

# Radiologist Assistant Curriculum

*Sponsored by the American Society of Radiologic Technologists, 15000 Central Ave. SE, Albuquerque, NM 87123-3909.*

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# Introduction

The goal of this curriculum is to provide a baseline of knowledge for the development of radiologist assistant education programs. A radiologist assistant is an advanced-practice radiologic technologist who works under the supervision of a radiologist to enhance patient care by assisting the radiologist in the imaging environment. The radiologist assistant is an ARRT-certified radiographer who has successfully completed an academic program including a nationally recognized radiologist assistant curriculum and a radiologist-directed clinical preceptorship. Under radiologist supervision, the radiologist assistant performs patient assessment, patient management and imaging procedures. The title “radiologist assistant” reflects the nature of the relationship between the radiologist and the radiologist assistant working in an advanced clinical role. The radiologist assistant’s professional role and clinical responsibilities are to serve as a radiologist physician extender.

The radiologist assistant has three primary areas of responsibility, all performed under the supervision of a radiologist:

1. Participate in patient assessment, patient management and patient education.
2. Perform medical imaging procedures.
3. Participate in the systematic analysis of the quality of patient care delivered within the medical imaging environment.

The radiologist assistant’s role is unique because of the extensive medical imaging expertise and radiation safety knowledge required. The radiologist assistant is expected to perform each function competently and to understand how each activity fits into the entire continuum of a patient’s care.

The content and objectives of the curriculum are organized to meet the mission, goals and needs of radiologist assistant programs. Items within each section may be modified to meet regional, state or institutional needs. The descriptions and objectives are general in nature and not exhaustive. Instructors are expected to modify the descriptions and objectives to reflect personal knowledge, experience, institutional preference and accreditation requirements. Curriculum content in outline form is intended to cover general knowledge which should be included in the curriculum, while allowing instructor latitude in choosing specific content. This curriculum is suitable for programs offered at a baccalaureate and postbaccalaureate level.

The document is divided into two content areas: core content and optional content.

- Core content: content in this section reflects educational content the radiologist assistant professional community supports as essential for preparation to enter the radiologist assistant field.
- Optional content: content in this section enhances the base curriculum with select topics of instruction that satisfy the mission of various programs and local employment markets.

The curricula that arise from this document will provide a foundation of knowledge and experience supporting continued career growth of technologists, a format for advanced-level education and a cultural standard within the medical imaging community encouraging meaningful professional collaboration.

# Radiologist Assistant Curriculum

## Table of Contents

<b>Foundations</b> .....	<b>1</b>
<b>Core Content</b> .....	<b>4</b>
Patient Assessment, Management and Education.....	5
Pharmacology and Clinical Decision-Making in Imaging.....	10
Contrast Media.....	18
Pathophysiology.....	21
Radiologic Procedures.....	24
Modality and Image Management.....	27
Radiation Safety, Radiobiology and Health Physics.....	34
Image Correlation with Anatomy, Physiology and Pathology.....	38
Clinical Pathways Related to Best Practice Imaging.....	41
Communication of Findings and Validation of Clinical Practice.....	44
Research and Professional Development.....	46
Legal and Professional Standards.....	48
Radiologist Assistant Regulatory and Governmental Affairs.....	54
Radiologist Preceptor Clinical Experience.....	57
<b>Optional Content</b> .....	<b>58</b>
Administration and Management of Radiopharmaceuticals.....	59
<b>Appendix A</b> .....	<b>62</b>
Advanced Patient Care.....	63
Advanced Sectional Anatomy.....	64
Communication.....	65
Patient Centered Care and Cultural Humility.....	66
Health Care Delivery.....	67
Health Care Ethics and Law.....	68
Leadership and Teambuilding.....	69
Pathophysiology.....	70
Health Care Compliance and Accreditation.....	71
Pharmacology.....	72
Quality Management.....	73
Research Methods and Information Literacy.....	74
<b>Appendix B</b> .....	<b>75</b>
Curriculum Revision Workgroup.....	75
<b>Resources</b> .....	<b>76</b>

# Foundations

The foundations section represents an inventory of preexisting knowledge and skills gained through prior academic experience and reinforced through professional practice. The content in this section is derived from the ASRT Bachelor of Science in Radiologic Sciences (B.S.R.S.) Core Curriculum and is intended to aid radiologist assistants in career planning and program managers in the development of preassessment tools for candidate selection.

Refer to Appendix A for a detailed list of objectives for each content area.

## **Advanced Patient Care**

As the role of the medical imaging professional continues to expand, more knowledge is needed in all areas, especially patient management. Advanced patient care skills are essential elements of providing high-quality patient care. This course focuses on patient education, assessment, communication, preprocedural and postprocedural care and proper charting and documentation. Technologists' responsibilities and intervention in cases of critical patient need also are discussed.

## **Advanced Sectional Anatomy**

The ability to locate and identify structures in the axial (transverse), sagittal, coronal and orthogonal (oblique) planes is a necessary skill in many imaging and therapeutic modalities. Volumetric data sets and 3-D reconstruction of the body structures are increasingly important to the critical diagnosis and treatment of diseases. To enhance patient care and assist physicians with the patient's prognosis, radiologic science professionals must understand cross-sectional anatomy.

## **Communication**

Communication is important because radiologic technologists need to effectively relate and communicate with patients and other health care professionals. Communication with the patient is well established in the entry-level curricula. Therefore, this content focuses on expanding the knowledge base and skills necessary for interpersonal, internal and external communication and written documentation. Additional emphasis is placed on respect and adapting to and supporting differences of patients.

## **Patient Centered Care and Cultural Humility**

Cultural humility is important because health care providers work in an increasingly interconnected and complex global community. Health care providers must interact respectfully with individuals from a variety of backgrounds, who may hold different beliefs and values. Understanding the varied backgrounds and needs of people enables medical imaging professionals to interact with individuals such as patients and coworkers, as well as the larger community. Leaders in health care must promote and enforce cultural humility within the facility to ensure patients receive the most appropriate, individually specific care.

## **Health Care Delivery**

It is important for the radiologic technologist to understand the various methods of health care delivery to remain knowledgeable in the changing face of technology. The political context of

health care organization and delivery, with specific focus on the mechanisms for policy formulation and implementation.

### **Health Care Ethics and Law**

Health care ethics and law are important because of their impact on technologists, patients and health care facilities. This content is geared toward legal issues that affect the employee and employer directly regarding ethical behavior and scope of practice. In addition, this content gives guidance on quality management techniques, including reporting, that can help mitigate noncompliance. Leaders in health care must promote and enforce ethics by identifying and reporting ethical issues within the facility. Ethical and legal compliance helps to ensure patients receive adequately patient-centered care, and that the institution is not liable for acts which might lead to litigation.

### **Leadership and Teambuilding**

Leadership and teambuilding are vital components of all health care organizations. To promote an effective team, the radiologic technologist must be able to lead and function within an interdisciplinary team. It is highly recommended for this information to be applied throughout the curriculum to ensure adequate understanding based on various situations.

### **Pathophysiology**

Content focuses on the characteristics and manifestations of diseases 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 in understanding alterations that occur in the major body systems. Emphasis is placed on the image correlation with these pathologies. The in-depth study of pathophysiology allows the professional to communicate better with other health care professionals, including physicians and scientists, as well as with the patient, for the history and physical assessment.

### **Health Care Compliance and Accreditation**

Patient information management is important because of the integral role the radiologic technologist has within the health care team. It is essential for the radiologic technologist to provide all members of the team with a thorough patient record to ensure quality patient care.

### **Pharmacology**

An exploration of pharmacology is necessary to provide the student with comprehensive knowledge concerning drugs and their applications in medical imaging. Drug regulations, types of drugs and drug administration are included. Discussions integrate the selection of drugs with their appropriate use and possible effects.

### **Quality Management**

Quality management (QM) is important to ensure the proper functioning of equipment and compliance with government and accreditation standards. Technologists should understand the activities and role in the QM process. This content is designed to expand the QM skills of the technologist to include digital imaging systems and the application of QM principles in an imaging department.

### **Research Methods and Information Literacy**

Research methods and information literacy are important because the health care profession is continually changing, which requires the radiologic technologist to possess new knowledge to function competently. The radiologic technologist should contribute to the body of knowledge and be able to effectively analyze resources to promote growth in the profession. The attitude of life-long learning enables the radiologic technologist to stay in step with the current health care environment and be prepared to help foster the future and increase awareness of the profession in the global community. This content is geared to increase and disseminate intellectual inquiry, information literacy and the use of scholarly research methods.

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## Core Content

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# Patient Assessment, Management and Education

## Description

This content reinforces the use of the clinical thinking model to aid in patient assessment, which includes interviewing skills and assessment techniques. The focus is on applying the radiologist assistant's knowledge of anatomy, physiology and pathophysiology to assist in patient assessment and management.

## Prerequisite or Corequisite

Radiologist assistants must possess certification in advanced cardiac life support (ACLS) to support their role in the patient care setting.

## Objectives

- Apply systematic clinical analysis to history and physical assessment findings in the medical imaging setting.
- Conduct interviews to confirm and document a patient's medical history.
- Perform and document a physical assessment of the patient undergoing imaging procedures.
- Obtain and analyze the patient's vital signs.
- Document initial observations during an examination and contribute to the planning and management of the patient.
- Provide patient education.
- Adapt communication techniques to address patient needs.
- Review patient medical data for indications, contraindications and alterations to procedures.
- Document, communicate and implement licensed practitioner orders to the appropriate members of the health care team.
- Identify and respond to changes in patient status, procedural complications and emergencies.
- Analyze laboratory data and correlate to patient status, pathological processes and procedural considerations.



## **Content**

### **I. History and Physical Assessment**

- A. Identify abnormal and normal findings
- B. Anatomically localize findings
- C. Communicate findings to the supervising radiologist
- D. Correlate findings with known patient conditions
- E. Identify potentially life-threatening and procedure-altering conditions

### **II. Interviewing and Patient History**

- A. Medical history purpose and components
  - 1. Preliminary data
    - a. Date and time of history
    - b. Identifying data
    - c. Reliability
  - 2. Chief complaint
  - 3. Current condition
  - 4. Past (medical and social) history
  - 5. Prior surgical history
  - 6. Medications
  - 7. Allergies
  - 8. Family history
  - 9. Lab values
  - 10. Indications or contraindications to procedure
  - 11. Change in patient management related to the procedure
  - 12. Medical analysis and interpretation of data
  - 13. Psychological and cognitive status
    - a. Cognitive abilities
    - b. Emotional stability
- B. Interviewing skills
- C. Challenges
  - 1. Patient age, physical attributes, cognitive ability and cultural background
  - 2. Adaptations and alterations based on patient status
- D. Patient education and instruction
  - 1. Preprocedure
  - 2. Postprocedure and follow-up

### **III. Vital Sign Assessment**

- A. Obtaining patient vital signs
  - 1. Temperature

2. Respiration
3. Pulse
4. Blood pressure
5. Pain scale
6. Oxygen saturation

#### **IV. Assessment of the Abdomen**

- A. Physical assessment findings
  1. Inspection
  2. Percussion
  3. Auscultation
  4. Palpation
- B. Correlation of abdominal assessment findings to imaging-related disease processes

#### **V. Assessment of the Thorax and Lungs**

- A. Physical assessment findings
  1. Inspection
  2. Auscultation
  3. Percussion
  4. Palpation
- B. Correlation of chest assessment findings to imaging-related disease processes

#### **VI. Assessment of the Cardiovascular System**

- A. Physical assessment findings
  1. Inspection
  2. Auscultation
  3. Palpation
- B. Correlation of cardiovascular findings to imaging-related disease processes

#### **VII. Assessment of the Musculoskeletal System**

- A. Physical assessment findings
  1. Inspection
  2. Palpation
  3. Sensory-motor function and range of motion
- B. Correlation of musculoskeletal findings to imaging-related disease processes

#### **VIII. Assessment of the Peripheral Vascular System**

- A. Physical assessment findings
  1. Inspection
  2. Palpation
  3. Auscultation

4. Evaluation for edema

B. Correlation of peripheral vascular findings to imaging-related disease processes

**IX. Assessment of the Nervous System**

A. Mental status

B. Sensory and motor evaluation

C. Mood and behavior evaluation

D. Neurological assessment and data interpretation

E. Correlation of nervous system findings to imaging-related disease processes

**X. Assessment of the Endocrine System**

A. Physical assessment findings

1. Inspection

2. Palpation

B. Correlation of endocrine findings to imaging-related disease processes

**XI. Assessment of the Breasts and Axillae**

A. Physical assessment findings

1. Inspection

2. Palpation

B. Correlation of breast and axillae findings to imaging-related disease processes

**XII. Documentation of Findings**

A. Characteristics required to describe a symptom

1. Onset

2. Location

3. Duration

4. Character

5. Aggravating/associated factors

6. Relieving factors

7. Temporal factors

8. Severity of symptoms

B. Reporting

1. Accreditation and facility protocol

2. Patient health record dictation and reporting protocol

**XIII. Patient Management**

A. Infection control

1. Sterile technique
  2. Standard precautions
- B. Postprocedure resources
- C. Patient monitoring during procedures
1. Intravenous lines
  2. Oxygen saturation
  3. Urine output
  4. Cardiac rhythms
- D. Medical complications and emergency intervention
- E. Medical devices
1. Imaging appearance
  2. Indications
  3. Purpose
  4. Location
  5. Complications
  6. Incident reports
- F. Patient care (e.g., AHA Patient Care Partnership)

#### **XIV. Common Lab Tests & Significance**

#### **XV. Patient Education and Instruction**

- A. Preprocedure
- B. Postprocedure and follow-up

#### **XIV. Documentation and Implementation of Licensed Practitioner Orders**

- A. Verbal orders
- B. Telephone orders
- C. Electronic orders
- D. Written orders
- E. Standing protocols

# Pharmacology and Clinical Decision-Making in Imaging

## Description

This content covers the pharmaceuticals commonly prescribed to patients undergoing medical imaging. The intent of each drug and its effect on diseases, conditions and physiology should be addressed. This content, in combination with associated clinical skills, will allow the radiologist assistant to analyze the patient's medications and other therapies to determine their significance to the imaging procedure. The radiologist assistant will be able to suggest appropriate plans for the procedure for each patient and will be responsible for the administration and documentation of procedure-related pharmaceuticals. The ability to assess contraindications and monitor the patient for adverse events, as well as respond to them, is critical. It is also essential for radiologist assistants to clearly understand the laws and policies related to pharmaceuticals in their practice setting.

## Objectives

- Identify key drug laws affecting consumer safety.
- Identify the five schedules of controlled substances.
- Identify the roles of the monitoring federal regulatory and enforcement agencies for consumer drugs.
- Identify strategies for health care workers involved in dispensing medications to comply with the restrictions of drug laws.
- Identify acceptable and unacceptable abbreviations and symbols used for medication orders.
- Differentiate drug names (generic, chemical, trade, official).
- Explain the restrictions on drug sales associated with the designations *over the counter*, *legend drug* and *controlled substance*.
- Research drug reference information from current pharmacological resources.
- Describe how the body metabolizes various drugs.
- List common variables affecting drug action within the body.
- Recognize unexpected responses to drugs.
- Explain the purposes for and principles of clinical drug trials.
- Perform calculations for drug dose delivery.
- Describe various forms of drug preparations and supplies.  
Incorporate the principles of responsible drug administration in the patient care setting to prevent medication errors.
- Apply medical techniques of drug administration for common delivery routes.
- Modify drug doses for pediatric and geriatric patients.
- Identify factors that can lead to cumulative effects in elderly patients.
- List the categories of drugs that frequently cause adverse effects in older adults.
- Identify guidelines and competencies for sedation and analgesia according to accreditation standards.
- Explain the adverse effects and cautions associated with preprocedural medications.
- Describe the administration, indications, contraindications and adverse effects related to minimal and moderate (conscious) sedation and local anesthetics.

- Assess and manage the patient prior to and during examinations requiring moderate sedation.
- Recognize, explain and respond to the indications, contraindications and adverse effects of drugs used for sedation, analgesia and diabetes, as well as respiratory, gastrointestinal and cardiovascular conditions.
- Describe the indications and precautions associated with oxygen therapy.
- Describe guidelines for preparation and dispensation of medications, including compounding, for imaging procedures per approved protocols.

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## **Content**

### **I. Consumer Safety and Drug Regulations**

- A. Laws and regulations
  - 1. 1906 Pure Food and Drug Act
  - 2. 1938 Federal Food, Drug and Cosmetic Act
  - 3. 1970 Controlled Substances Act
  - 4. 1973 Drug Enforcement Administration
- B. Roles of government regulatory agencies

### **II. Medication Orders**

- A. Common abbreviations
  - 1. Acceptable abbreviations
  - 2. Unacceptable abbreviations
- B. Policies and regulations
  - 1. Verbal, written and standing orders
  - 2. Order verification
- C. Medication components
  - 1. Patient identifiers
  - 2. Medication
    - a. Dose
    - b. Quantity
    - c. Route
    - d. Time
- D. Medication reconciliation

### **III. Pharmaceutical Terminology References**

- A. Classifications
- B. Schedules for controlled substances
- C. Identifying names (e.g., generic, trade)
- D. Legal terms referring to drugs (e.g., over the counter)

### **IV. Sources of Drug Information (e.g., PDR, USP)**

### **V. Pharmacotherapeutic Decision-making**

- A. Drug effects and indications
- B. Pharmacokinetics
  - 1. Absorption
  - 2. Distribution

3. Metabolism
  4. Excretion
  5. Other variables (i.e., age, weight, sex, psychological state)
  6. Drug interactions
    - a. Synergism
    - b. Potentiation
    - c. Antagonism
  7. Dosage
    - a. Minimum and maximum dose
    - b. Loading dose
    - c. Maintenance dose
    - d. Toxic dose
    - e. Lethal dose
    - f. Therapeutic dose
  8. Route
- C. Patient considerations (e.g., pediatric, geriatric, pregnancy)
1. Anatomic and physiologic variables
  2. Pharmacokinetic and pharmacodynamic considerations
  3. Dosing considerations
- D. Contraindications, warnings, adverse effects and events, adverse reactions and interactions

## **VI. Clinical Drug Trials**

- A. Principles of the controlled trial
- B. Protection of subjects
- C. Research design (i.e., single-blind, double-blind)

## **VII. Safe Dosage Preparation (e.g., Calculation Guidelines)**

- A. Anatomic and physiologic variables (e.g., renal and hepatic function)
- B. Safe dose calculation
  1. Ratio
  2. Proportion
  3. Dimensional analysis
- C. Factors affecting dose
  1. Body surface area
  2. Weight
  3. Age
- D. Medication preparation and compounding guidelines
  1. Regulatory agencies



2. [FDA compounding definition](#)
3. Types of compounding
  - a. Sterile (e.g., steroids, contrast media)
  - b. Non-sterile (e.g., gastrointestinal contrast media)

## **VIII. Principles of Drug Administration**

- A. Accurate drug administration
- B. Medication error avoidance
- C. Administration routes
- D. Documentation
  1. Administration
    - a. Dose
    - b. Time
    - c. Route
    - d. Location of injections
  2. Narcotics and medications
  3. Adverse events reporting
  4. Patient outcome

## **IX. Procedural Medication and Local Anesthetics**

- A. Sedation and analgesia policies and procedures
- B. American Society of Anesthesiologist (ASA) guidelines
- C. Equipment
  1. Monitoring equipment
  2. Intubation equipment
- D. Medications
  1. Local anesthetics
  2. Analgesics
  3. Benzodiazepines
  4. Reversal medications
- E. Minimal and moderate (conscious) sedation goals
  1. Contraindications
    - a. Absolute
    - b. Relative
  2. Altered level of consciousness and mood
  3. Maintenance of consciousness
  4. Cooperation
  5. Elevation of pain threshold
  6. Minimal variation of vital signs

7. Rapid degree of amnesia
8. Recovery and ambulation
9. Adverse effects
  - a. Treatment
    - 1) BLS
    - 2) ACLS

- F. Patient assessment and medication documentation
  1. Informed consent
  2. Procedural assessment (i.e., vital signs, laboratory values, level of consciousness)
- G. Airway management
- H. Patient recovery period (i.e., airway, vital signs, level of function)

## **X. Nonprescription and Dietary Supplements**

- A. Impact on procedures
- B. Interactions

## **XI. Drugs by Body System**

- A. Autonomic nervous system drugs
  1. Adrenergics (sympathomimetics)
  2. Adrenergic blockers (alpha and beta blockers)
  3. Cholinergics (parasympathomimetics)
  4. Cholinergic blockers (anticholinergics)
- B. Central nervous system drugs
  1. Anesthetics, sedatives and hypnotics
  2. Anticonvulsants
  3. Parkinson disease medications
  4. Alzheimer disease medications
  5. Neurologic and psychotropic medications
  6. Alcohol and drugs of abuse
  7. Antimetabolic medications
- C. Urinary system drugs
  1. Diuretics
  2. Gout medications
  3. Antispasmodics
  4. Cholinergics
  5. Prostatic medications
  6. Alpha blockers
  7. Overactive bladder medications
- D. Gastrointestinal drugs

1. Reflux medications
  2. Ulcerative disease medications
  3. Inflammatory bowel disease medications
  4. Antispasmodics
  5. Cholinergic blockers (anticholinergics)
  6. Gastrointestinal motility and function medications
  7. Antiemetics
  8. Antidiarrheals
- E. Endocrine system drugs
1. Pituitary hormones
  2. Adrenal corticosteroids
  3. Thyroid medications
  4. Diabetes medications
- F. Reproductive system drugs
1. Hormones
  2. Erectile dysfunction medications
- G. Cardiovascular drugs
1. Cardiac glycosides
  2. Antiarrhythmic medications
  3. Antihypertensives
  4. Coronary vasodilators
  5. Antilipemic medications
  6. Vasoconstrictors
  7. Anticoagulants
  8. Platelet inhibitor therapy
- H. Respiratory system drugs
1. Oxygen
  2. Bronchodilators
  3. Corticosteroids
  4. Mucolytics and expectorants
  5. Antihistamines
  6. Decongestants
- I. Musculoskeletal drugs
1. Skeletal muscle relaxants
  2. Osteoporosis therapy
  3. Injectable steroids

## **XII. Drugs Affecting Multiple Organ Systems**

- A. Anti-infective drugs
- B. Antineoplastic and Antimetabolite

1. Precautions and proper handling
- C. Analgesic
  - D. Antipyretic
  - E. Anti-inflammatory drugs
  - F. Fluid and electrolyte replacements

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# Contrast Media

## Description

This content covers the contrast media radiologist assistants use during diagnostic procedures. Topics include an overview of the chemical makeup and physical properties of contrast agents. The criteria for selecting contrast agents for procedures are also included, based on patient risk factors, premedication strategies and indicators of contrast media reaction. The radiologist assistant's role in the care and treatment of patients experiencing adverse reactions to contrast media is also described.

## Objectives

- Determine the appropriate use of contrast media based on patient factors and procedural requirements.
- Describe the physical properties, structural differences and pharmacologic characteristics of contrast media.
- Identify patients at increased risk of an adverse reaction to contrast media.
- Identify the response strategies for patients with a predisposition for allergic reaction to contrast media.
- Classify the indicators and symptoms associated with mild, moderate or severe reaction to contrast media and respond appropriately.
- Implement protocols to treat a patient experiencing an adverse reaction to contrast media.
- Discuss patient counseling and follow-up care for patients undergoing a procedure that uses contrast media.

## **Content**

### **I. Contrast Media Selection**

- A. Barium, iodinated contrast, magnetic resonance and echogenic agents
  - 1. Procedural requirements
  - 2. Reaction and complication causes
  - 3. Risk factors (e.g., renal function)
  - 4. Special considerations (e.g., Glucagon, Metformin administration)

### **II. Contrast Media and Preparations**

- A. Negative agents
- B. Positive agents
- C. Magnetic resonance contrast agents
- D. Echogenic agents

### **III. Characteristics of Iodinated Contrast Materials**

- A. Water solubility and hydrophilicity
- B. Osmolarity
  - 1. High osmolar
    - a. Molecular structure
    - b. Advantages
    - c. Disadvantages
  - 2. Low osmolar
    - a. Molecular structure
    - b. Advantages
    - c. Disadvantages
- C. Osmolality
- D. Viscosity
- E. Calcium binding
- F. Chemical stability

### **IV. Current Contrast Media**

#### **V. Contrast Media Risk Reduction**

- A. Patient assessment
- B. Premedication and hydration protocols
- C. Dosage

- D. Alternative procedure consultation
- E. Complications related to contrast
  - 1. Nephrotoxicity
  - 2. NSF

**VI. Contrast Media Reaction**

- A. ACR contrast reaction treatment and guidelines
  - 1. Standing protocols
  - 2. Verbal orders
- B. Resuscitation

**VII. Patient Care Following Contrast Media Administration**

- A. Patient counseling
- B. Postprocedure instructions
- C. Follow-up communication
- D. Protocols for extravasation
- E. Postprocedure complications

**VIII. Documentation**

- A. Administration
  - 1. Dose
  - 2. Time
  - 3. Route
  - 4. Location of injections
- B. Adverse event reporting
- C. Patient outcome

# Pathophysiology

## Description

This content covers the characteristics and manifestations of disease caused by alterations or injury to the structure or function of the body. Radiologist assistants will be exposed to basic pathophysiology concepts as well as common disease conditions to understand alterations that occur in major body systems. Image correlation with these pathologies should be emphasized.

## Objectives

- Define terminology used in the study of disease.
- Describe the general principles and mechanisms of disease.
- Explain the physiological response of inflammation and cell injury due to pathological insult.
- Differentiate various types of cellular and tissue injury and adaptive mechanisms.
- Describe the disorders of fluid and electrolyte balance.
- Differentiate between the mechanisms of tissue repair and healing.
- Identify common tests used to diagnose disease or injury.
- Examine the role of nutrition and genetics in various disorders.
- Describe the common etiology, signs and symptoms, diagnostic tests, typical course and management of common diseases and disorders.
- Discuss the common effects of aging on each body system.



## **Content**

### **I. Alterations in Cell Function and Growth**

- A. Cell and tissue characteristics
- B. Cellular adaptation and injury
- C. Genetic and congenital disorders
- D. Alterations in cell differentiation
- E. Tissue repair and wound healing

### **II. Alterations in Body Defenses**

- A. Stress and adaptation
- B. Alterations in temperature regulation
- C. Infectious processes
- D. Inflammation and repair
- E. The immune response
- F. Alterations in the immune response
- G. Acquired immunodeficiency syndrome (AIDS)
- H. White blood cell and lymphoproliferative disorders
- I. Alterations in hemostasis and blood coagulation

### **III. Alterations in Body System Functions:**

- A. Body Systems
  - 1. Skin
  - 2. Respiratory
  - 3. Cardiac
  - 4. Gastrointestinal
  - 5. Urinary
  - 6. Vascular
  - 7. Musculoskeletal
  - 8. Neurologic
  - 9. Hematologic
  - 10. Endocrine
  - 11. Reproductive
- B. Pathophysiology assessment related to the following categories:

1. Vascular
2. Infection
3. Neoplasm
4. Drug effects/ degenerative changes
5. Inflammatory/ idiopathic
6. Congenital
7. Autoimmune
8. Traumatic
9. Endocrine/ metabolic

**IV. Alterations in Structure and Function Related to Aging**

- A. Physiologic changes of aging
  
- B. Functional considerations of aging

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# Radiologic Procedures

## Description

This content covers information, materials and equipment required for radiologist assistant participation in diagnostic and therapeutic procedures. Risk factors related to examinations are discussed, as are tools for measuring outcomes against exam goals. Postprocedure care and instructions are also addressed. Examination procedures should follow American College of Radiology practice guidelines for producing high-quality radiologic images and patient care.

*Note: For a specific list of entry level examinations and procedures, reference the current [ARRT® Registered Radiologist Assistant Entry-Level Clinical Activities \(ELCA\)](#).*

## Objectives

- Identify the information, materials and equipment required for diagnostic imaging examinations.
- Describe the protocols for imaging examinations.
- Identify factors requiring an alteration or modification to examinations.
- Explain risk factors related to examinations.
- Under radiologist supervision, perform patient examinations for diagnostic inspection as well as therapeutic procedures.
- Measure examination outcomes against examination goals.
- Compose an internal memorandum of initial observations, to the supervising radiologist, made during the examination following prescribed protocols.
- Describe postprocedural patient care and instructions.

## **Content**

### **I. Procedural Guidelines and Examination Protocols**

- A. Exam-specific anatomy and pathophysiology
- B. Indications and contraindications for procedure
- C. Patient assessment and preparation for the procedure
- D. Alternative and complementary procedures
- E. Appropriate imaging modalities
- F. Patient management during the procedure
- G. Safe operation of imaging equipment
- H. Radiation safety
  - I. Devices and supplies
  - J. Administration of contrast media, radiopharmaceuticals and drugs
- K. Evaluation of image quality for diagnostic utility
- L. Image enhancement and postprocessing
- M. Complications and adverse event response
- N. Postprocedure patient care and education
- O. Outcomes measurement
- P. Health record (e.g., ICD and CPT coding)
- Q. Documentation of initial observations for supervising radiologist

### **II. Examinations and Procedures**

- A. Abdominal
- B. Thoracic
  - 1. Breast
  - 2. Cardiovascular
- C. Genitourinary

D. Musculoskeletal

E. Endocrine

F. Neurological

G. Vascular

H. Lymphatic

ASRT

# Modality and Image Management

## Description

This content establishes a knowledge base in the fundamentals of fluoroscopy, computed tomography, magnetic resonance, medical sonography, nuclear medicine and image postprocessing techniques. Education should promote awareness of the advantages and limitations of each area. Procedures and techniques to optimize image quality while minimizing radiation exposure are included.

## Objectives

- Make prudent judgment for the use of equipment as a diagnostic tool.
- Identify the advantages and limitations of equipment and various exposure settings.
- Identify the functional components involved in the operation of medical equipment and devices.
- Apply equipment and safety features to minimize radiation exposure to patients and operators.
- Employ methods and techniques to maximize diagnostic value while minimizing radiation exposure.
- Educate others on radiation protection practices during examinations.
- Provide patient education regarding the operation and benefits of various imaging modalities.
- Ensure that equipment is operating safely and in a standardized manner.

## Content

### I. Fluoroscopy: Pediatric and Adult

- A. Patient preparation
- B. Patient assessment
- C. Clinical advantages
  - 1. Demonstration of dynamic anatomy
  - 2. Localization
  - 3. Documentation
- D. Components of fluoroscopic units
  - 1. Table
  - 2. Radiation source
  - 3. Image receptor carriage
  - 4. Optics system
  - 5. Locks and angle indicators (fixed or mobile)
    - a. Structural provisions for radiation shielding
  - 6. Equipment provisions
    - a. Source-to-skin distance (SSD)
    - b. Object-to-image receptor distance (OID)
    - c. Source-to-image receptor distance (SID)
    - d. Control of radiation field
    - e. Maximum exposure rate
    - f. Lead apron requirements
    - g. Maximum entrance dose vs. equipment setup and technique
    - h. Scatter/isodose curves for fixed and mobile equipment and personnel placement
    - i. High-level or boost mode fluoroscopy
    - j. Pulsed fluoroscopy
    - k. Last image hold
    - l. Emergency stop
    - m. Automatic exposure rate control (AERC)
  - 7. Fluoroscopic dose recording
  - 8. Image recording, archival and retrieval
- E. Technical factors affecting radiation dose
  - 1. Direct factors
    - a. Milliamperage (mA)
    - b. Peak kilovoltage (kVp)
    - c. Collimation
      - 1) Impact on integral dose
    - d. Filtration
      - 1) Inherent
      - 2) Added
    - e. Exposure time

- f. Geometry (SID, SSD and Angulation)
- g. Grids
- h. Pulse fluoroscopy
- i. High dose fluoroscopy mode
- j. Pediatric vs. adult default settings
2. Indirect factors
3. Dose reduction (patient and operator)
  - a. Shielding
  - b. Lead drape
  - c. Bucky slot cover
  - d. Lead apron
  - e. Leaded glasses
  - f. Leaded gloves
  - g. Three-phase and high-frequency generators
  - h. Protective barriers
  - i. Cumulative timer
  - j. High dose mode alarm
  - k. Mobile equipment setup
  - l. Distance from source
4. Image receptor
  - a. Image quality considerations
  - b. Quantum mottle
  - c. Contrast resolution
  - d. Image resolution
  - e. Image distortion
  - f. Intensifier
    - 1) Lag
    - 2) Vignetting
    - 3) Pincushion
    - 4) Magnification
  - g. Flat panel technology
5. Ancillary equipment
  - a. Optics system
  - b. Image display systems
  - c. Cinefluorography
    - 1) Synchronous
    - 2) Framing frequency
  - d. Contrast media
  - e. Accessories
  - f. Grids
6. Image processing
7. Digital systems
8. Patient characteristics affecting beam attenuation
9. Operator controls of the fluoroscopic unit
  - a. Control panel settings for fluoroscopy vs. dose
  - b. Fluoro tower movement and carriage locks



- c. Tabletop movement
  - d. Collimator control
  - e. Compression devices
  - f. Fluoro grid device
  - g. Exposure switches
10. Patient supports and immobilization devices

- F. Patient dose and image quality
- 1. Digital
  - 2. Cine
  - 3. DVD
  - 4. Risks of low-level radiation exposure

## **II. Computed Tomography: Pediatric and Adult**

- A. Patient preparation
- B. Patient assessment
- C. Radiation safety and dosimetry
- 1. Technical factors affecting patient dose
  - 2. Radiation protection
  - 3. Dose measurement
  - 4. Patient dose reduction
- D. Image processing
- 1. Reconstruction
  - 2. Postprocessing
  - 3. FOV modification
  - 4. Algorithms
  - 5. Cardiac analysis

- E. Image Quality

## **III. Magnetic Resonance (MR): Pediatric and Adult**

- A. Patient preparation
- B. Patient assessment
- C. MR screening and safety
- 1. Patient screening
  - 2. Safety (e.g., nonferromagnetic ancillary equipment, ferromagnetic foreign bodies, quenching)
  - 3. Environment (e.g., magnetic and radiofrequency shielding)
  - 4. Biological considerations
    - a. RF field
    - b. Static and gradient magnetic fields

- c. Acoustic noise
  - D. Pulse sequence configurations
  - C. Postprocessing
    - 1. Maximum intensity projection (MIP)
    - 2. Multiplanar reconstruction techniques (MPR)
    - 3. Cardiac analysis
    - 4. 3-D reconstruction
    - 5. Quantitative measurement
      - a. Volume
      - b. Distance
      - c. Diameter
  - D. Functional imaging
  - E. Sequence parameters and options
  - F. Tissue characteristics
- IV. Medical Sonography: Pediatric and Adult**
  - A. Patient preparation
  - B. Patient assessment
  - C. Physics principles
    - 1. Properties of ultrasound waves
    - 2. Interactions of sound with tissue
    - 3. Power, intensity and amplitude
    - 4. Units of measurement
  - B. Ultrasound transducers
    - 1. Construction and physical characteristics
    - 2. Function (e.g., sector, linear, phased arrays)
    - 3. Spatial resolution
    - 4. Transducer selection
    - 5. Scanning planes
  - C. Pulse-echo instrumentation
  - D. Doppler instrumentation and hemodynamics
- V. Nuclear Medicine: Pediatric and Adult**
  - A. Patient preparation

- B. Patient assessment
- C. Nuclear medicine radiopharmaceutical principles
- D. Radiopharmaceutical safety
- E. Theory of operation
- F. Image formation and reconstruction
- G. Diagnostic procedures

## **VI. Image Postprocessing**

- A. Processing techniques
  - 1. 2-D display tools
  - 2. 3-D display tools
  - 3. Segmentation tools (i.e., cutting, region growing, dilation/erosion)
- B. Data volume
- C. Multiplanar reformations
- D. Maximum intensity projection (MIP) and minimum intensity projection (MinIP)
  - 1. Principle
  - 2. Applications
  - 3. Artifacts
- E. 3-D surface rendering (SSD)
  - 1. Principle
  - 2. Applications (e.g., image rotation and viewing angle, presurgical planning)
  - 3. Artifacts
- F. Volume rendering techniques
  - 1. Principle
  - 2. Applications
  - 3. Artifacts
- G. Virtual endoscopy
  - 1. Principle
  - 2. Applications
  - 3. Artifacts

## **VII. Equipment Safety**

- A. Regulations
- B. Hazard identification and control

- C. Policies and procedures
  - 1. Occupational Safety and Health Administration (OSHA)
  - 2. Federal Drug Administration (FDA)
  - 3. Facility
  - 4. State
- D. Employee training
- E. Fire, electrical and chemical safety
- F. Magnetic and RF field safety
- G. Injury prevention
- H. Quality improvement
- I. Risk management
- J. Infection control

# Radiation Safety, Radiobiology and Health Physics

## Description

This content expands on prior knowledge to enhance protection of patients and personnel from the harmful effects of ionizing radiation. This includes an overview of the regulatory bodies and patient radiation safety regulations affecting modern diagnostic imaging. The effect of ionizing radiation on biological samples is included. Interactions of ionizing radiation with matter, units of exposure and dose, radiation detection and measurement devices will be outlined. Practical techniques for reducing patient and operator risk of exposure to ionizing radiation are also introduced.

## Objectives

- Identify organizations that set standards for radiation safety and radiopharmaceuticals.
- Describe the mechanism by which ionizing radiation interacts with matter.
- Explain the quantitative relationships between radiation exposure and biological damage.
- Identify instruments used for measuring accumulated dose, measured dose and dose rate.
- Describe the operating principles of common radiation measuring devices.
- Distinguish between radiation exposure and radiation absorbed dose.
- Apply techniques to reduce exposure to sources of radiation for patients and personnel.
- Evaluate the design of radiologically safe equipment, processes and environments.
- Maintain a radiation-safe environment for personnel and the public.
- Describe safe handling and disposal of radiopharmaceuticals.
- Explain how to safely clean up radiopharmaceutical spills and contamination.

## **Content**

### **I. Regulatory Organizations**

- A. ICRP
- B. MQSA
- C. NRC
- D. NCRP
- E. OSHA
- F. FDA
- G. NIH
- H. EPA

### **II. Basic Radiation Safety Criteria**

- A. Occupational exposure
- B. Medical exposure
- C. Exposure to the general public
- D. Population exposure
- E. Dose limits

### **III. Radiation Detection and Measurement Devices**

- A. Dose measuring devices
- B. Personnel dosimetry report

### **IV. Dose-Response Interactions**

- A. Direct
- B. Indirect

### **V. Radiation Effects**

- A. Acute effects
- B. Delayed effects
- C. Genetic effects
- D. Stochastic effects vs. tissue reactions

E. Fetal/child-related irradiation

**VI. Expressing Cancer Risks**

- A. Absolute risk
- B. Excess risk
- C. Relative risk

**VII. Interaction of Ionizing Radiation with Matter**

**VIII. System Response to Irradiation**

- A. Hematopoietic syndrome
- B. Skin
- C. GI syndrome
- D. CNS syndrome
- E. Immune system
- F. Reproductive system

**IX. Personnel Dosimetry Report**

- A. Exposure period
- B. Report identification of individuals
- C. Dosimeter type
- D. Exposure for the reporting period
- E. Cumulative totals (e.g., year to date, total dose equivalent)

**X. Radiation Measurement Dose and Equipment**

- A. Exposure - coulombs/kg
- B. Air kerma - gray
- C. Absorbed dose - gray
- D. Equivalent dose - sievert
- E. Effective dose - sievert

F. Exposure measurement equipment

**XI. Practical Techniques for Reducing Dose**

A. External radiation protection

B. Internal radiation protection (radioactive)

C. Radiopharmaceutical waste management

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# Image Correlation with Anatomy, Physiology and Pathology

## Description

This content covers methods and techniques for analyzing diagnostic images for abnormalities, anomalies and pathological conditions for communication with the supervising radiologist. The radiologist assistant does not independently interpret imaging studies. The radiologist assistant may identify imaging findings or observations and communicate relevant details to the supervising radiologist. Interpretations are not within the radiologist assistant scope and are distinguished from observations in that interpretations involve synthesizing imaging findings in the context of clinical histories, physical examination findings, laboratory testing and comparison with other imaging studies in a manner that leads to clinical impressions or conclusions, specific diagnoses and medical decision-making.

## Objectives

- Implement a systematic method or technique for observing patient images to recognize normal anatomical and physiological appearances and variations that may indicate pathology or injury for communication with the supervising radiologist.
- Recommend additional images or alternative imaging procedures for diagnostic purposes.
- Formulate initial observations for the supervising radiologist in accordance with ACR Practice Guidelines for Communication of Diagnostic and Imaging Findings.

## **Content**

### **I. Thorax and Breast Imaging: Adult and Pediatric**

- A. Thorax and breast imaging assessment
- B. Clinical presentation related to differential diagnosis
- C. Correlation of image findings with disease and injury

### **II. Musculoskeletal Imaging: Adult and Pediatric**

- A. Musculoskeletal imaging assessment
- B. Clinical presentation related to differential diagnosis
- C. Correlation of image findings with disease and injury
- D. Imaging signs of abuse

### **III. Endocrine Imaging: Adult and Pediatric**

- A. Endocrine imaging assessment
- B. Clinical presentation related to differential diagnosis
- C. Correlation of image findings with disease and injury

### **IV. Gastrointestinal (GI) and Hepatobiliary Imaging: Adult and Pediatric**

- A. GI and hepatobiliary imaging assessment
- B. Clinical presentation related to differential diagnosis
- C. Correlation of image findings with disease and injury

### **V. Neurological Imaging: Adult and Pediatric**

- A. Neurological imaging assessment
- B. Clinical presentation related to differential diagnosis
- C. Correlation of image findings with disease and injury

### **VI. Urinary and Reproductive Imaging: Adult and Pediatric**

- A. Urinary and reproductive imaging assessment
- B. Clinical presentation related to differential diagnosis
- C. Correlation of image findings with disease and injury

### **VII. Vascular and Lymphatic Imaging: Adult and Pediatric**

- A. Vascular and lymphatic imaging assessment
- B. Clinical presentation related to differential diagnosis
- C. Correlation of image findings with disease and injury

ASRT

# Clinical Pathways Related to Best Practice Imaging

## Description

This content introduces clinical pathways as multidisciplinary plans of best clinical practice. These pathways are for specific groups of patients with a particular diagnosis and aid the coordination and delivery of high-quality care. Clinical pathway components include a timeline, the categories of care or activities and their interventions, intermediate and long-term outcome criteria, as well as the variance record. Clinical pathways differ from practice guidelines, protocols and algorithms, as they are used by a multidisciplinary team and focus on quality and coordination of care.

## Objectives

- Define clinical pathways.
- Justify the use of clinical pathways in the patient care setting.
- Compose a model clinical pathway related to a radiologic diagnostic or therapeutic procedure.
- Implement clinical pathways in practice.
- Identify criteria for evaluating clinical pathways.
- Explain variance analysis as it relates to clinical pathway assessment.
- Analyze clinical pathway variance.
- List the outcomes created through the implementation of clinical pathways in imaging.
- Explain the relationship between clinical pathways and quality improvement in imaging.

## **Content**

### **I. Clinical Pathway Definition**

- A. Alternative phrases
  - 1. Care maps or paths
  - 2. Collaborative plans of care
  - 3. Multidisciplinary action plans
  - 4. Anticipated recovery paths
  
- B. Features
  - 1. Patient outcomes
  - 2. Timeline
  - 3. Collaboration
  - 4. Comprehensive aspects of care

### **II. Rationale for Clinical Pathways**

- A. Patient benefits
  
- B. Health care provider benefits
  
- C. Health care agency/system benefits
  
- D. Cost-effective health care delivery benefits

### **III. Clinical Pathway Development Plan**

- A. Identification of expected patient outcomes
  
- B. Clinical pathway selection
  - 1. High-volume, high-cost, high-risk procedures
  - 2. Problem-prone procedures
  - 3. Insurance denials
  - 4. Quality improvement initiatives

### **IV. Clinical Pathways in Imaging**

- A. Patient condition
  
- B. Radiologist expertise
  
- C. Equipment availability
  
- D. Clinical presentation
  
- E. Procedure necessity for care plan
  
- F. Sequencing of imaging

G. ACR Appropriateness Criteria

H. Radiation exposure

**V. Clinical Pathway Implementation Plan**

A. Personnel involvement

B. Institution policy review

C. Contribution to patient care

**VI. Clinical Pathway Evaluation Plan**

A. Variance analysis

B. Outcomes analysis (i.e., infection rates, complication rates, morbidity and mortality rates)

ASRT

# Communication of Findings and Validation of Clinical Practice

## Description

This content introduces guidelines for communicating initial observations made by the radiologist assistant during procedures and image assessments to the supervising radiologist. The radiologist assistant's role focuses on the systematic analysis of clinical practice, including the diagnosis and treatment, resources, evidenced-based decision making, procedures, resulting outcomes and the patient's quality of life. The radiologist assistant does not independently interpret imaging studies. The radiologist assistant may identify imaging findings or observations and communicate relevant details to the supervising radiologist. Interpretations are not within the radiologist assistant scope and are distinguished from observations in that interpretations involve synthesizing imaging findings in the context of clinical histories, physical examination findings, laboratory testing and comparison with other imaging studies in a manner that leads to clinical impressions or conclusions, specific diagnoses and medical decision-making.

## Objectives

- Communicate initial observations to the radiologist based on practice guidelines.
- Communicate radiologist's findings and interpretation to appropriate health care personnel consistent with established guidelines.
- Identify the legal components of a report of findings following diagnostic testing.
- Establish and evaluate benchmarks as they apply to diagnostic imaging.
- Justify the need for clinical audits.
- Identify audit schemes applied to the clinical setting.
- Identify measurement criteria and instruments employed during a clinical audit.
- Explain how sensitivity and specificity measurements apply to diagnostic imaging.
- Differentiate positive and negative predictive values in the results of diagnostic imaging.
- Discuss sampling and biases on the internal and external validity of audits of diagnostic accuracy.
- Participate in institutional and health care team practice reviews (e.g., tumor board, case conferences).

## **Content**

### **I. Clinical Reporting**

- A. Legal considerations and requirements
  
- B. Initial observations report
  - 1. Composing
  - 2. Recording
  - 3. Archiving
  
- C. Communicating radiologist's interpretation to other health care personnel
  - 1. ACR policies on Communication of Diagnostic Imaging Findings
  - 2. HIPAA

### **II. Evaluation of Diagnostic Accuracy**

- A. Benchmarks
  
- B. Sensitivity and specificity
  
- C. Predictive values
  
- D. Prior probability
  
- E. Bias

### **III. Clinical Audit**

- A. Rationale
  
- B. Audit schemes
  - 1. External quality assessment
  - 2. Internal quality assessment
  - 3. Accreditation
  - 4. Clinical governance (e.g., credentialing)
  
- C. Audit categories
  - 1. Access
  - 2. Process
  - 3. Output
  - 4. Outcome
  - 5. Use of resources
  
- D. Measurement criteria and instruments (e.g., ACR Appropriateness Criteria)



# Research and Professional Development

## Description

This content enhances inquiry, professional growth and research skills in support of evidence-based practice. Learning research skills and conducting research projects benefits both individuals and the profession. The individual benefits by acquiring new knowledge and skills while the profession benefits from an increased body of knowledge. To meet this professional obligation, radiologist assistants review and synthesize professional literature and conduct research.

## Objectives

- Develop research skills.
- Analyze the validity of references.
- Enhance professional knowledge and clinical performance through research and self-reflection.
- Evaluate current trends in health care and medical imaging.
- Improve patient care and clinical outcomes through integration and dissemination of evidence-based research.
- Apply ethical principles and legal requirements of professional research.
- Conduct a comprehensive literature review to identify best practices.
- Critique research results for bias and study validity.

## **Content**

### **I. Intellectual Inquiry and Research Analysis**

- A. Source and quality of publications
- B. Relevance of background
- C. New knowledge created
- D. Application of new knowledge
- E. Research design
- F. Research bias and study validity
  - 1. Significance tests
  - 2. Confidence intervals
- G. Application for future research and recommendations
- H. Implications for evidence-based professional practice
- I. Bibliography/reference documentation

### **II. Conducting Research**

- A. Ethical principles and legal consideration
- B. Research plan
- C. Qualitative and quantitative research
- D. Types of research design
  - 1. Literature review
  - 2. Experimental
  - 3. Descriptive/survey research
  - 4. Case study projects
  - 5. Randomized clinical trials

# Legal and Professional Standards

## Description

This content provides a background in the legal and regulatory issues of modern health care environments. Advanced legal terminology, concepts and principles will be presented, discussed and applied in relation to clinical practice. Basic concepts of patient information management are included, as well as medical records management, privacy and regulatory issues.

## Objectives

- Differentiate civil and criminal law.
- Explain the process of civil procedures.
- Describe legal doctrines, negligence and malpractice.
- Define the concept of standard of care.
- Distinguish between the different types of consent.
- Describe the patient's, employer's and employee's legal responsibilities.
- Discuss regulatory and accreditation issues related to health care.
- Describe Joint Commission standards for accountability and protection of patient information.
- List the requirements of a consent document.
- Discuss privacy and regulatory issues related to patient information.
- Apply the Health Insurance Portability and Accountability Act (HIPAA) to patient information systems.
- Identify potential abuses of confidential patient information.
- Adhere to health information and medical informatics policies and procedures.
- Apply the ASRT Practice Standards and ARRT Standards of Ethics.

## **Content**

### **I. Scope of Practice**

### **II. Practice Standards**

### **III. Legal Issues**

- A. Civil law (e.g., malpractice, defamation of character, negligence)
  - 1. Torts
    - a. Intentional
    - b. Unintentional
- B. Criminal law
  - 1. Assault and battery
  - 2. False imprisonment

### **IV. Civil Procedures**

- A. Pleadings
- B. Summons and complaint
- C. Discovery
- D. Evidence
- E. Motions
- F. Trial procedure
- G. Evidence
- H. Verdict
- I. Appeals

### **V. Standard of Care**

- A. Scope of practice and practice standards
- B. State statutes
- C. Institutional policy
- D. AHA Patient Care Partnership (Patient's Bill of Rights)

### **VI. Legal Doctrines**

- A. Burden of proof

- B. Res ipsa loquitur
- C. Respondeat superior
- D. Personal liability
- E. Good Samaritan Law
- F. Foreseeability
- G. Borrowed servant

**VII. Consent**

- A. Informed
- B. Uninformed
- C. Implied
- D. Patient surrogate for consent

**VIII. Patient Directives**

- A. Living wills and advanced directives
- B. Do-not-resuscitate/Do-not-attempt-resuscitation (DNR/DNAR) orders
- C. Power of attorney for health care

**IX. Employer and Employee Responsibilities**

- A. Labor laws
- B. Unions
- C. Discrimination laws
- D. Harassment in the workplace
- E. Conditions of employment
- F. Liability coverage
- G. Equipment operation and safety
- H. Whistleblower protection
- I. Risk management

**X. Accreditation and Regulatory Issues**

- A. Purpose of accreditation
- B. Education program accreditation
- C. Health care facility accreditation
- D. Health care professional credentialing
- E. Regulatory agencies
- F. Advisory agencies

**XI. Joint Commission Standards**

- A. Accountability for protecting patient information
- B. Demonstrating compliance
- C. Medication management and reconciliation
- D. Consents
- E. Education regarding policies, rights and responsibilities

**XII. Medical Record Content: Paper and Electronic**

- A. Patient identification
- B. History
- C. Physical examination
- D. Psychosocial needs
- E. Treatment plan
- F. Physician orders
- G. Informed consent
- H. Clinical observations
- I. Progress notes
- J. Consultation requests and reports

- K. Surgical and invasive procedure reports
- L. Diagnostic procedure reports
- M. Transplant information
- N. Diagnosis
- O. Discharge summary and instructions
- P. Living will and advance directives
- Q. Patient education
- R. Interventions
- S. Outcomes

**XIII. Techniques and Protocols for Proper Documentation**

- A. Location
- B. Date
- C. Time
- D. Frequency
- E. Route
- F. Content
- G. Signature
- H. Corrections
- I. Abbreviations

**XIV. Patient Information Standards**

- A. Privacy issues
- B. Health Insurance Portability and Accountability Act (HIPAA)
- C. Security standards
- D. Medical informatics
  - 1. Definition of informatics

2. Application in medicine
3. Information systems and standards

ASRT



# Radiologist Assistant Regulatory and Governmental Affairs

## Description

This content enhances the radiologist assistant's knowledge of state and federal regulatory processes. The process of obtaining state licensure, and the enforcement of scope of practice and supervision levels, are covered. Billing and coding terminology, and the procedures involved in the development and amending of current procedure terminology codes will be discussed. The roles of organizations that govern and advocate for radiologist assistants, such as the American Medical Association, American College of Radiology, American Registry of Radiologic Technologists, Centers for Medicare & Medicaid Services, U.S. Department of Health and Human Services, American Society of Radiologic Technologists and Society of Radiology Physician Extenders will be explained.

## Objectives

- Differentiate radiologic technology licensure boards and state medical boards.
- Contrast the scope of authority of state physician delegation acts and radiologic technology licensures.
- Identify the key components of state licensure for the radiologist assistant.
- Explain the radiologist assistant scope of practice and current procedural and diagnostic supervision levels.
- Describe the role of Centers for Medicare & Medicaid Services to the Physician Fee Schedule.
- Explain the relationship between proposed and final rules by Centers for Medicare & Medicaid Services and the federal register.
- Describe the connection of the Social Security Act of 1935 to current radiologist assistant practice.
- Explain the process of creating, amending and approving CPT codes and supervision levels as it pertains to the American College of Radiology and the American Medical Association.
- Define Medicare Physician Fee Schedule billing components and how they are formulated.
- Describe professional component modifiers for billing and reimbursement purposes.
- Describe the function of National Physician Identifier numbers.
- Adhere to ARRT Standards and Code of Ethics.

## **Content**

### **I. State Level Regulatory Process**

- A. State radiologic technologist licensure board
  - 1. Creation
    - a. Components
  - 2. Implementation
  - 3. Enforcement
  
- B. Physician delegation act
  - 1. Role
  - 2. Language

### **II. National Governing and Advocacy Bodies**

- A. American College of Radiology (radiologists)
  - 1. Governance
  - 2. Advocacy
  
- B. American Medical Association
  - 1. CPT code development
  - 2. Supervision levels
  
- C. Centers for Medicare & Medicaid Services
  - 1. Proposed rule
  - 2. Executive order
  - 3. Federal Register
  - 4. Medicare Physician Fee Schedule (MPFS)
    - a. Fee components and equations
      - 1) Professional component
      - 2) Technical component
      - 3) Modifiers
      - 4) Surgical component
      - 5) Relative value units (RVU)
      - 6) Geographic pricing cost index (GPCI)
      - 7) Current procedural terminology (CPT)
      - 8) Centers for Medicare & Medicaid Services supervision levels
        - a) Personal
        - b) Direct
        - c) General
      - 9) National Provider Identification Number (NPI)
        - a) Role as it pertains to the radiologist assistant
  
- D. American Registry of Radiologic Technologists
  - 1. Advocacy (radiologist assistant)
  - 2. Examination
  - 3. Ethics

4. Continuing Qualifications Requirements (CQR)

E. American Society of Radiologic Technologists

1. Governance
2. Practice Standards
3. Curriculum

F. Society of Radiology Physician Extenders

1. Advocacy

**III. Social Security Act of 1935**

A. Title XVIII

1. Medicare Access to Radiology Care Act (MARCA)

ASRT

# Radiologist Preceptor Clinical Experience

## Description

Preceptor clinical experience is the cornerstone in the development of the radiologist assistant. Radiologist assistant students work closely with radiologist preceptors to maximize the learning opportunities available in the clinical environment. The radiologist assistant student and radiologist preceptor 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 and therapeutic procedures, and the radiologist assistant's contribution to the radiologist's final diagnosis of these procedures, is essential to the clinical experience.

## Prerequisite or Corequisite

Radiologist assistants and students must obtain certification in advanced cardiac life support (ACLS) to work in the patient care setting.

## Objectives

- Demonstrate competence in performing diagnostic and therapeutic procedures according to departmental, institutional, governmental and professional standards under the preceptorship of a radiologist.
- Provide initial observations and outcomes of examinations for review, interpretation and approval by the radiologist.
- Assess, evaluate and formulate priorities in daily practice.
- Establish patient-centered and clinically effective service delivery strategies.
- Assess patient condition before, during and after procedures.
- Employ radiation protection standards.
- Engage in quality improvement practices and programs.
- Apply effective written, oral and nonverbal communication with patients, health care providers and the public.
- Adapt procedure protocols to respect the personal beliefs and values of patients.
- Respect radiologist assistant practice standards, state regulations and institutional policies.
- Assess psychological and physical changes in patient condition and formulate appropriate responses.
- Recognize cultural and physical differences that influence patient compliance with procedural requirements.
- Provide psychosocial support to the patient and family during professional interactions.
- Document care in the patient's medical record in accordance with institutional and legal guidelines.

## Optional Content

The content in this section enhances the base curriculum with select topics of instruction that satisfy the mission of various programs and local employment markets.

ASRT

# Administration and Management of Radiopharmaceuticals

## Description

This content identifies common radiopharmaceuticals used for diagnostic imaging procedures (e.g., sentinel lymph node injection, cisternography). The scope of radiologist assistant practice varies by region, and regulatory guidelines and facility policies must be consulted before these procedures are performed. Safe handling and disposal practices for radiopharmaceuticals used in diagnostic imaging are also included.

*Note: State statutes, regulations and accreditation standards may limit the professionals permitted to use radiopharmaceuticals.*

## Objectives

- List regulatory requirements for radiopharmaceuticals.
- Identify organizations that set standards for radiation safety and radiopharmaceuticals.
- Identify an Authorized User and procedures for which they can provide supervision to the radiologist assistant.
- Explain the duties of the radiation safety officer and their role in procedures performed by radiologist assistants.
- Describe the indications, contraindications, administration and adverse effects associated with radiopharmaceuticals.
- Determine the appropriate use of radiopharmaceuticals based on patient factors and procedural requirements.
- Describe safe handling and disposal of radiopharmaceuticals.
- Explain how to safely clean up radiopharmaceutical spills and contamination.
- Discuss patient counseling and recommended follow-up care for patients undergoing a procedure using radiopharmaceuticals.

## **Content**

### **I. Compliance**

- A. National Council on Radiation Protection and Measurements
- B. National Regulatory Commission
- C. Radiation Safety Officer
- D. Authorized User
- E. Regulatory requirements (e.g., state, facility)

### **II. Common Radiopharmaceuticals**

### **III. Safe Handling**

- A. Radiation detection equipment
- B. Shields and labels
- C. Personal monitoring devices

### **IV. Safe Administration**

- A. Order verification
- B. Dose verification
- C. Verification of pregnancy status
- D. Verification of lactation/breastfeeding status
- E. Administration routes

### **V. Safe Disposal**

### **VI. Decontamination of Spills**

- A. Major spills
- B. Minor spills
- C. Documentation

### **VII. Documentation of Administration and Patient Outcomes**

### **VIII. Postprocedure Guidelines**

- A. Patient safety

B. Half-life

**IX. Postprocedure Complications**

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## Appendix A

Appendix A includes content descriptions and learning objectives for items in the Foundations section.

This section is an inventory of pre-existing knowledge and skills gained through entry-level educational experience and reinforced through professional practice. The content in this section is intended to aid technologists in career planning and program managers in the development of preassessment tools for candidate selection.

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# Advanced Patient Care

## Description

As the role of the medical imaging professional continues to expand, more knowledge is needed in all areas. Patient care is no exception. Advanced patient care skills are essential elements of providing high-quality patient care. This course focuses on patient education, assessment, communication, preprocedural and postprocedural care and proper charting and documentation. Technologists' responsibilities and intervention in cases of critical patient need also are discussed.

## Objectives

1. Describe the areas required for patient education in medical imaging.
2. Contribute to imaging plan based on patient assessment.
3. Describe the procedure for and importance of obtaining a complete patient clinical history.
4. Perform proper charting and documentation using manual or electronic formats.
5. List the parameters used in the current American Heart Association (AHA) Advanced Cardiac Life Support Guidelines.
6. Recognize normal and abnormal cardiac rhythms.

# Advanced Sectional Anatomy

## Description

The ability to locate and identify structures in the axial (transverse), sagittal, coronal and orthogonal (oblique) planes is a necessary skill in many imaging and therapeutic modalities. Volumetric data sets and 3-D reconstruction of the body structures are increasingly important to the critical diagnosis and treatment of diseases. To enhance patient care and assist physicians with the prognosis, radiologic science professionals must understand cross-sectional anatomy.

## Objectives

1. Distinguish normal anatomical structures in the transverse or axial, coronal, sagittal and orthogonal (oblique) cross-sectional imaging planes within the:
  - 1.Head
  - 2.Neck
  - 3.Thorax
  - 4.Abdomen
  - 5.Pelvis
  - 6.Body imaging
  - 7.Musculoskeletal system
2. Distinguish common pathologies recorded on multiplanar images.

# Communication

## Description

Communication is important because radiologic technologists need to effectively relate and communicate with patients and other health care professionals. Communication with the patient is well established in the entry-level curricula. Therefore, this content focuses on expanding the knowledge base and skills necessary for interpersonal, internal, external and written communications. Additional emphasis is placed on respect and adapting to and supporting patient differences.

## Objectives

1. Apply effective communication within the professional environment.
2. Apply communication strategies for conflict management.
3. Create and deliver professional presentations.
4. Integrate professional and organizational values in daily communications.
5. Compose professional and scholarly communications in a variety of formats.
6. Participate in social and professional networking.
7. Demonstrate active listening skills.

# Patient Centered Care and Cultural Humility

## Description

Cultural humility is important because health care providers work in an increasingly interconnected and complex global community. Health care providers must interact respectfully with individuals from a variety of backgrounds, who may hold different beliefs and values. Understanding the varied backgrounds and needs of people enables medical imaging professional to interact with individuals such as patients and coworkers, as well as the larger community. Leaders in health care must promote and enforce cultural humility within the facility to ensure patients receive the most appropriate, individually- specific care.

## Objectives

1. Evaluate situations to determine if the radiologic technologist interacts appropriately and respectfully with members of all populations.
2. Identify patterns in population health data and disparities in health care.
3. Encourage staff and students to reflect on personal values and biases.
4. Develop models to assist staff and students in understanding cultural competence as it relates to patient care.
5. Apply strategies for addressing bias and discrimination in health care delivery.
6. Demonstrate cross-cultural communication techniques that meet individual patients' needs.
7. Advocate for cultural awareness and sensitivity in the health care system.

# Health Care Delivery

## Description

It is important for the radiologic technologist to understand the various methods of health care delivery to remain knowledgeable in the changing face of technology. The political context of health care organization and delivery, with specific focus on the mechanisms for policy formulation and implementation, is discussed.

## Objectives

1. Debate historical perspectives and technological advances as they relate to the delivery of health care.
2. Discriminate between various policy formation and implementation mechanisms and the impact of each on direct patient care.
3. Analyze the various influences of policy on direct patient care.
4. Compare and contrast the different types of health care delivery systems.
5. Differentiate between the components of the U.S. health care delivery system.
6. Explain factors influencing health care delivery.
7. Characterize the sources of research and monitoring in health care delivery.
8. Examine the impact of imaging technology on health care delivery.

# Health Care Ethics and Law

## Description

Health care ethics and law are important because of their impact on technologists, patients and health care facilities. This content is geared toward legal issues that affect the employee and employer directly regarding ethical behavior and scope of practice. In addition, this content gives guidance on quality management techniques, including reporting, that can help mitigate noncompliance. Leaders in health care must promote and enforce ethics by identifying and reporting ethical issues within the facility. Ethical and legal compliance helps to ensure patients receive adequately patient-centered care, and that the institution is not liable for acts which might lead to litigation.

## Objectives

1. Assess challenges to determine how to act ethically based on personal, societal and professional standards.
2. Apply principles and strategies of ethical behavior to cultivate an ethical environment.
3. Analyze various scenarios involving roles and responsibilities of radiologic technologists to determine if the individuals are working within their scope of practice and using appropriate practice standards.
4. Evaluate an existing quality management plan to determine if it complies with effective quality management principles.
5. Determine implications of civil and criminal law upon professional licensing/certification and accreditation.
6. Outline civil procedures followed when a complaint is filed.
7. Analyze a situation to determine the type of patient consent granted.
8. Identify strategies to assure that patient's rights are maintained.
9. Differentiate between the employer's and employee's legal responsibilities.

# Leadership and Teambuilding

## Description

Leadership and teambuilding are vital components of all health care organizations. To promote an effective team, the radiologic technologist must be able to lead and function within an interdisciplinary team. It is highly recommended for this information to be applied throughout the curriculum to ensure adequate understanding based on various situations.

## Objectives

1. Evaluate the characteristics of a team as they relate to the effectiveness of the team.
2. Compare and contrast the advantages and disadvantages of a team.
3. Discuss the role of the leader in building effective teams.
4. Identify the skills necessary to be an effective team leader.
5. Analyze different leadership styles and evaluate their effectiveness.



# Pathophysiology

## Description

Content focuses on the characteristics and manifestations of diseases 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 in understanding alterations that occur in the major body systems. Emphasis is placed on the image correlation with these pathologies. The in-depth study of pathophysiology allows the professional to communicate better with other health care professionals, including physicians and scientists, as well as with the patient, for the history and physical assessment.

## Objectives

1. Define terminology used in the study of disease.
2. Describe the general principles and mechanisms of disease.
3. Describe the physiological response in inflammation and cell injury due to pathological insult.
4. Differentiate between the processes of various types of cellular and tissue injury and adaptive mechanisms.
5. Describe the disorders of fluid and electrolyte balance.
6. Differentiate between the mechanisms of tissue repair and healing.
7. Identify common tests used to diagnose disease or injury.
8. Examine the role of nutrition and genetics in disorders.
9. Describe the common etiology, signs and symptoms, diagnostic tests, typical course and management of common diseases and disorders of body systems.
10. Discuss the common effects of aging on each of the body systems.

# Health Care Compliance and Accreditation

## Description

Patient information management is important because of the integral role the radiologic technologist has within the health care team. It is essential for the radiologic technologist to provide all members of the team with a thorough patient record to ensure quality patient care.

## Objectives:

1. Describe the Joint Commission standards and Health Insurance Portability and Accountability Act (HIPAA) regulations regarding the accountability and protection of patient information.
2. Evaluate the patient record to ensure The Joint Commission standards and HIPAA regulations are satisfied.
3. Explain the process by which imaging departments develop and revise policies and procedures to maintain compliance regarding patient information
4. Analyze the potential abuses in maintaining confidential patient information.
5. Identify accreditation and compliance issues relevant to health care facilities.

# Pharmacology

## Description

An exploration of pharmacology is necessary to provide the student with comprehensive knowledge concerning drugs and their applications in medical imaging. Drug regulations, types of drugs and drug administration are included. Discussions integrate the selection of drugs with their appropriate use and possible effects.

## Objectives

1. Outline consumer safety and drug regulations.
2. Differentiate among various types of drugs and their proper application.
3. Administer drugs commonly used for medical imaging.
4. Assess various types of responses following drug administration.

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# Quality Management

## Description

Quality management (QM) is important to ensure the proper functioning of equipment and compliance with government and accreditation standards. Thus, technologists should have an understanding of the activities and the individual's role in the QM process. This content is designed to expand the QM skills of the technologist to include digital imaging systems and the application of QM principles in an imaging department.

## Objectives

1. Differentiate between quality management (QM), quality assurance (QA) and quality control (QC).
2. Apply QM principles to a given scenario.
3. Analyze collected QM data and make appropriate recommendations.
4. Analyze the benefits of a QM program to the patient and to the department.
5. Develop a QM plan to collect data for digital imaging equipment.

# Research Methods and Information Literacy

## Description

Research methods and information literacy are important because the health care profession is continually changing, which requires the radiologic technologist to possess new knowledge to function competently. The radiologic technologist should contribute to the body of knowledge and be able to effectively analyze resources to promote growth in the profession. The attitude of life-long learning enables the radiologic technologist to stay in step with the current health care environment and be prepared to help foster the future and increase awareness of the profession in the global community. This content is geared to increase and disseminate intellectual inquiry, information literacy and the use of scholarly research methods.

## Objectives

1. Analyze research articles to determine the accuracy and validity of findings.
2. Integrate information literacy concepts into a research project.
3. Critique research projects to determine appropriateness and usefulness to the profession.

## Appendix B

### Curriculum Revision Workgroup

We would like to extend special recognition to the outstanding professionals who volunteered their time as members of the curriculum revision project:

John W. Candler, M.H.S., R.R.A., R.T.(R)  
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Joy Renner, M.A., R.T.(R)  
Vicki Dillard, M.S.R.S., R.R.A., R.T.(R)(CV)(CT)  
Barbara Smith, M.S., R.T.(R)(QM)(ARRT), FASRT, FAEIRS

We also wish to express our sincere appreciation for the many contributions and suggestions from the professional community over the course of this project.

## Resources

This list of resources is a sample of the many references and study materials available for medical imaging. The resources list should be viewed as a snapshot of available materials and is subject to change over time. Omission of any one title is not intentional. The creation of literature and media related to the field is dynamic, and educators are encouraged to locate additional sources for updates, revisions and additions to this collection of titles.

### Textbooks

Ball JW, Dains JE, Flynn JA, Solomon BS, Stewart RW. *Siedel's Guide to Physical Examination: An Interprofessional Approach*. 9<sup>th</sup> ed. St. Louis, MO: Mosby; 2019. ISBN 9780323481953.

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## Websites

American College of Radiology  
<http://www.acr.org>

Communications Standards  
<https://www.acr.org/-/media/ACR/Files/Practice-Parameters/CommunicationDiag.pdf>

Appropriateness Criteria  
<https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria>

American Medical Association Current Procedural Terminology  
<http://www.ama-assn.org>

Centers for Medicare and Medicaid Services  
[cms.gov](https://www.cms.gov)

Harrison's Online  
[www.accessmedicine.com/resourceTOC.aspx?resourceID=4](http://www.accessmedicine.com/resourceTOC.aspx?resourceID=4)

Micromedex 2.0  
[www.micromedex.com](http://www.micromedex.com)

Physician's Desk Reference

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