. agents<sup>2</sup>
  - a. negative contrast agents
  - b. positive contrast agents
    1. barium sulfate
    2. iodinated contrast media
      - a. osmolality
      - b. molecular structure
  - c. MRI agents
2. contrast related complications
  - a. nephrotoxicity
  - b. NSF (nephrogenic systemic fibrosis)
  - c. extravasation
  - d. allergies
    1. allergy history
    2. types of reactions (mild to severe)
    3. premedications
      - a. diphenhydramine
      - b. corticosteroids
    4. anaphylaxis
3. resuscitation
  - a. life support
    1. basic life support (BLS)
    2. advanced cardiac life support (ACLS)
  - b. basic drugs<sup>2</sup>
    1. epinephrine
    2. atropine
    3. bronchodilator
    4. nitroglycerine
    5. intravenous fluid

<sup>2</sup> Includes indications, contraindications, adverse reactions, dosage, routes of administration, and excretion process.



## Safety

### 1. Patient Safety, Radiation Protection, and Equipment Operation

#### A. Exposure and Dose

1. exposure
2. absorbed dose, equivalent dose, effective dose
3. measurement and calculation of quantities (e.g., CTDI, DAP)
4. high dose exams and modalities

#### B. Safety Standards

1. organizations and their roles
  - a. Nuclear Regulatory Commission (NRC)
  - b. Occupational Safety and Health Administration (OSHA)
  - c. Environmental Protection Agency (EPA)
  - d. Food and Drug Administration (FDA)
  - e. International Commission on Radiological Protection (ICRP)
  - f. National Council on Radiation Protection and Measurements (NCRP)
  - g. state health departments
2. monitoring and measuring
  - a. personnel dosimetry
  - b. environment
  - c. devices
3. effective dose limits
  - a. NCRP reports
  - b. ACR Appropriateness Criteria®

#### C. Methods to Reduce Patient Exposure

1. intermittent fluoroscopy
2. limitation of field size
3. exposure factors (x ray and CT)
4. geometry (e.g., SID, SSD, angulation)
5. filtration of the x-ray beam
6. protective shielding
7. immobilization
8. grid selection
9. limitation of fluoroscopic time
10. proper fluoroscope use
  - a. last image hold
  - b. cumulative timer
  - c. magnification mode
  - d. dose mode
    1. low dose
    2. cine
    3. high-level control
    4. pulsed
11. pediatric considerations

#### D. Methods to Reduce Occupational Exposure (e.g., ALARA)

1. time and location in radiation area
2. shielding devices in x-ray rooms
3. personal shielding devices
4. proper fluoroscope use

#### E. Radiation Biology

1. cell growth and division
2. radiosensitivity of cells
  - a. direct and indirect effects
  - b. linear energy transfer (LET)
  - c. relative biological effectiveness (RBE)
  - d. oxygen enhancement ratio (OER)
  - e. dose rate, fractionation, and protraction
3. radiation effects
  - a. deterministic and stochastic effects
  - b. background radiation
  - c. dose-response relationships
  - d. skin effects
  - e. acute radiation syndromes
  - f. local tissue damage
  - g. hematological effects
  - h. carcinogenesis
  - i. fetal effects
  - j. genetic effects

(Safety continues on the following page.)



## Safety (continued)

### F. Regulations

1. quality assurance management
  - a. facility rules
  - b. The Joint Commission requirements
2. credentialing
  - a. local or hospital requirements
  - b. state licensing/registration regulations
  - c. supervisory requirements
  - d. professional standards
3. government regulations
  - a. Medical Practice Act – supervisory requirements
  - b. Health Insurance Portability and Accountability Act (HIPAA)
  - c. MQSA Act – personnel requirements

### G. Equipment Operation

1. fluoroscopy
  - a. components
    1. x-ray tube
    2. image receptors
    3. collimators
    4. recording devices (e.g., digital cameras, cine)
    5. generator
    6. controls
    7. display
    8. automatic exposure rate control (AERC)
  - b. static image storage
  - c. dynamic image storage
  - d. pulsed fluoroscopy
  - e. high-level or boost mode
  - f. exposure factors
  - g. cumulative timer
2. dose monitoring equipment

### H. MRI Safety

1. screening and education (patients, personnel, non-personnel)
  - a. biomedical implants
  - b. ferromagnetic foreign bodies
  - c. medical conditions (e.g., renal function, pregnancy)
  - d. prior diagnostic or surgical procedures
  - e. topical or externally applied items (e.g., tattoos, medication patches, body piercing jewelry, monitoring devices)
2. equipment safety
  - a. ancillary equipment in proximity
  - b. designated safety zones

### I. Quality Improvement and Research

1. continuous quality improvement (CQI)
2. statistics
  - a. measures of frequency
  - b. measures of central tendency
  - c. measures of variation
3. clinical study design
4. clinical trial phases



## Procedures

Each section may include questions related to the following topics:

- Anatomy and Physiology: normal, age-related changes, and common surgical changes.
- Pathophysiology: alteration in function and structure related to disease/injury, compensation mechanisms, and congenital and developmental abnormalities.
- Patient Assessment.
- Procedures: patient and procedure preparation, consent (indications, contraindications, alternatives), performance, image evaluation and post-processing\*, and post procedure outcomes assessment.

### 1. Abdominal Section

#### A. General Abdomen

1. anatomy and physiology
2. assessment
  - a. pre-procedure rectal exam
  - b. signs and symptoms
3. related procedures
  - a. paracentesis
  - b. abscess, fistula, or sinus tract study
  - c. percutaneous drainage
  - d. change of percutaneous tube or drainage catheter
  - e. liver biopsy
4. medical devices (image appearance, indications, purpose, appropriate location, and complications)
  - a. drainage catheters
  - b. peritoneal dialysis catheters
  - c. stents
  - d. umbilical vascular catheters
  - e. IVC filter
5. pathophysiology
  - a. abdominal calcifications
  - b. abdominal aortic aneurysm
  - c. normal and abnormal gas patterns
  - d. pneumatosis intestinalis
  - e. portal venous gas
  - f. peritonitis
  - g. pneumoperitoneum
  - h. abscess
  - i. free fluid

#### B. Gastrointestinal

1. anatomy and physiology
2. related procedures
  - a. esophageal study
  - b. swallowing function study
  - c. upper GI study
  - d. small bowel study
  - e. enema with barium, air, or water soluble contrast
  - f. postoperative GI study
  - g. CT colonography
  - h. nasogastric/enteric and orogastric/enteric tube placement
3. medical devices (image appearance, indications, purpose, appropriate location, and complications)
  - a. bariatric devices
  - b. gastroenteric tubes

(Procedures continues on the following page.)

\*post-processing includes:

#### CT & MRI Image Post-Processing

- 3D reconstruction
- maximum intensity projection (MIP)
- multiplanar reconstruction (MPR)
- quantitative measurements (volume, distance, diameter)
- volume rendering

#### CT Post-Processing

- modifications to field of view (FOV)
- slice spacing
- algorithm
- cardiac analysis (calcium scoring and coronary artery mapping)





## Procedures (continued)

4. pathophysiology - esophagus and stomach
  - a. achalasia
  - b. Barrett esophagus
  - c. bezoar
  - d. Crohn disease
  - e. diverticula (Zenker, Killian-Jameson, epiphrenic)
  - f. dysphagia
  - g. esophagitis
  - h. fistulae
  - i. gastric outlet obstruction
  - j. gastritis
  - k. gastroesophageal reflux disease (GERD)
  - l. gastroparesis
  - m. hiatal hernias
  - n. malignant and benign masses
  - o. presbyesophagus
  - p. primary muscular and neural disorders
  - q. pyloric stenosis
  - r. scleroderma
  - s. surgical variation (Roux-en-Y, gastric band, Nissen fundoplication)
  - t. ulcers
  - u. varices
  - v. volvulus
  - w. webs
  - y. superior mesenteric artery (SMA) syndrome
  - z. toxic megacolon
  - aa. volvulus
5. pathophysiology - small and large intestine
  - a. adhesions
  - b. appendicitis
  - c. colitis
  - d. constipation
  - e. Crohn disease
  - f. diverticulosis/diverticulitis
  - g. duodenitis
  - h. fistulae
  - i. hernias
  - j. Hirschsprung disease
  - k. ileus
  - l. infections
  - m. inflammatory bowel syndrome
  - n. inflammatory diseases
  - o. intussusception
  - p. ischemia
  - q. malabsorption
  - r. malignant and benign tumors (masses)
  - s. Meckel diverticulum
  - t. necrotizing enterocolitis
  - u. malrotation
  - v. obstruction
  - w. peptic ulcer disease
  - x. polyps
- C. Hepatobiliary, Pancreas, and Spleen
  1. anatomy and physiology
  2. related procedure: t-tube cholangiogram
  3. pathophysiology
    - a. biliary calculi
    - b. biliary dyskinesia
    - c. cholangitis
    - d. cholecystitis
    - e. cirrhosis
    - f. hepatic steatosis
    - g. hepatitis
    - h. liver failure
    - i. malignant and benign masses
    - j. pancreatic insufficiency
    - k. pancreatic pseudocyst
    - l. pancreatitis
    - m. portal hypertension
    - n. splenomegaly
- D. Urinary
  1. anatomy and physiology
  2. related procedures
    - a. antegrade urography (e.g., nephrostography)
    - b. loopography (neobladder study)
    - c. retrograde urethrography or urethrocytography
    - d. voiding cystography/cystourethrography
  3. medical devices (image appearance, indications, and purpose)
    - a. urinary catheters
    - b. nephrostomy tubes
    - c. ureteral stents
  4. pathophysiology
    - a. acute and chronic renal failure
    - b. calculi
    - c. glomerulonephritis and nephrotic syndrome
    - d. infarcts, ischemia, thrombosis
    - e. infectious and inflammatory processes
    - f. malignant and benign masses
    - g. nephrocalcinosis
    - h. polycystic kidney disease
    - i. renal papillary necrosis
    - j. UPJ obstruction (congenital, adult)
    - k. vesicoureteral reflux

(Procedures continues on the following page.)



## Procedures (continued)

### E. Reproductive

1. anatomy and physiology
2. related procedure: hysterosalpingography
3. pathophysiology
  - a. female
    1. ectopic pregnancy
    2. endometriosis
    3. infertility
    4. malignant and benign masses
    5. pelvic inflammatory disease
    6. polycystic ovary disease
    7. pregnancy
  - b. male
    1. benign prostatic hypertrophy
    2. hydrocele
    3. inflammatory processes
    4. malignant and benign masses
    5. testicular torsion
4. medical devices (image appearance, indications, and purpose)
  - a. penile implants
  - b. pessary
  - c. contraceptive devices

## 2. Thoracic Section

### A. General Thoracic

1. anatomy and physiology
2. related procedures: chest fluoroscopy
3. pathophysiology
  - a. calcification
  - b. diaphragmatic paresis
  - c. inflammatory and infectious diseases
  - d. malignant and benign masses
  - e. pneumomediastinum

### B. Cardiac

1. anatomy and physiology
2. assessment
  - a. perfusion status
  - b. electrocardiogram (ECG)
3. signs and symptoms
4. medical devices (image appearance, indications, purpose, appropriate location, and complications)
  - a. IABP/heart assist device
  - b. pacers/AICD
  - c. cardiovascular valves
  - d. Swan-Ganz catheters
  - e. central venous catheters
5. pathophysiology
  - a. cardiac dysrhythmias
  - b. congestive heart failure (CHF)
  - c. coronary artery disease
  - d. pericardial disease
  - e. valvular heart disease
  - f. endocarditis

### C. Pulmonary

1. anatomy and physiology
2. assessment:  
oxygen saturation measurement
3. signs and symptoms
4. related procedures
  - a. thoracentesis
  - b. placement of catheter for pneumothorax
5. medical devices (image appearance, indications, purpose, appropriate location, and complications)
  - a. chest tubes
  - b. tracheal tubes
6. pathophysiology
  - a. adult respiratory distress syndrome (ARDS)
  - b. asthma
  - c. atelectasis
  - d. bronchopulmonary dysplasia (BPD)
  - e. chronic obstructive pulmonary disease (COPD)
  - f. neonatal respiratory distress syndrome
  - g. pleural diseases
  - h. pleural effusions
  - i. pneumothorax
  - j. pulmonary edema
  - k. pulmonary emboli
  - l. pulmonary fibrosis
  - m. pulmonary venous and arterial hypertension

(Procedures continues on the following page.)



## Procedures (continued)

### D. Breast and Axilla

1. anatomy and physiology
2. assessment
3. signs and symptoms
4. related procedures
  - a. injection for sentinel node localization
  - b. breast needle localization
  - c. breast imaging - reporting and data system (BI-RADS)
5. medical devices (image appearance, indications, purpose, appropriate location, and complications): breast implants
6. pathophysiology
  - a. benign and malignant masses
    1. cysts
    2. ductal carcinoma in situ
    3. fibroadenoma
    4. inflammatory breast cancers
    5. invasive ductal carcinoma
    6. invasive lobular carcinomas
    7. Paget disease
    8. phyllodes
  - b. inflammatory diseases

## 3. Musculoskeletal and Endocrine Sections

### A. Musculoskeletal

1. anatomy and physiology
2. assessment
3. signs and symptoms
4. related procedures
  - a. therapeutic bursa aspiration and/or injection
  - b. diagnostic joint aspiration
  - c. therapeutic joint injection
  - d. arthrogram (radiography, CT, MRI)
    1. shoulder
    2. elbow
    3. wrist
    4. hip
    5. knee
    6. ankle
5. medical devices (image appearance, indications, purpose): orthopedic hardware

### 6. pathophysiology

- a. arthritis
  1. gout
  2. osteoarthritis
  3. rheumatoid arthritis
  4. ankylosing spondylitis
  5. psoriatic arthritis
  6. septic arthritis
- b. bursitis
- c. trauma
  1. fractures
  2. dislocations
  3. associated soft tissue injuries
- d. tumors
  1. chondrosarcoma
  2. enchondroma
  3. Ewing sarcoma
  4. metastatic disease
  5. multiple myeloma/plasmacytoma
  6. osteochondroma
  7. osteoid osteoma
  8. osteosarcoma
- e. infections
  1. osteomyelitis
  2. soft tissue infection
- f. diseases
  1. fibrous dysplasia
  2. osteogenesis imperfecta
  3. osteomalacia
  4. osteoporosis
  5. Paget disease
  6. renal osteodystrophy

### B. Endocrine

1. anatomy and physiology
2. related study: thyroid biopsy
3. pathophysiology
  - a. adrenal disorders
  - b. diabetes mellitus
  - c. hyperparathyroidism
  - d. pituitary disorders
  - e. renovascular hypertension
  - f. thyroid disorders
    1. malignant and benign masses
    2. hypo and hyperthyroidism
    3. inflammatory

(Procedures continues on the following page.)



## Procedures (continued)

### 4. Neurological, Vascular, and Lymphatic Sections

#### A. Neurological

1. anatomy and physiology
2. assessment
3. signs and symptoms
4. related procedures
  - a. lumbar puncture
  - b. myelogram
    1. cervical
    2. thoracic
    3. lumbar
5. medical devices
  - a. image appearance, indications, and purpose
    1. CSF shunts
    2. intrathecal catheters
    3. neuro stimulators
    4. embolization devices
6. pathophysiology
  - a. amyotrophic lateral sclerosis (ALS)
  - b. cerebrovascular accident (CVA)
  - c. dementia (e.g., Alzheimer disease)
  - d. herniated disc
  - e. hydrocephalus
  - f. increased intracranial pressure
  - g. infection/inflammation
  - h. malignant and benign masses
  - i. multiple sclerosis (MS)
  - j. myasthenia gravis
  - k. normal pressure hydrocephalus (NPH)
  - l. open and closed head injuries
  - m. Parkinson disease
  - n. pseudotumor cerebri
  - o. seizures
  - p. spinal cord injury
  - q. syrinx
  - r. tethered cord
  - s. Chiari malformation

#### B. Vascular and Lymphatic

1. anatomy and physiology
2. assessment
3. signs and symptoms of arterial occlusion and insufficiency
4. signs and symptoms of venous obstruction and insufficiency
5. related procedures
  - a. extremity venography
  - b. superficial lymph node biopsy
  - c. insertion of non-tunneled central venous catheter
  - d. insertion of tunneled central venous catheter
  - e. port injection
  - f. peripherally inserted central catheter (PICC) placement
6. medical devices
  - a. catheters
  - b. stents
  - c. embolization devices
  - d. IVC filters
7. pathophysiology
  - a. anemias
  - b. aneurysm
  - c. dissection
  - d. arterial venous malformations (AVM)
  - e. arteriosclerosis/atherosclerosis
  - f. blood clotting disorders
  - g. infectious or inflammatory lymphadenopathy (e.g., cat scratch disease)
  - h. coarctation of aorta
  - i. hypertension
  - j. leukemias
  - k. lymphedema
  - l. lymphomas
  - m. shock
  - n. venous insufficiency
  - o. deep vein thrombosis



## Attachment A

Two of the following 13 procedures (identified as mandatory on *Form CR-1 Summary of Clinical Experience and Competence Assessments*) will be included in the **Case Study Essay Section of the Examination**

### Abdominal Procedures

#### *General Abdomen*

**1. Paracentesis**

#### *Gastrointestinal*

**2. Esophageal study**

**3. Swallowing function study**

**4. Upper GI study**

**5. Small bowel study**

**6. Enema with barium, air, or water soluble contrast**

**7. Nasogastric/enteric or orogastric/enteric tube placement**

#### *Urinary*

**8. Cystography, voiding cystography or voiding cystourethrography**

### Thoracic Procedures

#### *Pulmonary*

**9. Thoracentesis**

### Musculoskeletal and Endocrine Procedures

#### *Musculoskeletal*

**10. Arthrogram (shoulder or hip)**

### Neurological, Vascular, and Lymphatic Procedures

#### *Neurological*

**11. Lumbar puncture with or without contrast**

**12. Cervical, thoracic, or lumbar myelography – imaging only**

#### *Vascular and Lymphatic*

**13. Peripherally inserted central catheter (PICC) placement**

## Appendix IV: RA Course Sequence Grid

# Courses

### Radiologist Assistant Program

#### First Professional Year

Spring Semester Courses	Prerequisites	Credit Hrs.
<a href="#">RADI 710</a> Advanced Patient Assessment, Management, and Education	RA students only	3
<a href="#">RADI 711</a> Abdominal Imaging and Procedures I	RA students only	3
<a href="#">RADI 713</a> Advanced Pathophysiology I	RA students only	3
<a href="#">RADI 712</a> Clinical Practicum I	RA students only	1
<i>Semester Total</i>		<i>10</i>
Summer Session I Courses	Prerequisites	Credit Hrs.
<a href="#">RADI 721</a> Abdominal Imaging and Procedures II	RADI 711- 713	3
<a href="#">RADI 722</a> Clinical Practicum II	RADI 711- 713	2
<i>Semester Total</i>		<i>5</i>
Summer Session II	Prerequisites	Credit Hrs.
<a href="#">RADI 742</a> Musculoskeletal Imaging and Procedures		3
<a href="#">RADI 732</a> Clinical Practicum III	RADI 722	2
<i>Semester Total</i>		<i>5</i>
Fall Semester	Prerequisites	Credit Hrs.
<a href="#">RADI 741</a> Thoracic Imaging and Principles		3
<a href="#">RADI 714</a> Advanced Pathophysiology II	RADI 713	3
<a href="#">RADI 743</a> Clinical Practicum IV	RADI 732	2
<i>Semester Total</i>		<i>8</i>
<b>First Year Total</b>		<b>28</b>

## Second Professional Year

Spring Semester	Prerequisites	Credit Hrs.
<a href="#">RADI 755</a> Research Methodology & Statistics	First Yr. Courses	3
<a href="#">RADI 752</a> Vascular and Lymphatic Imaging and Procedures		3
<a href="#">RADI 753</a> Clinical Practicum V	RADI 743	2
<i>Semester Total</i>		8
Summer Session I	Prerequisites	Credit Hrs.
<a href="#">RADI 751</a> Neurological and Endocrine Imaging and Procedures		3
<a href="#">RADI 762</a> Clinical Practicum VI	RADI 753	2
<i>Semester Total</i>		5
Summer Session II	Prerequisites	Credit Hrs.
<a href="#">RADI 731</a> Pharmacology and Clinical Decision Making in Radiology	RADI 710- 762	3
<a href="#">RADI 772</a> Clinical Practicum VII	RADI 762	2
<i>Semester Total</i>		5
Fall Semester	Prerequisites	Credit Hrs.
<a href="#">RADI 761</a> Practice Issues	RADI 710- 755, 762, 772	3
<a href="#">RADI 771</a> Professional Practice Seminar	RADI 710- 755, 772	3
<a href="#">RADI 781</a> Clinical Practicum VIII	RADI 772	2
<i>Semester Total</i>		8
<b>Second Year Total</b>		<b>26</b>
<b>Program (First and Second Years) Total</b>		<b>54</b>

## Appendix V: Course Descriptions

### Course Descriptions

#### Radiologist Assistant Program

##### **RADI 710** Advanced Patient Assessment, Management, and Education

Content introduces a model for clinical thinking to aid in patient assessment and analysis and interpretation of physiological data. Clinical skills acquired will include interviewing skills and assessment techniques. The focus is on the application of anatomy and physiology knowledge to assist in patient assessment and management.

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##### **RADI 711 & 721** Abdominal Imaging and Procedures I and II

These courses include abdominal anatomy, physiology, and pathophysiology with clinical pathways. Fluoroscopic equipment operation and radiation safety are also included. The following procedures will be covered with an emphasis on patient assessment, management, preparation, post-procedure care, indications, contraindications, possible complications, contrast media, drugs, image evaluation and observation reporting: UGI, Ba Swallow, SB studies, BE, cystogram, nasoenteric and oroenteric tube placement, paracentesis, fistulagram, sonogram, hysterosalpingogram, loopogram, RUG, and tube injections.

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##### **RADI 712, 722, 732, 743, 753, 762, 772, 781** Clinical Practicum I- VIII

Mentored clinical experience is the cornerstone in the development of the radiologist assistant. RA students work closely with radiologist mentors to maximize the learning opportunities available in the clinical environment. It is recognized that no two diagnostic imaging centers will be exactly the same. The RA student and radiologist mentor collaborate to establish goals and expectations for this portion of the curriculum. A clear understanding of the degree of autonomy in the performance of diagnostic/ therapeutic procedures and the assistant's contribution to the radiologist's final diagnosis related to the procedures is essential to the clinical experience (ASRT, 2002). Throughout the program, students will be required to complete competencies for imaging procedures.

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##### **RADI 713** Pathophysiology I & II

Using a system approach, this course is designed to focus on the characteristics and manifestations of disease caused by alterations or injury to the structure or function of the body. Concepts basic to pathophysiology as well as common disease conditions are studied and serve as prototypes in understanding alterations that occur in the major body systems. Emphasis is placed on the characteristic manifestations and image correlation with these pathologies observed through diagnostic imaging. Section 1 will focus on



gastrointestinal, genitourinary and cardiovascular systems. Section II will cover respiratory, neurological, endocrine and reproductive systems.

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**RADI 731 Pharmacology and Clinical Decision Making in Radiology**

The course includes pharmaceuticals common to radiology patients and will address indications, contraindications, complications, the intended use of these drugs and their effect on physiology, diseases and conditions. After learning this content and possessing the appropriate clinical skills, the radiologist assistant will analyze the patient's current condition with regards to medications and other therapies and determine the significance to the radiology procedure. He or she will suggest the appropriate action plan for the procedure for the specific patient. The radiologist assistant will be responsible for the delivery and documentation of procedure-related pharmaceuticals and for patient assessment and monitoring before, during and after the procedure and drug administration. It is essential that the radiologist assistant have a clear understanding of the laws and policies related to pharmaceuticals in his or her practice setting.

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**RADI 741 Thoracic Imaging and Principles**

This course includes thoracic and breast anatomy, physiology, and pathophysiology with clinical pathways. The following procedures will be covered with an emphasis on patient assessment, management, preparation, post-procedure care, indications, contraindications, possible complications, contrast media, drugs, image evaluation and observation reporting: thoracentesis, ductogram, and breast needle localization.

---

**RADI 742 Musculoskeletal Imaging and Procedures**

This course includes musculoskeletal anatomy, physiology, and pathophysiology with clinical pathways. The following procedures will be covered with an emphasis on patient assessment, management, preparation, post-procedure care, indications, contraindications, possible complications, contrast media, drugs, image evaluation and observation reporting: arthrogram, joint injection and joint aspiration.

---

**RADI 751 Neurological and Endocrine Imaging and Procedures**

This course includes neurological and endocrine system anatomy, physiology, and pathophysiology with clinical pathways. Content includes CT and MRI Imaging principles. The following procedures will be covered with an emphasis on patient assessment, management, preparation, post-procedure care, indications, contraindications, possible complications, contrast media, drugs, image evaluation and observation reporting: lumbar puncture and myelogram.

---

**RADI 752** Vascular and Lymphatic Imaging and Procedures

This course includes lymphatic and vascular anatomy, physiology, and pathophysiology with clinical pathways. The following procedures will be covered with an emphasis on patient assessment, management, preparation, post-procedure care, indications, contraindications, possible complications, contrast media, drugs, image evaluation and observation reporting: PICC placement, port injection, non-tunneled venous catheter central line placement, and venous catheter placement for dialysis.

---

**RADI 755** Research Methodology & Statistics

Content is designed to aid in the development of inquiry and research skills. Learning research skills and conducting research projects benefits the individual and the profession. The individual benefits by learning new knowledge and skills; the profession benefits by adding to the professional body of knowledge.

Technological innovations result in new procedures, equipment and expanded or new modalities that require technologists to remain current in their knowledge and skills. One method of meeting this professional obligation is to read, study professional literature or conduct research. Learning does not end when a student completes the formal educational process; therefore, as a professional, the technologist must develop inquiry skills, determine continuing education needs and pursue methods to meet those needs. The course will culminate in a master's thesis that will be presented on campus.

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**RADI 761** Practice Issues

Content is designed to impart an understanding of protection of individual and population groups against the harmful effects of ionizing and nonionizing radiation. This includes an overview of the regulatory bodies and patient radiation safety regulations affecting the modern diagnostic imaging environment. The effect of ionizing radiations on biological samples will be included. Interaction of ionizing radiation with matter, units of exposure and dose, radiation detection and measurement devices will be discussed. Practical techniques and QA/QC procedures for reducing patient and operator risk of exposure to ionizing radiation will be introduced. Content also provides a fundamental background in the law and regulatory issues of today's health care culture. Advanced legal terminology, concepts and principles will be presented, discussed and applied in relation to clinical practice. Content includes basic concepts of patient information management and medical records management, including privacy and regulatory issues.

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**RADI 771** Professional Practice Seminar

Content introduces guidelines for reporting initial observations made by the radiologist assistant during radiology procedures and image assessment. The radiologist assistant

role in the systematic analysis of the quality of care - the diagnosis and treatment, the resources, procedures and resulting outcomes, including the patient's quality of life - will be discussed. Topics of sensitivity and specificity as they relate to diagnostic testing will be presented. Also included will be predictive values, prior probability and bias as they relate to the analysis of information obtained from diagnostic testing.

## Appendix VI A: Example Memorandum of Understanding/Preceptorship Agreement

The Division of Radiologic Science at The University of North Carolina is pleased that you have agreed to provide the preceptorship component for (student name) during the Radiologist Assistant Program. The student will be enrolled in clinical education courses from January (beginning year) through December (ending year). This letter serves as a communication of expectations for the program and for the preceptorship. Please read it over carefully and then provide us with **three** signed copies and then we will add our signatures and send you a finalized copy.

Both the RA Program and the Preceptorship agree and understand the following:

a. The Program appoints a Clinical Education Coordinator who will be liaison representative for the Program. Leslie Meredith is the Coordinator and she will be in contact with you on a regular basis regarding the students' requirements and progress. She can be reached at [leslie\\_meredith@med.unc.edu](mailto:leslie_meredith@med.unc.edu) home 757-482-2401 or cell 949 949-8499.

b. The Program will provide communication regarding the Practice's performance in providing clinical education experiences; said communication may include general information on the students' evaluations of their experiences with the Practice.

c. The Program assures that all assigned students meet the immunization and health requirements of the Program and clinical sites, and provides the Practice with evidence of such immunizations and health requirements upon request.

d. The Program provides the Practice with an exposure control plan and guidelines for its students in accordance with OSHA Standards for Bloodborne Pathogens and TB, or other applicable guidelines upon request. Adequate OSHA safety and HIPAA training will occur prior to any clinical experience.

e. The Program will be responsible for admissions, matriculation, grade submissions, exchanging and monitoring radiation badges, dismissals, graduation, and certification procedures.

f. The Practice will provide the supervision and instruction necessary for the clinical education experience.

g. The Practice will designate a Clinical Preceptorship Coordinator (primary preceptor) to be the liaison representative to the Program. **Need to add full name of primary preceptor with credentials, practice name, address, phone, and fax information here.**

Primary Preceptor's name and credentials:

Practice Name:

Address, phone and fax information:

h. The Practice will provide the Program with the name and contact information of a person at each clinical site to be notified of student participation at the site. This person may be a Radiology Manager, Legal Services employee, or any other appropriate personnel who can verify the need for site contracts.

i. The Practice will submit to the Program evaluations of each student's performance and progress based on his/her activities during the clinical experience assignment. All evaluation and assessment forms will be provided by the Program. The Practice shall provide the student ongoing feedback regarding his/her performance

and a final evaluation conference will be held.

j. The Practice will oversee the RA student completion of as many RA mandatory and elective clinical competencies that the clinical site is able to provide. These mandatory and elective procedures are identified by the UNC RA curriculum and the American Registry of Radiologic Technologists (ARRT) Clinical Education Requirements document. Competencies will be evaluated and reported according to program documentation.

k. The Practice will retain full authority and responsibility for the care and treatment of its patients.

l. The Practice will ensure that each and every Party of the Practice is aware of this agreement to provide supervision and instruction and are informed of his or her responsibilities. If at any time a designated primary preceptor leaves or enters the practice, the Program must be notified in writing.

m. The Practice will ensure that each and every Party of the Practice who is designated as a preceptor understands his/her role. The Preceptor duties include, but are not limited to:

1. Clinical Instruction and guidance of the RA student as he/she develops overall RA clinical skills.
2. Supervision and oversight of RA student interactions with patients.
3. Teaching, evaluating, and documenting successful completion of RA Clinical Competency Procedures (Required and Elective) as identified by the UNC RA curriculum and the ARRT Clinical Education Requirements. Competencies will be evaluated and reported according to program documentation.
4. Communication with the UNC faculty about the progress of the RA student in the RA program.

Again, we want to thank you for joining us in the educational preparation of a Radiologist Assistant. Our program has been quite successful with a 100% pass rate on the national certification examination and a high level of satisfaction from those practices who have employed the graduates. The program is appropriately rigorous for the advanced level of accountability and responsibility of this healthcare provider. With the supportive clinical experiences your practice will provide, we feel confident our graduates will continue to contribute to maintaining high quality imaging services offered by radiologists.

If you have any questions, I can be reached at [joy\\_renner@med.unc.edu](mailto:joy_renner@med.unc.edu) or 919 966-5147. We are looking forward to a wonderful, collaborative learning relationship over the next two years.

\_\_\_\_\_/Date

Joy J. Renner, M.A., RT(R), FAEIRS  
Director, Division of Radiologic Science  
UNC School of Medicine

\_\_\_\_\_/Date

Fill in name, credentials and title of individual signing on behalf of the practice  
(chief or head of radiology practice)

\_\_\_\_\_/Date

Fill in RA student name, credentials

**Appendix VI B: Example Affiliation Agreement  
between the facility and the University**

## AFFILIATION AGREEMENT

THIS AFFILIATION AGREEMENT (“Agreement”) is made and entered by and between the University of North Carolina at Chapel Hill for its School of Medicine, Department of Allied Health Sciences (the “University”) and \_\_\_\_\_ (the “Agency”). The purpose of this Agreement is to set forth the terms of the working relationship between the Agency and the University to provide on-site clinical learning experiences for Allied Health students of the University at the Agency (the “Practicum”). In consideration of the mutual covenants and agreements contained herein, the University and the Agency agree as follows:

### GENERAL PROVISIONS

1. The University and the Agency will be mutually responsible for planning the schedule of student assignments to the Agency including the number of students and the time periods of the assignment. The number of students accepted by the Agency shall be subject to the availability of the personnel of the Agency for teaching and supervising as well as other commitments. The University will send information to the Agency prior to the initiation of the clinical education experience; such information shall include dates of assignment, number of students, names and pertinent information about students, University’s objectives for clinical education, curriculum outline and types of previous clinical experience. The Agency will provide clinical education experiences and supervise students. The nature of the clinical experience shall be arranged by the responsible personnel of the Agency after consultation with the responsible personnel of the University.
2. The University and the Agency will jointly plan and shall mutually agree on the Practicum experience for assigned students. The University and the Agency will jointly evaluate students. Exchange of information will occur during on-site visits when practical and by letter, telephone and/or email in other instances. The University and the Agency agree that they shall refrain from disclosing any student’s educational records except with the student’s consent or as permitted under the Family Educational Rights and Privacy Act of 1974, 20 USC 1232 (g), otherwise known as “FERPA,” and applicable regulations thereunder.
3. The University and the Agency will instruct their respective faculty, staff and students participating in the Practicum to maintain confidentiality of student and patient information as required by applicable law and by the policies and procedures of the University and the Agency.
4. There shall be no monetary exchange for services rendered by the Agency or services rendered by students and/or faculty personnel. It is expected that as a result of these experiences the Agency and the University will be enriched through the stimulus of the relationship.
5. There will be no discrimination against any program participant or applicant covered under this Agreement because of age, color, disability, gender, gender expression, gender identity, genetic information, national origin, race, religion, sex, sexual orientation, veteran status or disability, provided, however, with respect to disability, the disability must not be such as would, even with reasonable accommodation, in and of itself preclude the student’s effective participation in the Practicum, nor will the University or the Agency engage in unlawful discrimination in their employment or personnel policies or practices.
6. The parties acknowledge and agree that Agency may, at Agency’s sole discretion, include any additional entities and locations owned and operated by Agency for purposes of providing Practicum experience to assigned students in addition to the primary location identified herein. Students may participate in the work of the agency at locations owned and operated by the Agency, and at community locations or other locations with whom the Agency has contracts/agreements.

7. The parties each agree to comply with all applicable state and federal laws, rules and regulations in their respective performance of this Agreement. Each party further agrees to cooperate with the other party with respect to such party's efforts to comply with applicable laws, rules and regulations, to the extent such efforts relate to the party's performance of its respective obligations under this Agreement.

#### **THE UNIVERSITY'S RESPONSIBILITIES**

8. The University will provide information to the Agency concerning its curriculum and will assume responsibility for the academic preparation and evaluation of its students. The University will designate an appropriately qualified faculty member to coordinate and act as the liaison with the Agency. The University will notify the Agency in writing of any change or proposed change of its liaison. The University will have the final responsibility for grading its students.

9. The University will provide the names and information pertaining to relevant education and training for all students enrolled in the Practicum at least four (4) weeks before the beginning date of the Practicum. The University will also keep staff at the Agency informed regarding the specific allied health science program requirements and policies.

10. The University will require students to comply with the policies and procedures established by the Agency, including, but not limited to, those policies and procedures related to the Health Insurance Portability and Accountability Act of 1996, P.L. 104-91, as amended, and its implementing regulations ("HIPAA").

11. The University will require each student participating in the Practicum to acquire comprehensive health and accident insurance that will provide continuous coverage of the student during his/her participation in the Practicum. The University will inform students that Students are responsible for their own health needs, health care costs, and health insurance coverage.

12. The University shall be responsible for all workers' compensation claims by its employees, to the extent required by applicable law.

13. The University will assure that a state criminal background check is conducted on all students to be assigned to the Agency under this Agreement. Such criminal background check shall be conducted in all states where the assigned student has lived, worked or gone to school, either within the past seven (7) years, or from the date that the assigned individual turned sixteen (16) years of age, whichever is shorter. The University shall assure that any assigned individual will notify the Agency within ten (10) days prior to beginning such assignment if such individual has a criminal record. The University acknowledges that the Agency reserves the right not to accept any student who has a criminal record into the Practicum. In the event that the Agency declines to accept a student based upon a positive criminal record, the Agency shall notify the University and the student in a timely manner.

14. The University will assure that all assigned students meet the immunization and health requirements of Appendix A, attached hereto and the items of which are incorporated herein by reference, and to provide the Agency with evidence of such immunizations and health requirements upon request.

#### **THE AGENCY'S RESPONSIBILITIES**

15. The Agency will provide students with a desirable Practicum experience within the scope of allied health care services provided by the Agency. Such Practicum experience should be a practical (job-like) experience;

16. The Agency will designate in writing preceptors, if any, to be responsible for the Practicum experience and will designate in writing one person as the clinical education supervisor who will maintain contact with the University-designated liaison to assure mutual participation in and review of the Practicum and student progress. The Agency's preceptor(s) and clinical education supervisor(s) may be the same person. The Agency will notify the University in writing of any or proposed change of the preceptor(s) or clinical education supervisor(s).



17. The Agency will provide students with access to sources of information necessary for the Practicum experience within the Agency's policies and procedures and commensurate with patient's rights, including material such as Agency policy and procedure manuals and rules and regulations.

18. The Agency will provide students any required orientation/training in the Agency's policies, procedures, rules and regulations, including, but not limited to training required under the Agency's HIPAA policy.

19. The Agency will make available to students basic supplies and equipment necessary for care of patients/clients and the Practicum, including a nametag. Within the limitation of its facilities, the Agency will make available office and conference space for students, and if applicable, University Faculty.

20. The Agency will submit required reports on each student's performance and will provide student evaluation to the University. The Agency shall comply with the applicable provisions of FERPA, and shall take all measures necessary to ensure the confidentiality of any and all information in its possession regarding the University's students who train at the Agency pursuant to this Agreement.

21. The Agency retains full responsibility for the care and treatment of its patients/clients and will maintain the quality of patient care without relying on the students' clinical training activities for staffing purposes.

#### **STUDENTS' STATUS AND RESPONSIBILITIES**

22. Both parties acknowledge and agree that students will have the status of learners and will not replace Agency personnel and no student shall be deemed to be an employee or agent of the Agency or the University for purposes of compensation, fringe benefits, workers' compensation, unemployment compensation, minimum wage laws, income tax withholding, social security, liability or any other purpose, because of their participation in the Practicum described herein. Each student is placed within the Agency to receive clinical experience as a part of his or her academic curriculum only. The foregoing notwithstanding, the parties acknowledge that during the clinical instruction at the Agency, students will receive "protected health information," as defined in HIPAA, and because students, as trainees, will be under the supervision of Agency in their performance of duties for Agency, students will be deemed to function as part of the Agency's "workforce," as defined in HIPAA.

23. The University will inform students that they are required to adhere to the standards, policies, procedures and regulations of the Agency during their Practicum experience.

#### **LIABILITY**

24. The University shall maintain professional liability self-insurance, including medical malpractice insurance, for itself in amounts not less than required by the North Carolina Tort Claims Act and for any of its faculty members or students assigned under this Affiliation Agreement in an amount not less than \$1 million per occurrence, \$3 million annual aggregate.

25. The Agency shall obtain and maintain adequate professional liability and commercial general liability insurance in an amount not less than \$1 million per occurrence, \$3 million annual aggregate that will cover itself and its employees and agents who perform services pursuant to the Affiliation Agreement.

26. To the fullest extent permitted by applicable law, Agency shall indemnify and hold the University and its employees and agents harmless from any and all liability arising out of the Agreement, including but not limited to, property damage or personal injuries including death, to the extent caused by the negligent acts or omissions or willful misconduct of the Agency or its employees or agents in performing its obligations under this Agreement. The University will be responsible for its own negligence and for the negligence of its employees and agents in accordance with the North Carolina Tort Claims Act.

27. No student shall be deemed to be an employee or agent of either Agency or the University unless the student was employed by either party prior to and remains continuously employed by such party through the Practicum experience. The foregoing notwithstanding, the parties acknowledge that each student is placed at the Agency to receive clinical experience as a part of his or her academic curriculum only, and each faculty member is placed at the Agency to aid in such student clinical experience. Accordingly, neither the University nor the Agency will be responsible for acts of negligence or willful misconduct on the part of any assigned student.

#### TERM AND TERMINATION

28. The term of this Agreement shall begin \_\_\_\_\_, 2020 and will remain in place for three (3) years. This Agreement may be renewed thereafter for additional three (3) year periods upon written agreement, executed by authorized signatories of the parties.

29. This Agreement may be terminated at any time by either party without penalty provided that written notice of such termination is furnished to the other party at least ninety (90) days prior to termination. The parties agree that any student who is participating in clinical instruction on the effective date of any such termination will be permitted to complete the remainder of his/her term of instruction.

#### BLOOD-BORNE PATHOGENS AND EMERGENCY TREATMENT

30. The University shall provide Agency with an exposure control plan and guidelines for its students in accordance with OSHA Standards for Bloodborne Pathogens and TB, or other applicable guidelines upon request.

31. In the event a student or faculty member requires first aid or emergency care for an illness or incident that occurs while he/she is performing placement responsibilities, such care is available at \_\_\_\_\_. The individual student or faculty member will be responsible for the cost of care. Students who experience an HIV exposure incident should go to UNC-CH Student Health Services for appropriate emergency counseling and treatment. Faculty members who experience an HIV exposure incident should go to the Occupational Health Services in the UNC Ambulatory Care Center for appropriate emergency counseling and treatment.

32. The source patient's HBV, HCV and HIV status will be determined by the Agency in the usual manner to the extent possible.

#### MISCELLANEOUS PROVISIONS

33. This Agreement contains the entire understanding of the parties and shall not be altered, amended, or modified, except by agreement in writing executed by the duly authorized officials of both parties.

34. Each party may designate a change of address by notice in writing. All notices, demands, requests or communications that are not hand-delivered will be deemed received three (3) days after deposit in the US mail, postage pre-paid, or upon confirmation of successful facsimile transmission, to the last known address or fax number.

35. Neither party may assign or otherwise transfer its rights or obligations under this Agreement without the prior written consent of the other party, which consent shall not be unreasonably withheld or delayed. Any purported assignment in violation of the preceding sentence will be void and of no effect.

36. The parties will cooperate and consult when developments so demand during the term of this Agreement.

37. Neither the University nor the Agency will be responsible for costs or expenditures incurred by the other in the conduct of the Practicum.

38. The parties hereby acknowledge that they are independent contractors, and in no event shall this Agreement be construed as establishing a partnership or joint venture or similar relationship between the parties hereto. The provisions set forth herein shall survive expiration or other termination of this Agreement regardless of the cause of such termination.

39. The Agency reserves the right, in its sole discretion, to immediately discontinue a student's participation in the Practicum experience at the Agency and insist that such student no longer be present at the Agency. Such discontinuance may occur for, but not be limited to, the following reasons: 1) such individual is found in violation of the Agency's policies, procedures, rules, or regulations; 2) such individual is interfering with the Agency's operations; or, 3) such individual is engaging in conduct detrimental to the care and treatment of the Agency's patients; provided, however, the person is made aware of the Agency's intent to discontinue his/her participation and has been given the opportunity to respond prior to discontinuing such participation. In the event the Agency elects to discontinue a student's participation in the clinical training experience at the Agency, it shall immediately notify the University. The foregoing notwithstanding, the University also reserves the right to remove a student from participation in the Practicum if it determines that the student is no longer able to meet educational objectives.

40. If any provision of this Agreement, or of any other agreement, document or writing pursuant to or in connection with this Agreement, is held to be wholly or partially invalid or unenforceable under applicable law, that provision will be ineffective to that extent only, without in any way affecting the remaining parts or provisions of this Agreement.

41. Neither the waiver by any of the parties hereto of a breach of or a default under any of the provisions of this Agreement, nor the failure of either party, on one or more occasions, to enforce any of the provisions of this Agreement or to exercise any right or privilege hereunder, will thereafter be construed as a waiver of any subsequent breach or default of a similar nature, or as a waiver of any such provisions, rights or privileges hereunder.

42. The laws of North Carolina shall govern the validity and interpretation of the provisions, terms, and conditions of this Agreement.

[SIGNATURE PAGE TO FOLLOW]

IN WITNESS WHEREOF, the parties have signed this Agreement in their official capacities on the day and year listed below:

**THE UNIVERSITY OF NORTH CAROLINA  
AT CHAPEL HILL**

**AGENCY:**

\_\_\_\_\_  
A. Wesley Burks, MD  
Dean, School of Medicine  
Vice Chancellor for Medical Affairs

Date: \_\_\_\_\_

\_\_\_\_\_  
Authorized Agency Representative

Printed Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

\_\_\_\_\_  
Stephen R. Hooper, PhD  
Associate Dean and Chair  
Department of Allied Health Sciences

Date: \_\_\_\_\_

## APPENDIX A

### Immunization Requirements Department of Allied Health Sciences University of North Carolina – Chapel Hill

**NC state law requires that all students entering college submit documentation of certain immunizations, including:**

- 3 doses of Diphtheria, Tetanus, and/or Pertussis; \*one dose must have been within the past 10 years\* & one must be a Tdap
- 2 doses of Measles & Mumps, or laboratory evidence of immunity
- 1 dose of Rubella, or laboratory evidence of immunity

*\*\*Note – 2 MMR vaccines given on or after 12 months of age may be substituted for Rubella, Measles, and Mumps requirement.*

**Students in the Department of Allied Health Sciences are required to provide the following additional documentation as indicated:**

- 2 doses of Varicella vaccine, or laboratory evidence of immunity
- 3 doses of Hepatitis B vaccine **plus** a positive quantitative titer
- Annual screening for exposure to tuberculosis. Any student who has ever had a positive screening test is required to have an annual clinical evaluation for signs or symptoms of active TB.
- Annual seasonal influenza vaccine for all students in clinical settings during flu season.

#### **Other Requirements:**

OSHA Training – for TB and Bloodborne Pathogens required when student will be in patient care areas.

HIPAA Training – Required when student will be in patient care areas.

Agency Requirements (please specify if there are other requirements other than previously mentioned) –

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# **Appendix VII : RA Clinical Competency List**

2013

## Registered Radiologist Assistant (R.R.A.)

### Component 1: Clinical Experience Documentation and Competence Assessments

The R.R.A. Entry-Level Clinical Activities (ELCA) document identifies the radiologic procedures and clinical activities that serve as the basis for R.R.A. certification standards. As part of the preceptorship, the student will be exposed to the vast majority of those procedures. This document identifies those clinical procedures the candidate is expected to master to become eligible for certification by ARRT.

As part of their preceptorship, candidates for certification will satisfy two types of clinical requirements. First, they must submit documentation indicating the number of cases completed for a broad range of radiologic procedures. Second, candidates are required to demonstrate competence performing the various radiologic procedures. The specific requirements for the *Clinical Experience Documentation and Competence Assessments* follow. Forms for documenting the clinical and assessment requirements appear on pages 42-48. Candidates must complete all clinical procedures prior to the examination administration date. Examination results will not be released until all clinical experience and competence assessment forms have been received and evaluated by ARRT.

#### Clinical Experience Documentation

A minimum of 500 total cases are required. A total of 36 procedures comprise the clinical experience and competence requirements for R.R.A. certification. All candidates are required to perform 12 mandatory procedures for the specified minimum number of cases. In addition, candidates select a subset from the 24 elective procedures. The maximum number of mandatory and elective cases indicates the maximum reportable cases, not the maximum number a student may perform during their training program. Candidates are encouraged to complete as many additional mandatory and elective procedures as achievable.

**Mandatory Procedures:** The table on the following pages identifies the 12 mandatory radiologic procedures and the minimum and the maximum number of cases required for each procedure. Candidates are required to complete:

- A minimum of 375 of the cases must be from the mandatory procedures category.
- For each mandatory procedure, the specified minimum number of cases must be completed.

*For example, assume a hypothetical candidate performed 70 upper GIs, 60 small bowel studies, 35 barium enemas, 30 cystograms, 65 arthrograms, 30 lumbar punctures, 30 NG tube placements, 20 paracenteses, and 75 PICC procedures. Of those, 50 UGI, 25 small bowel studies, 35 barium enemas, 30 cystograms, 45 arthrograms, 25 lumbar punctures, 25 NG tube placements, 20 paracenteses and 30 PICC line placements equaling 285 cases, which count toward the minimum 375 mandatory cases.*

**Elective Procedures:** The table on the following pages also identifies 24 elective procedures from which candidates must select a minimum of 3 elective procedures. Candidates are required to complete:

- A minimum of 125 cases must be from the elective procedures category.
- For each selected elective, the specified minimum number of cases must be completed for that procedure.

*For example, assume a hypothetical candidate performed 30 fistulograms, 5 extremity venograms, 35 port injections, 20 myelograms, 5 breast needle localizations, 5 retrograde urethrograms, and 15 insertions of tunneled central venous catheters. Of those, 15 fistulograms, 5 extremity venograms, 15 port injections, 15 myelograms, 0 breast needle localizations (did not meet the minimum required number), 5 retrograde urethrograms, and 15 insertions of tunneled central venous catheters total 70 which count toward the minimum 125 elective cases.*

Candidates must use Form CR-1 for summarizing the number of cases for each procedure. In addition, candidates are expected to keep a detailed record of each case completed (e.g., date, time, facility) for audit purposes.

## Clinical Competence Assessment

For all mandatory and elective procedures, candidates must be evaluated according to the following guidelines. The competence assessment is to be completed:

- Once for each procedure. A minimum of 15 assessment forms (12 mandatory and 3 elective) are to be submitted to ARRT.
- By a radiologist using the ARRT evaluation forms that follow. Note that there are separate forms for each class of procedures (GI and Chest, GU, invasive vascular, invasive nonvascular, and post-processing activities).
- At any time during the preceptorship, presumably after the student has completed a sufficient number of cases under appropriate instruction to acquire proficiency.

It is not necessary for the student to complete all cases (e.g., 15 cystograms) prior to presenting for competence assessment. The assessment may be completed at any time after the student has acquired sufficient skill performing a procedure.

During training it is expected that students will receive appropriate levels of supervision. For additional information on supervision, refer to the ELCA document. All procedures must be performed on actual patients; simulated procedures cannot be used to satisfy the competence assessments.

## Required Documentation

### *Form CR-1: Summary of Clinical Experience and Competence Assessments*

1. This form is completed by the student as he or she: (a) completes the requisite number of cases for the mandatory and elective procedures; and (b) is evaluated by a radiologist on the mandatory and elective procedures.
2. The student records the number of cases completed for each mandatory and elective procedure he or she performs.
3. The student records only the date that the competency assessment was completed. Note that the actual competence assessments are completed by a radiologist using Form CR-2, as described immediately below.
4. The preceptor and program director must verify and sign the bottom of Form CR-1. This form is submitted to ARRT at the time of application.

### *Form CR-2: Clinical Competence Assessments (Forms CR-2A through CR-2E)*

1. These forms are completed by the radiologist at the time he or she evaluates the student. There are separate evaluation forms for each class of radiologic procedures:
  - Form CR-2A: GI/Chest
  - Form CR-2B: GU
  - Form CR-2C: invasive nonvascular
  - Form CR-2D: invasive vascular
  - Form CR-2E: post-processing activities
2. The radiologist and student are required to sign the bottom of Form CR-2 for each assessment, which is subsequently reviewed and signed by the program director.
3. The student must submit a minimum total of 15 assessment forms to ARRT (12 mandatory and 3 elective procedures).



## Form CR-1

### Summary of Clinical Experience and Competence Assessments

Procedure	Experience Documentation			Competence Assessment Date
	Mandatory or Elective	Minimum and Maximum Number of Repetitions		
		Min	Max	
<b>Gastrointestinal and Chest</b>				
Esophageal study – must fluoro and image the esophagus, may be with UGI	Mandatory	20	50	
Swallowing function study (participate in procedure and provide initial observations to radiologist)	Mandatory	20	50	
Upper GI study	Mandatory	20	50	
Small bowel study – direct the study and spot TI	Mandatory	10	25	
Small bowel study via enteroclysis tube	Elective	15	30	
Enema with barium, air, or water soluble contrast	Mandatory	20	50	
Nasogastric/enteric and orogastric/enteric tube placement – may not require image guidance	Mandatory	10	25	
T-tube cholangiogram	Elective	5	15	
Defecography	Elective	5	15	
Perform chest fluoroscopy for diaphragmatic motion	Elective	5	15	
<b>Genitourinary</b>		<b>Min</b>	<b>Max</b>	
Antegrade urography through existing tube (e.g., pyelostography, nephrostography)	Elective	5	15	
Cystography or voiding cystourethrography, with a minimum of 10 bladder catheterizations	Mandatory	15	30	
Retrograde urethrography or urethrocystography	Elective	5	15	
Loopography through existing tube	Elective	5	15	
Hysterosalpingography – imaging only	Elective	5	15	
Hysterosalpingography – procedure and imaging (physician participation required)	Elective	20	50	

**Form CR-1(continued)**

Procedure	Experience Documentation			Competence Assessment Date
	Mandatory or Elective	Minimum and Maximum Number of Repetitions	Actual Number Completed	
<b>Invasive Nonvascular</b>		<b>Min</b>	<b>Max</b>	
Arthrogram (radiography, CT, and MR) joint injection and aspiration	Mandatory	15	45	
Lumbar puncture	Mandatory	10	25	
Cervical, thoracic, or lumbar myelography – imaging only	Elective	5	15	
Lumbar puncture with contrast	Elective	15	45	
Thoracentesis with or without catheter	Mandatory	20	50	
Placement of catheter for pneumothorax	Elective	10	25	
Paracentesis	Mandatory	10	25	
Abscess, fistula, or sinus tract study	Elective	5	15	
Injection for sentinel node localization	Elective	5	15	
Breast needle localization	Elective	20	50	
Change of percutaneous tube or drainage catheter	Elective	5	15	
Thyroid biopsy	Elective	20	50	
Liver biopsy (random)	Elective	20	50	
<b>Invasive Vascular</b>		<b>Min</b>	<b>Max</b>	
Peripheral insertion of central venous catheter (PICC) placement	Mandatory	10	30	
Insertion of non-tunneled central venous catheter	Elective	20	50	
Insertion of tunneled central venous catheter	Elective	30	50	
Port injection	Elective	5	15	
Extremity venography	Elective	5	15	
<b>Post-Processing</b>		<b>Min</b>	<b>Max</b>	
Perform CT post-processing	Elective	5	15	
Perform MR post-processing	Elective	5	15	
<b>Total Number of Cases</b>		<b>500</b>		

Chief Preceptor Signature and Date \_\_\_\_\_

Program Director Signature and Date \_\_\_\_\_

Student Signature and ARRT ID # \_\_\_\_\_

**Form CR-2A**  
**Clinical Competence Assessment for**  
**GI and Chest Procedures**

(esophageal study; swallowing function study; upper GI study; small bowel study; small bowel study via enteroclysis tube; enema with barium, air, or water soluble contrast; nasogastric/enteric and orogastric/enteric tube placement; t-tube cholangiogram; defecography; chest fluoroscopy)

*Directions:* This form should be completed by the radiologist supervising the procedure after the student has completed a sufficient number of cases to merit evaluation. To meet the required performance standard, the student must perform each clinical activity safely and effectively on a consistent basis.

Procedure: \_\_\_\_\_ Date Performed: \_\_\_\_\_

Clinical Activity	Performance Standard		
	does not meet	meets	exceeds
Review patient record and other information to verify appropriateness of procedure. Assess patient for possible contraindications (e.g., history, medications, pregnancy, psychological status).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interview patient to obtain, verify, or update medical history. Explain procedure (risks, benefits, alternatives, and follow-up) and any required pharmaceuticals. Obtain or verify informed consent and confirm adequate exam preparation (e.g., diet, medications).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perform physical exam and evaluate lab studies as needed; report findings to the radiologist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Prepare and administer contrast agents prescribed by radiologist. Position patient; operate fluoro unit, modifying procedure as necessary; observe and evaluate structure and function; and document fluoroscopy time.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monitor patient status and respond as needed (e.g., discomfort, drug reactions, cardiac distress).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Evaluate procedure for completeness and diagnostic quality; recommend additional images as required; communicate initial observations to the radiologist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Educate patient regarding follow-up care and verify comprehension.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Document procedure and record exceptions from established protocol.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Overall Evaluation</b>	does not meet <input type="checkbox"/>	meets <input type="checkbox"/>	exceeds <input type="checkbox"/>
<b>Radiologist Comments</b> (Note any particular strengths or areas for improvement for the student, or unusual features of the case that warrant consideration.)	_____ _____ _____		
<b>Radiologist Signature</b>	_____		<b>Date</b> _____
<b>Student Signature</b>	_____		<b>Date</b> _____

**Form CR-2B**  
**Clinical Competence Assessment for**  
**GU Procedures**

(antegrade urography; cystography or voiding cystourethrography, retrograde urethrography or urethrocytography; loopography; hysterosalpingography)

*Directions:* This form should be completed by the radiologist supervising the procedure after the student has completed a sufficient number of cases to merit evaluation. To meet the required performance standard, the student must perform each clinical activity safely and effectively on a consistent basis.

Procedure: \_\_\_\_\_ Date Performed: \_\_\_\_\_

Clinical Activity	Performance Standard		
	does not meet	meets	exceeds
Review patient record and other information to verify appropriateness of procedure. Assess patient for possible contraindications (e.g., history, medications, pregnancy, psychological status).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interview patient to obtain, verify, or update medical history. Explain procedure (risks, benefits, alternatives, and follow-up) and any required pharmaceuticals. Obtain or verify informed consent and confirm adequate exam preparation (e.g., diet, medications).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perform physical exam and evaluate lab studies as needed; report findings to the radiologist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perform urinary catheterization; prepare and administer contrast agents prescribed by radiologist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Position patient; operate fluoro unit, modifying procedure as necessary; observe and evaluate structure and function; and document fluoroscopy time.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monitor patient status and respond as needed (e.g., discomfort, drug reactions, cardiac distress).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Evaluate procedure for completeness and diagnostic quality; recommend additional images as required; communicate initial observations to the radiologist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Educate patient regarding follow-up care and verify comprehension.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Document procedure and record exceptions from established protocol.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Overall Evaluation</b>	does not meet <input type="checkbox"/>	meets <input type="checkbox"/>	exceeds <input type="checkbox"/>
<b>Radiologist Comments</b> (Note any particular strengths or areas for improvement for the student, or unusual features of the case that warrant consideration.)	_____ _____ _____		
<b>Radiologist Signature</b>	_____	<b>Date</b>	_____
<b>Student Signature</b>	_____	<b>Date</b>	_____

### Form CR-2C

#### Clinical Competence Assessment for Invasive Nonvascular Procedures

(arthrogram, joint injection and aspiration; lumbar puncture; myelography lumbar puncture with contrast; thoracentesis; placement of catheter for pneumothorax paracentesis; abscess, fistula, or sinus tract study; injection for sentinel node localization; breast needle localization; change of percutaneous tube or drainage catheter; thyroid biopsy; liver biopsy)

**Directions:** This form should be completed by the radiologist supervising the procedure after the student has completed a sufficient number of cases to merit evaluation. To meet the required performance standard, the student must perform each clinical activity safely and effectively on a consistent basis.

Procedure: \_\_\_\_\_ Date Performed: \_\_\_\_\_

Clinical Activity	Performance Standard		
	does not meet	meets	exceeds
Review patient record and other information to verify appropriateness of procedure. Assess patient for possible contraindications (e.g., history, medications, pregnancy, psychological status).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interview patient to obtain, verify, or update medical history. Explain procedure (risks, benefits, alternatives, and follow-up) and any required pharmaceuticals. Obtain or verify informed consent and confirm adequate exam preparation (e.g., diet, medications).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perform physical exam and evaluate lab studies as needed; report findings to the radiologist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Administer local anesthetic; select and insert needle, catheter, or tube to required location; collect fluids and measure pressures as needed; administer prescribed contrast; maintain aseptic environment throughout procedure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Position patient; operate fluoro unit, modifying procedure as necessary; observe and evaluate structure and function; and document fluoroscopy time.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monitor patient status and respond as needed (e.g., discomfort, drug reactions, cardiac distress).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Evaluate procedure for completeness and diagnostic quality; recommend additional images as required; communicate initial observations to the radiologist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Educate patient regarding follow-up care and verify comprehension.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Document procedure and record exceptions from established protocol.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Overall Evaluation</b>	does not meet <input type="checkbox"/>	meets <input type="checkbox"/>	exceeds <input type="checkbox"/>
<b>Radiologist Comments</b> (Note any particular strengths or areas for improvement for the student, or unusual features of the case that warrant consideration.)	_____ _____ _____		
<b>Radiologist Signature</b>	_____		<b>Date</b> _____
<b>Student Signature</b>	_____		<b>Date</b> _____

### Form CR-2D

#### Clinical Competence Assessment for Invasive Vascular Procedures

(PICC placement; insertion of non-tunneled central venous catheter; insertion of tunneled central venous catheter; port injection; extremity venography)

*Directions:* This form should be completed by the radiologist supervising the procedure after the student has completed a sufficient number of cases to merit evaluation. To meet the required performance standard, the student must perform each clinical activity safely and effectively on a consistent basis.

Procedure: \_\_\_\_\_ Date Performed: \_\_\_\_\_

Clinical Activity	Performance Standard		
	does not meet	meets	exceeds
Review patient record and other information to verify appropriateness of procedure. Assess patient for possible contraindications (e.g., history, medications, pregnancy, psychological status).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interview patient to obtain, verify, or update medical history. Explain procedure (risks, benefits, alternatives, and follow-up) and any required pharmaceuticals. Obtain or verify informed consent and confirm adequate exam preparation (e.g., diet, medications).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perform physical exam and evaluate lab studies as needed; report findings to the radiologist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Administer local anesthetic; select and insert needle or catheter to required location; administer contrast and guide catheter; maintain aseptic environment throughout procedure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Position patient; operate fluoro unit, modifying procedure as necessary; observe and evaluate structure and function; and document fluoroscopy time.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monitor patient status and respond as needed (e.g., discomfort, drug reactions, cardiac distress).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Evaluate procedure for completeness and diagnostic quality; recommend additional images as required; communicate initial observations to the radiologist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Educate patient regarding follow-up care and verify comprehension.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Document procedure and record exceptions from established protocol.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<div style="display: flex; justify-content: space-around; font-size: small;"> <span>does not meet</span> <span>meets</span> <span>exceeds</span> </div> <p><b>Overall Evaluation</b> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><b>Radiologist Comments</b></p> <p style="font-size: x-small;">(Note any particular strengths or areas for improvement for the student, or unusual features of the case that warrant consideration.)</p> <p>_____</p> <p>_____</p> <p>_____</p> <p><b>Radiologist Signature</b> _____ <b>Date</b> _____</p> <p><b>Student Signature</b> _____ <b>Date</b> _____</p>			

**Form CR-2E**  
**Clinical Competence Assessment for**  
**Post-Processing Activities**  
 (CT post-processing; MR post-processing)

*Directions:* This form should be completed by the radiologist supervising the procedure after the student has completed a sufficient number of cases to merit evaluation. To meet the required performance standard, the student must perform each clinical activity safely and effectively on a consistent basis.

Procedure: \_\_\_\_\_ Date Performed: \_\_\_\_\_

Clinical Activity	Performance Standard		
	does not meet	meets	exceeds
Retrieve image data from archive system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Preview image data set.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Load image data set.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Display volume using MPR, MIP, SSD, VRT, or CPR.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use segmentation or editing tools to remove obstructive anatomy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Evaluate final images.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Use measuring tools (distance, ROI, percent of stenosis calculation).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Export images to server, secure web site, or report.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Overall Evaluation</b>	does not meet <input type="checkbox"/>	meets <input type="checkbox"/>	exceeds <input type="checkbox"/>
<b>Radiologist Comments</b> <small>(Note any particular strengths or areas for improvement for the student, or unusual features of the case that warrant consideration.)</small>	_____ _____ _____		
<b>Radiologist Signature</b>	_____		Date _____
<b>Student Signature</b>	_____		Date _____