

Radiologist Assistant Curriculum

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Introduction

The goal of this curriculum is to provide the professional community with a cognitive base supporting 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 diagnostic imaging environment. The radiologist assistant is 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. 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 title clearly places the radiologist assistant’s professional role and clinical responsibilities within the medical imaging environment as a radiologist physician extender. The curriculum is suitable for programs offered at a baccalaureate and postbaccalaureate level.

The content and objectives should be organized to meet the mission, goals and needs of each radiologist assistant program. Faculty members are encouraged to expand and broaden these fundamental objectives as they incorporate them into their curricula. Specific instructional methods for the didactic setting were intentionally omitted to allow for programmatic prerogative as well as creativity in instructional delivery.

The radiologist assistant has three primary areas of responsibility, all performed with 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 and dose reduction 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 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 change within the medical imaging community leading to the development of meaningful professional dependencies.

The Foundations Section located in Appendix A of the document represents content taken from the ASRT Bachelor of Science in Radiologic Sciences (B.S.R.S.) Core Curriculum.

Radiologist Assistant Curriculum

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Foundations

This 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 intended to aid radiologist assistants in career planning and program managers in the development of preassessment tools for candidate selection.

Advanced Patient Care

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 is 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 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, external and written communications. Human diversity and respect is emphasized.

Ethics and Diversity

Ethics and diversity are important because all health care providers work in a global community that is increasingly diverse and complex. Health care providers must interact with individuals from a variety of backgrounds both ethically and with respect for their beliefs and values. This content builds on ethical and diverse issues that affect the radiologic technologist as an individual and interactions with patients, coworkers and the community.

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, is discussed.

Health Care Law and Compliance

Health care law and compliance is important because of its impact on technologists, patients and health care facilities. This content is geared toward legal and compliance issues that affect the employee and employer directly regarding accreditation and compliance issues. In addition this

content gives guidance on quality management techniques, including reporting, that can help mitigate noncompliance.

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 exercise the ability to 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.

Patient Information Management

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. Thus, technologists should have an understanding of the activities and their 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.

Core Content

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Patient Assessment, Management and Education

Description

Content reinforces the use of the clinical thinking model to aid in patient assessment that 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

1. Apply the radiologic clinical analysis process in the patient care setting.
2. Conduct interviews to confirm and document a patient's medical history.
3. Perform a physical assessment of the patient undergoing imaging procedures and document findings.
4. Obtain and analyze a patient's vital signs.
5. Document initial observations made during an examination and contribute to the planning and management of the patient.
6. Participate in patient education.
7. Adapt communication techniques to address patient needs.
8. Review patient medical data for indications, contraindications and alterations in patient procedure.

Content

I. The Radiologic Clinical Analysis Model

- A. Identify abnormal and normal findings
- B. Anatomically localize findings
- C. Communicate findings in terms of probable causes
- D. Develop hypotheses about the nature of the patient's problem
 - 1. Select the most specific and/or central finding
 - 2. Correlate findings against conditions
 - 3. Weigh competing possibilities
 - 4. Identify and give attention to potentially life-threatening and treatable conditions
- E. Identify steps and procedures to test the hypothesis
- F. Establish a working description of the problem

II. Interviewing and Patient History

- A. Structure and purposes of the medical history
- B. Setting the stage for the interview
- C. Learning about the patient's condition
 - 1. Interviewing skills
 - 2. Challenges
 - a. Patients at different ages, with varying comprehension abilities and cultural backgrounds
 - b. Adaptations and alterations based on patient status
 - 3. Components of a comprehensive history
 - a. Preliminary data
 - 1) Date and time of history
 - 2) Identifying data
 - 3) Reliability
 - b. Chief complaint
 - c. Present condition
 - d. Past (medical and social) history
 - e. Prior surgical history
 - f. Medications
 - g. Allergies
 - h. Family history
 - i. Current health status
 - j. Review of systems and physical examination for indications or contraindications to a procedure or change in patient management as related to the radiologic procedure
 - 1) General

- 2) Skin
 - 3) Respiratory
 - 4) Cardiac
 - 5) Gastrointestinal (GI)
 - 6) Urinary
 - 7) Peripheral vascular
 - 8) Musculoskeletal
 - 9) Neurologic
 - 10) Hematologic
 - 11) Endocrine
 - 12) Cognitive and mental health
- k. Medical analysis and interpretation of data

- D. Provide education and instruction
1. Preprocedure
 2. Postprocedure and follow-up

III. Performing the Patient Assessment of Vital Signs

- A. Method and technique for obtaining a patient's vital signs
1. Temperature
 2. Respiration
 3. Pulse
 4. Blood pressure
 5. Pain score

IV. Assessment of the Abdomen

- A. Physical assessment findings
- B. Association to disease processes (differential diagnosis)
- C. Inspection
- D. Percussion
- E. Auscultation
- F. Palpation
- G. Abdominal assessment findings within the following categories:
1. Infection or inflammation
 2. Congenital
 3. Degenerative
 4. Metabolic
 5. Tumor
 6. Trauma
 7. Vascular

V. Assessment of the Thorax and Lungs

- A. Physical assessment finding
- B. Association to disease processes (differential diagnosis)
- C. Inspection
- D. Percussion
- E. Palpation
- F. Auscultation
- G. Oxygen saturation
- H. Chest assessment findings within the following categories:
 - 1. Infection or inflammation
 - 2. Congenital
 - 3. Degenerative
 - 4. Metabolic
 - 5. Tumor
 - 6. Trauma
 - 7. Vascular

VI. Assessment of the Cardiovascular System

- A. Inspection
- B. Auscultation
- C. Palpation
- D. Cardiovascular system assessment findings within the following categories:
 - 1. Infection or inflammation
 - 2. Congenital
 - 3. Degenerative
 - 4. Metabolic
 - 5. Tumor
 - 6. Trauma
 - 7. Vascular

VII. Assessment of the Musculoskeletal System

- A. Inspection
- B. Palpation
- C. Sensory-motor function and range of motion

- D. Musculoskeletal system assessment findings within the following categories:
 - 1. Infection or inflammation
 - 2. Congenital
 - 3. Degenerative
 - 4. Metabolic
 - 5. Tumor
 - 6. Trauma
 - 7. Vascular

VIII. Assessment of the Peripheral Vascular System

- A. Inspection
- B. Palpation
- C. Auscultation
- D. Evaluation for edema
- E. Peripheral vascular system assessment findings within the following categories:
 - 1. Infection or inflammation
 - 2. Congenital
 - 3. Degenerative
 - 4. Metabolic
 - 5. Tumor
 - 6. Trauma
 - 7. Vascular

IX. Assessment of the Nervous System

- A. Mental status and speech
- B. Neurological assessment and data interpretation
- C. Nervous system assessment findings within the following categories:
 - 1. Infection or inflammation
 - 2. Congenital
 - 3. Degenerative
 - 4. Metabolic
 - 5. Tumor
 - 6. Trauma
 - 7. Vascular

X. Assessment of the Breasts and Axillae

- A. Inspection
- B. Palpation

- C. Breast and axillae assessment findings within the following categories:
 - 1. Infection or inflammation
 - 2. Congenital
 - 3. Degenerative
 - 4. Metabolic
 - 5. Tumor
 - 6. Trauma
 - 7. Vascular

XI. 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

XII. Patient Management

- A. Infection control
- B. Post procedure resources
- C. Patient monitoring and assessment
 - 1. Intravenous therapy
 - 2. Oxygen therapy
 - 3. Urinary catheterization
 - 4. Medical emergency
- D. Appropriate medical complication and emergency intervention
 - 1. Radiologic procedure complication
- E. Medical devices
 - 1. Image appearance
 - 2. Indications
 - 3. Purpose
 - 4. Appropriate location
 - 5. Complications

XIII. Provide Education and Instruction

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

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Pharmacology and Clinical Decision-Making in Imaging

Description

This content is designed to enhance the radiologist assistant's knowledge of pharmaceuticals commonly used by and given to patients undergoing medical imaging. The content addresses the intent of each drug and its effect on diseases, conditions and physiology. After acquiring this content and the appropriate clinical skills, the radiologist assistant will analyze the patient's current condition with regard to medications and other therapies to determine the significance to the imaging procedure. He or she will suggest the appropriate plan for the procedure for each patient. The radiologist assistant will be responsible for the administration and documentation of procedure-related pharmaceuticals. He or she will assess contraindications and monitor the patient for adverse events and respond appropriately. It is essential for the radiologist assistant to have a clear understanding of the laws and policies related to pharmaceuticals in his or her practice setting.

Objectives

1. Identify key drug laws affecting consumer safety.
2. Identify the five schedules of controlled substances.
3. Identify the roles of the monitoring federal regulatory and enforcement agencies for consumer drugs.
4. Identify strategies for health care workers involved in dispensing medications to comply with the restrictions of drug laws.
5. Identify acceptable and unacceptable abbreviations and symbols used for medication orders.
6. Differentiate among drug names (generic, chemical, trade, official).
7. Explain the restrictions of drug sales implied by the designations *over-the-counter*, *legend drug* and *controlled substance*.
8. Research drug reference information from current pharmacological resources.
9. Describe how the body metabolizes drugs.
10. List common variables affecting drug action within the body.
11. Describe unexpected responses to drugs.
12. Describe the purposes for and principles of clinical drug trials.
13. Accurately perform calculations for drug dose delivery.
14. Describe various forms of drug preparations and supplies.
15. Incorporate the principles of responsible drug administration in the patient care setting to prevent medication errors.
16. Use proper medical techniques of drug administration for common routes of delivery.
17. Describe dose modifiers for pediatric and geriatric patients.
18. Identify factors that can lead to cumulative effects in elderly patients.
19. List the categories of drugs that frequently cause adverse effects in older adults.
20. Identify guidelines and competencies for sedation and analgesia according to accreditation standards.
21. Describe the adverse effects and cautions associated with preprocedure medications.
22. Describe the administration, indications, contraindications and adverse effects related to minimal and moderate (conscious) sedation and local anesthetics.

23. Assess the patient and patient's records prior to and manage the patient during examinations requiring moderate sedation.
24. Recognize, explain and respond to the indications, contraindications and adverse effects of drugs used for sedation, analgesia, and diabetes as well as for respiratory, gastrointestinal, and cardiovascular conditions. These drugs can include antineoplastics, antiseizure medications, psychotropics, diuretics, steroids, hormone replacements, antiarrhythmics, antihypertensives, anticoagulants, and anti-infectives.
25. Explain precautions in caring for the patient receiving radioactive isotopes.
26. Describe the indications for and the precautions necessary with the use of oxygen therapy.

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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
- B. Roles of government regulatory agencies

II. Medication Orders

- A. Common abbreviations for medication orders
 - 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. Identifying names (i.e., generic, trade)
- C. Legal terms referring to drugs (i.e., over-the-counter)

IV. Sources of Drug Information

- A. Current drug references (i.e., 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. Contraindications, warnings, adverse effects, 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 (i.e., Calculation Guidelines)

- A. Anatomic and physiologic variables (i.e., renal and hepatic function)
- B. Factors affecting dose
 1. Body surface area
 2. Weight
 3. Age
- C. Patient considerations
 1. Pregnant
 - a. Fetus
 2. Pediatric
 3. Adult
 4. Geriatric

VIII. Principles of Drug Administration

- A. Accurate drug administration
- B. Medication error avoidance
- C. Administration routes
- D. Appropriate documentation of administration and patient outcomes
 1. Dose

2. Time
3. Route
4. Location of injections
5. Sign or initial record
6. Documentation involving narcotics and any medications
7. Adverse events reporting

IX. Pediatric Considerations

- A. Anatomic and physiologic variables
- B. Pharmacokinetic and pharmacodynamic considerations

X. Geriatric Considerations

- A. Anatomic and physiologic variables
- B. Pharmacokinetic and pharmacodynamic considerations

XI. Procedural Medication and Local Anesthetics

- A. Sedation and analgesia policies and procedures
- B. Minimal and moderate (conscious) sedation goals
 1. Altered level of consciousness and mood
 2. Maintenance of consciousness
 3. Cooperation
 4. Elevation of pain threshold
 5. Minimal variation of vital signs
 6. Rapid degree of amnesia
 7. Safe, prompt recovery and ambulation
- C. Assessment of patient and documentation of medications related to procedure
 1. Informed consent
 2. Procedural assessment (i.e., vital signs, laboratory values, level of consciousness)
- D. Airway management
- E. Patient recovery period (i.e., airway, vital signs, level of function)

XII. Nonprescription and Dietary Supplements, Anti-infective and Antineoplastic Drugs

- A. Impact on procedures
- B. Interactions

XIII. 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 (CNS) drugs
1. Analgesics, sedatives, and hypnotics
 2. Anticonvulsants, antiparkinsonian drugs, and medications for Alzheimer disease
 3. Psychotropic medications,
 4. Alcohol and drugs of abuse
- C. Urinary system drugs
1. Diuretics
 2. Gout medications
 3. Antispasmodics
 4. Cholinergics
 5. Analgesics
 6. Prostatic medications
 7. Alpha blockers
 8. Overactive bladder medications
- D. GI drugs
1. Antacids
 2. Reflux, ulcerative and inflammatory bowel disease medications
 3. Antispasmodics/anticholinergics
 4. GI motility and function medications
 5. Antiemetics
- E. Endocrine system drugs
1. Pituitary hormones
 2. Adrenal corticosteroids
 3. Thyroid medications
 4. Diabetic 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. Respiratory stimulants
 - 3. Bronchodilators
 - 4. Corticosteroids
 - 5. Mucolytics and expectorants
 - 6. Antihistamines
 - 7. Decongestants
 - 8. Smoking cessation aids

- I. Musculoskeletal and anti-inflammatory drugs
 - 1. Skeletal muscle relaxants
 - 2. Anti-inflammatory drugs
 - 3. Osteoporosis therapy
 - 4. Injectable steroids

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Contrast Media

Description

Content imparts an understanding of contrast media used during diagnostic procedures. Topics include an overview of the chemical makeup and physical properties of contrast agents. The radiologist assistant selects appropriate contrast agents for procedures, based on patient risk factors, premedication strategies and indicators of contrast media reaction. He or she participates in the care and treatment of patients experiencing adverse reactions to contrast media.

Objectives

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

Content

I. Contrast Media Selection

- A. Barium, iodinated contrast, magnetic resonance and echogenic agents
 - 1. Procedural requirements
 - 2. Occurrences and causes of reactions and complications
 - 3. Risk factors (i.e., renal function)
 - 4. Special considerations (i.e., 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 and low osmolar contrast media
 - a. Molecular structure
 - b. Advantages
 - c. Disadvantages
- C. Osmolality
- D. Viscosity
- E. Calcium binding
- F. Chemical stability

IV. Current Contrast Media

V. Allergic Reaction Risk Reduction

- A. Patient Assessment
- B. Premedication and hydration protocols
- C. Dosage
- D. Alternative procedure consultation

VI. Patient Care Following Contrast Media Administration

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

VII. Appropriate documentation of administration and patient outcomes

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Pathophysiology

Description

Content focuses on the characteristics and manifestations of disease caused by alterations or injury to the structure or function of the body. Students will be exposed to basic pathophysiology concepts as well as common disease conditions to understand alterations that occur in the major body systems. Emphasis is placed on image correlation with these pathologies.

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.

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 within the following categories:
 - 1. Infection or inflammation

2. Congenital
3. Degenerative
4. Metabolic
5. Tumor
6. Trauma
7. Vascular

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

Content establishes a framework for radiologist assistant participation in patient examinations for the purpose of diagnostic inspection and therapeutic treatment. Examination procedures should follow American College of Radiology practice guidelines for producing high-quality radiologic images and patient care.

Objectives

1. Identify the information, materials and equipment required in preparation for conducting diagnostic imaging examinations.
2. Describe the protocol for performing imaging examinations.
3. Identify factors requiring an alteration or modification to examinations.
4. Identify risk factors (patient or operator) related to examinations.
5. Under radiologist supervision, perform patient examinations for diagnostic inspection and therapeutic treatment.
6. Measure examination outcomes against examination goals.
7. Compose an internal memorandum of initial observations made during the examination following prescribed protocols.
8. Describe postprocedure patient care and instructions.

Content

- I. Procedural Guidelines and Examination Protocols**
 - A. 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 modality
 - F. Patient management during the procedure
 - G. Safe operation of radiation producing equipment
 - H. Devices and supplies
 - I. Administration of contrast media and drugs
 - J. Evaluation of image quality for diagnostic utility
 - K. Image enhancement and postprocessing
 - L. Complications and response to adverse events
 - M. Postprocedure patient care
 - N. Outcomes measurement
 - O. Health record
 - 1. ICD and CPT coding
- II. Chest Procedures**
- III. Gastrointestinal Procedures**
- IV. Genitourinary Procedures**
- V. Invasive Nonvascular Procedures**

VI. Invasive Vascular Procedures

- A. Vascular access (tunneled and nontunneled)
 - 1. Peripherally inserted catheters
 - 2. Centrally inserted catheters
 - 3. Implanted

- B. Angiography

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Modality and Image Management

Description

Content is designed to establish a knowledge base in the fundamentals of fluoroscopy, computed tomography, magnetic resonance, medical sonography, positron emission tomography and image postprocessing. Content promotes awareness of the advantages and limitations of each area. Procedures and techniques to optimize image quality while minimizing radiation exposure are included.

Objectives

1. Make prudent judgment for the use of equipment as a diagnostic tool.
2. Identify the advantages and limitations of equipment and various exposure settings as a diagnostic tool.
3. Identify the functional components involved in the operation of the devices.
4. Identify features of the equipment designed to minimize radiation exposure to patients and operators.
5. Employ methods and techniques to maximize the diagnostic value of a given examination while minimizing patient radiation exposure.
6. Following guided practice, operate the device, including recording images, to satisfy the protocol for routine studies.
7. Provide direction regarding radiation protection practices to others present during an examination.
8. Provide patient education regarding the operation and benefits of the equipment.
9. Ensure that equipment is operating safely and in a standardized manner on a daily basis and especially prior to patient exposure.

Content

I. Fluoroscopy: Pediatric and Adult

- A. Clinical advantages
 - 1. Demonstration of dynamic anatomy
 - 2. Localization
 - 3. Documentation

- B. 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), object-to-image receptor distance (OID), source-to-image receptor distance (SID)
 - b. Control of radiation field
 - c. Maximum exposure rate
 - d. Lead apron requirements
 - e. Maximum entrance dose vs. equipment setup and technique
 - f. Scatter/isodose curves in relation to mobile equipment setup and personnel placement
 - g. High dose fluoroscopy mode
 - h. Pulsed fluoroscopy
 - i. Last image hold
 - 7. Recording of fluoroscopic dose
 - 8. Image recording, archiving and retrieval

- C. Technical factors affecting the radiation dose rate for patients and operators
 - 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. SSD, OID, SID
 - g. Grids
 - h. Pulse fluoroscopy
 - i. High dose fluoroscopy mode
 - j. Pediatric vs. adult default settings
 - 2. Indirect factors
 - 3. Patient and/or operator dose reducers

- a. Gonadal shielding
- b. Lead drape
- c. Bucky slot cover
- d. Lead apron
- e. Thyroid shield
- f. Leaded glasses
- g. Leaded gloves
- h. Three-phase and high-frequency generators
- i. Protective barriers
- j. Cumulative timer
- k. High dose mode audible alarm
- l. Mobile equipment setup
- m. Personnel distance from source
4. Image intensifier
 - a. Image quality considerations
 - b. Quantum mottle
 - c. Contrast resolution
 - d. Image resolution
 - e. Image distortion
 - f. Lag
 - g. Vignetting
 - h. Magnification
 - i. Flat panel technology
5. Ancillary equipment
 - a. Optics system
 - b. Image display systems
 - c. Cinefluorography
 - 1) Synchronous
 - 2) Framing frequency
 - d. Videotape and video disc recording
 - e. Cassette spot filming
 - f. Photofluorospot camera
 - g. Contrast media
 - h. Accessories
 - i. Gonadal shields
 - j. Grids
 - k. Cassettes
6. Image processing
7. Digital systems
8. Patient characteristics affecting beam attenuation
9. Operator controls of the fluoroscopic unit
 - a. Control panel setting(s) 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 switch(es)
 - h. Spot-film device
10. Patient supports and immobilization devices

- D. Patient dose vs. image quality
- 1. Spot-film image
 - 2. Digital or photospot
 - 3. Cine
 - 4. Videotape or DVD
 - 5. Risks of low-level radiation exposure

II. Computed Tomography: Pediatric and Adult

- A. Patient preparation
- B. Patient assessment
- C. IV procedures
- D. Radiation safety and dosimetry
- 1. Technical factors affecting patient dose
 - 2. Radiation protection
 - 3. Dose measurement
 - 4. Patient dose reduction
- E. Image processing
- 1. Reconstruction
 - 2. Postprocessing
- F. Image Quality

III. Magnetic Resonance: Pediatric and Adult

- A. MR screening and safety
- 1. Patient screening
 - 2. Safety (i.e., nonferromagnetic ancillary equipment, quenching)
 - 3. Environment (i.e., magnetic and radiofrequency [RF] shielding)
 - 4. Biological considerations
 - a. RF field
 - b. Static and gradient magnetic fields
 - c. Acoustic noise
- B. Pulse sequence configurations
- 1. Partial saturation/saturation recovery sequence
 - 2. Spin echo
 - 3. Inversion recovery
 - a. Types of inversion recovery (IR) sequences
 - 1) Spin echo IR

- 2) Fast spin-echo inversion recovery FSE – IR
 - 3) Double IR (driven equilibrium)
 - 4) Gradient echo – IR
 - b. IR sequence image contrast
 - 1) Short tau inversion recovery (STIR)
 - 2) Fluid-attenuated inversion recovery (FLAIR)
 - 3) Spectral selected attenuation inversion recovery (SPAIR)
 - 4. Rapid acquisition recalled echo (RARE)
 - a. Types
 - 1) Fast spin-echo (FSE)
 - 2) Turbo spin-echo
 - 5. Gradient echo
 - a. Steady-state coherence (SSC)
 - b. Spoiled gradient recall (SPGR)
 - c. Rapid gradient echo – echo-planar imaging (EPI)
 - 6. Spectroscopy sequences
 - a. Single voxel
 - b. Multivoxel
- C. Postprocessing
- 1. Maximum intensity projection (MIP)
 - 2. Multiplanar reconstruction techniques (MPR)
 - 3. Cardiac analysis
- D. Functional imaging
- 1. Magnetic resonance angiography (MRA)/magnetic resonance venography (MRV)
 - 2. Techniques
 - a. Diffusion
 - b. Perfusion
 - c. Spectroscopy
 - d. fMRI
 - 3. Dynamic imaging
- E. Sequence parameters and options
- 1. Imaging parameters
 - a. Repetition time (TR)
 - b. Echo time (TE)
 - c. Inversion time (TI)
 - d. Field of view (FOV)
 - 2. Imaging options (i.e., suppression techniques, physiologic gating and triggering, saturation pulse)
- F. Tissue characteristics
- 1. T1 relaxation
 - 2. T2 relaxation
 - 3. T2 (susceptibility artifact)

4. Proton (spin) density
5. Flow
6. Diffusion
7. Perfusion

IV. Medical Sonography: Pediatric and Adult

- A. 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. Transducer construction and characteristics
 2. Transducer types (sector, linear, phased arrays, etc.)
 3. Spatial resolution
 4. Transducer selection
- C. Pulse-echo instrumentation
 1. Display modes and their formation (A-mode, B-mode, M-mode, 3-D, etc.)
 2. Transmission of ultrasound
 3. Reception of ultrasound (preprocessing)
 4. Beam former
 5. Postprocessing of ultrasound signals
 6. Pulse-echo imaging artifacts
 7. Tissue harmonic imaging
 8. Real-time ultrasound instrumentation
 9. Recording and storage devices
- D. Doppler instrumentation and hemodynamics
 1. Ability to acquire color flow image
 2. Ability to acquire a Doppler spectral image
 3. Ability to take measurements from the spectral waveform
 4. Hemodynamics
- E. Quality assurance and quality control of equipment
 1. Preventive maintenance
 2. Malfunctions
 3. Performance testing with phantoms

V. Positron Emission Tomography: Pediatric and Adult

- A. Positron emission tomography (PET) radiopharmaceutical principles
- B. Radiation safety with positron decay
- C. Theory of operation

- D. Image formation and reconstruction
- E. Diagnostic procedures
 - 1. Radiopharmaceutical characteristics
 - 2. Administration of radiopharmaceuticals
 - 3. Gated procedures
 - 4. Acquisition modes
 - 5. Imaging procedures (i.e., cardiology, neurology, oncology)
 - 6. Image artifacts
 - 7. Computerized data processing
 - 8. Image fusion and registration

VI. Image Postprocessing

- A. Processing techniques
 - 1. 2-D display tools
 - 2. 3-D display tools
 - a. Maximum intensity projection (MIP)
 - b. Minimum intensity projection (MinIP/minIP)
 - c. Shaded surface display (SSD)
 - d. Volume rendering technique (VRT)
 - e. Ray sum projection
 - 3. Segmentation tools (i.e., cutting, region growing, dilation/erosion)
- B. Data volume
 - 1. Voxel-based models
 - 2. Grid-based models
 - 3. 3-D sampling function
 - 4. Secondary raw data set
 - a. Image noise
- C. Cine viewing
- D. Multiplanar reformations
- E. Maximum intensity projection (MIP) and minimum intensity projection (MinIP)
 - 1. Principle
 - 2. Thin-slab MIP
 - 3. MinIP
 - 4. Artifact pitfalls
 - a. CT angiography
 - b. Pulmonary MIP and MinIP
 - 5. Applications of MIP and MinIP
- F. 3-D surface rendering (SSD)
 - 1. Principle

2. Applications
 - a. Clarification of complex 3-D relationships
 - b. Image rotation and viewing angle
 - c. Presurgical planning
 - d. Presentation of findings
 - e. Virtual endoscopy

G. Volume rendering techniques

1. Principle
2. Special techniques
3. Artifacts and pitfalls
4. Applications

H. Virtual endoscopy

1. Principle
2. Alternative viewing techniques
3. Artifacts and pitfalls
4. Virtual Applications

VII. Equipment Safety

A. Equipment safety regulations

B. Safety

1. Hazard identification and control
2. Policies and procedures
 - a. Occupational Safety and Health Administration (OSHA)
 - b. Centers for Disease Control and Prevention (CDC)
 - c. Facility
 - d. State
3. Employee training
4. Fire, electrical and chemical safety
5. Magnetic fields and radio frequency safety
6. Injury prevention
7. Safety and quality improvement committees
8. Risk management

Radiation Safety, Radiobiology and Health Physics

Description

Content is designed to expand on prior knowledge to enhance an understanding of protecting patients against the harmful effects of ionizing radiation. This includes an overview of the regulatory bodies and patient radiation safety regulations affecting the modern diagnostic imaging environment. The effect of ionizing radiation 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 for reducing patient and operator risk of exposure to ionizing radiation will be introduced.

Objectives

1. Identify organizations that set standards for radiation safety.
2. Describe the mechanism by which radiation interacts with matter.
3. Explain the quantitative relationships between radiation exposure and biological damage.
4. Describe the effects of radiation exposure.
5. Identify instruments used for measuring accumulated dose, measured dose and dose rate.
6. Describe the operating principles of common radiation measuring devices.
7. Distinguish between radiation exposure and radiation absorbed dose.
8. Apply techniques for reducing exposure to external and internal sources of radiation to the patient and personnel.
9. Evaluate the design of radiologically safe equipment, processes and environments.
10. Describe surveillance methods for maintaining a radiation safe environment for personnel and the general public.

Content

I. Regulatory Organizations

II. Philosophy of Radiation Protection

- A. Public health and radiation protection
 - 1. Genetically significant dose and population mutation rate
 - 2. Public awareness campaigns
- B. Dose limitation principles

III. Basic Radiation Safety Criteria

- A. Occupational exposure
- B. Medical exposure
- C. Effective dose equivalent
- D. Exposure to individuals in the general public
- E. Exposure to populations
- F. Dose limits

IV. Radiation Detection and Measurement Devices

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

V. Dose-Response Interactions

- A. Direct
- B. Indirect

VI. Radiation Effects

- A. Acute effects
- B. Treatment of acute overexposure
- C. Delayed effects
- D. Intellectual disability
- E. Genetic effects

VII. Expressing Cancer Risks

- A. Absolute risk

- B. Excess risk
- C. Relative risk

VIII. Interaction of Ionizing Radiation With Matter

IX. Stochastic Effects vs. Nonstochastic Effects

X. Fetal/Child-related Irradiation

- A. Prenatal death
- B. Neonatal death
- C. Congenital malformation
- D. Diminished growth and development
- E. Childhood malignancy
- F. Lactating mothers

XI. System Response to Irradiation

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

XII. Personnel Dosimetry Report

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

XIII. Radiation Measurement Dose and Equipment

- A. Roentgen and coulombs/kg
- B. Radiation absorbed dose and grays
- C. Dose equivalent and sieverts
- D. Absorbed dose
- E. Exposure
- F. Exposure measurement equipment

XIV. Practical Techniques for Reducing Dose

- A. External radiation protection
- B. Internal radiation protection (radioactive)
- C. Radiopharmaceutical waste management

ASRT

Image Correlation with Anatomy, Physiology and Pathology

Description

Content imparts an understanding of methods and techniques for the systematic observation of static and dynamic diagnostic images for the purpose of evaluating the presence of abnormalities, anomalies and pathological conditions.

Objectives

1. Implement a systematic method or technique for observing static and dynamic patient images for the purpose of recognizing normal anatomical and physiological appearances and those variations in appearance that may indicate pathology or injury.
2. Recommend additional images or alternative imaging procedures as warranted for diagnostic purposes.
3. Formulate initial observations.

ASRT

Content

I. Chest Imaging: Adult and Pediatric

- A. Systematic observation of chest imaging
- B. Clinical presentation related to differential diagnosis
- C. Assess image findings within the following categories:
 - 1. Infection or inflammation
 - 2. Congenital
 - 3. Degenerative
 - 4. Metabolic
 - 5. Tumor
 - 6. Trauma
 - 7. Vascular

II. Musculoskeletal Images: Adult and Pediatric

- A. Systematic observation of musculoskeletal imaging
- B. Clinical presentations related to differential diagnosis
- C. Assess image findings within the following categories:
 - 1. Infection or inflammation
 - 2. Congenital
 - 3. Degenerative
 - 4. Metabolic
 - 5. Tumor
 - 6. Trauma
 - 7. Vascular
- D. Imaging appearance of abuse

III. Images of the GI and Urinary Tracts: Adult and Pediatric

- A. Systematic observation of GI and GU imaging
- B. Clinical presentations related to differential diagnosis
- C. Assess image findings within the following categories:
 - 1. Infection or inflammation
 - 2. Congenital
 - 3. Degenerative
 - 4. Metabolic
 - 5. Tumor
 - 6. Trauma
 - 7. Vascular

IV. Neurological Imaging Patterns: Adult and Pediatric

- A. Systematic observations of CNS imaging
- B. Clinical presentation related to differential diagnosis
- C. Assess image findings within the following categories:
 - 1. Infection or inflammation
 - 2. Congenital
 - 3. Degenerative
 - 4. Metabolic
 - 5. Tumor
 - 6. Trauma
 - 7. Vascular

V. Reproductive and Breast Imaging Patterns: Adult and Pediatric

- A. Systematic observations of reproductive and breast imaging
- B. Clinical presentation related to differential diagnosis
- C. Assess image findings within the following categories:
 - 1. Infection or inflammation
 - 2. Congenital
 - 3. Degenerative
 - 4. Metabolic
 - 5. Tumor
 - 6. Trauma
 - 7. Vascular

VI. Vascular Imaging Patterns: Adult and Pediatric

- A. Systematic observations of vascular imaging
- B. Clinical presentation related to differential diagnosis
- C. Assess image findings within the following categories:
 - 1. Infection or inflammation
 - 2. Congenital
 - 3. Degenerative
 - 4. Metabolic
 - 5. Tumor
 - 6. Trauma
 - 7. Vascular

Clinical Pathways Related to Best Practice Imaging

Description

Content is designed to introduce clinical pathways as multidisciplinary plans of best clinical practice for specific groups of patients with a particular diagnosis that 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, and the variance record. Clinical pathways differ from practice guidelines, protocols and algorithms as they are used by a multidisciplinary team and have a focus on quality and coordination of care.

Objectives

1. Define clinical pathways as related to imaging.
2. Identify the rationale for the use of clinical pathways in the patient care setting.
3. Compose a model clinical pathway related to a radiologic diagnostic/therapeutic procedure.
4. Implement the use of clinical pathway knowledge in the clinical setting.
5. Identify criteria for evaluating clinical pathways.
6. Explain variance analysis as it relates to clinical pathway assessment.
7. Participate in the analysis of clinical pathway variance.
8. List the outcomes created through the implementation of clinical pathways in imaging.
9. Explain the relationship between clinical pathways and quality improvement in imaging.

Content

I. Clinical Pathways Defined

- 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 Developing 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 and status
- B. Radiologist expertise
- C. Equipment availability
- D. Clinical presentation
- E. Necessity of procedure 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

Content introduces guidelines for communicating initial observations made by the radiologist assistant during imaging procedures and image assessments. The radiologist assistant's role focuses on the systematic analysis of clinical practice—the diagnosis and treatment, resources, evidenced-based decision making, procedures and resulting outcomes, including the patient's quality of life.

Objectives

1. Communicate initial observations to the radiologist based on practice guidelines.
2. Identify the required legal components of a report of findings following diagnostic testing.
3. Establish and evaluate benchmarks as they apply to diagnostic imaging.
4. Explain the rationale for performing clinical audits.
5. Identify audit schemes applied to the clinical setting.
6. Identify measurement criteria and instruments employed during a clinical audit.
7. Describe how sensitivity and specificity measurements apply to diagnostic imaging.
8. Distinguish between positive and negative predictive values when evaluating the results of diagnostic imaging.
9. Discuss the importance of sampling and biases on the internal and external validity of audits of diagnostic accuracy.
10. Participate in specialty presentations (i.e., The Gut Club)

Content

I. Clinical Reporting

- A. Legal considerations and requirements
- B. Composing, recording and archiving a report of initial observations

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 (i.e., credentialing)
- C. Audit categories
 - 1. Access
 - 2. Process
 - 3. Output
 - 4. Outcome
 - 5. Use of resources
- D. Measurement criteria and instruments (i.e., ACR Appropriateness Criteria)

Research and Professional Development

Description

Content aids in the development of inquiry, professional growth and research skills in support of evidence-based practice. Learning research skills and conducting research projects benefits the individual and the profession. The individual benefits by acquiring new knowledge and skills; the profession benefits when the individual adds to the professional body of knowledge. One method of meeting this professional obligation is to review and synthesize professional literature or conduct research.

Objectives

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

Content

I. Intellectual Inquiry and Analysis of Research

- 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, including significance tests and confidence intervals
- G. Application for future research and recommendations
- H. Implications for evidence-based professional practice
- I. Bibliography/reference documentation

II. Elements of Scholarship

- 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

Content 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. Medical records management, including privacy and regulatory issues, will be examined.

Objectives

1. Compare civil and criminal law.
2. Explain civil procedures.
3. Describe the concept of standard of care.
4. Distinguish between the different types of consent.
5. Describe the client or patient's legal responsibilities.
6. Describe the employer's legal responsibilities.
7. Describe the employee's legal responsibilities.
8. Discuss regulatory and accreditation issues related to health care.
9. Discuss the Joint Commission standards regarding the accountability and protection of patient information.
10. List the requirements of a patient consent document.
11. Identify challenges to the protection of patient information.
12. Discuss privacy and regulatory issues related to patient information.
13. Apply the Health Insurance Portability and Accountability Act (HIPAA) to patient information systems.
14. Identify potential abuses of confidential patient information.
15. Adhere to health information and medical informatics policies and procedures, including those related to the use of electronic health record systems.

Content

I. Scope of Practice

II. Practice Standards

III. Legal Issues

- A. Civil liability
- B. Intentional torts
- C. Unintentional torts/negligence
- D. Criminal law

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

VI. Legal Doctrines

- A. Burden of proof
- B. Res ipsa loquitur
- C. Respondeat superior

D. Personal liability

E. Good Samaritan

VII. Consent

A. Informed

B. Uninformed

C. Implied

VIII. Patient Directives

A. Living wills and advanced directives

B. Do-not-resuscitate orders (DNR)

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. Security standards
- C. Medical informatics
 - 1. Definition of informatics
 - 2. Application in medicine
 - 3. Information systems and standards

Radiologist Assistant Regulatory and Governmental Affairs

Description

Content is designed to enhance the radiologist assistant's knowledge of state and federal regulatory processes. The content will address the process behind obtaining state licensure, and the enforcement of scope of practice and supervision levels.

Content will include an introduction to billing and coding terminology. 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

1. Identify the difference between radiologic technology licensure boards and state medical boards.
2. Contrast the scope of authority between state physician delegation acts and radiologic technology licensures.
3. Identify the key components of state licensure for the radiologist assistant.
4. Explain radiologist assistant scope of practice and appropriate current procedural and diagnostic supervision levels.
5. Explain the role of Centers for Medicare & Medicaid Services as it pertains to the physician fee schedule.
6. Explain the relationship between rules proposed by Centers for Medicare & Medicaid Services and the federal register.
7. Identify the role of the Social Security Act of 1935 as it pertains to the current radiologist assistant practice.
8. Identify the process behind creating, amending, and approving CPT codes and supervision levels as it pertains to the American College of Radiology and the American Medical Association.
9. Define Medicare Physician Fee Schedule billing components (i.e., professional component, technical component, surgical component) and how they are formulated.
10. Describe professional component modifiers for billing and reimbursement purposes.
11. Describe the function of National Physician Identifier numbers.

Content

I. State Level Regulatory Process

- A. State radiologic technologist licensure board
 - 1. Creation
 - a. Components
 - 2. Implementation
 - 3. Enforcement
- B. State-level 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
- D. American Registry of Radiologic Technologists
 - 1. Advocacy (radiologist assistant)
 - 2. Ethics
- 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)

IV. Medicare Physician Fee Schedule (MPFS)

- A. Fee components and equations
 - 1. Professional component
 - 2. Technical component
 - 3. Surgical component

4. Relative value units (RVU)
5. Geographic pricing cost index (GPCI)
6. Current procedural terminology (CPT)
7. Centers for Medicare & Medicaid Services supervision levels
 - a. Codes (i.e., 1, 2, 3, 9)
8. National Provider Identification Number (NPI)
 - a. Role as it pertains to the radiologist assistant

ASRT

Radiologist Preceptor Clinical Experience

Description

Preceptor clinical experience is the cornerstone in the development of the radiologist assistant. RA students work closely with radiologist preceptors 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 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/therapeutic procedures and the assistant's contribution to the radiologist's final diagnosis of these procedures is essential to the clinical experience.

Prerequisite or Corequisite

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

Objectives

1. Demonstrate competence in performing diagnostic/therapeutic procedures under the preceptorship of a radiologist.
2. Provide initial observations and outcomes of examinations performed for review, interpretation and approval by the radiologist.
3. Assess, evaluate and formulate priorities in daily practice.
4. Establish patient-centered clinically effective service delivery strategies.
5. Implement and perform diagnostic/therapeutic procedures adhering to accepted departmental, institutional, governmental and professional standards.
6. Assess and evaluate the patient's status and condition prior to, during and after diagnostic/therapeutic procedures.
7. Apply the principles of radiation protection standards.
8. Apply principles of quality improvement.
9. Establish appropriate and effective written, oral and nonverbal communication with patient, family, health care providers and the public.
10. Respect and recognize the clinical significance of the patient's personal beliefs and values for adaptation to procedure protocols.
11. Function within the radiologist assistant practice standards in accordance with state regulations and institutional policies.
12. Assess and evaluate psychological and physical changes in the patient's condition and formulate appropriate actions.
13. Appraise cultural and age differences that influence patient compliance with procedural requirements.
14. Interact with the patient and family in a manner that provides the desired psychosocial support.
15. Document care in the patient's medical record in accordance with institutional and legal guidelines.

Appendix A

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

ASRT

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 is discussed.

Objectives

1. Describe the areas required for patient education in medical imaging.
2. Contribute to treatment 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. Analyze a situation requiring drug dispensing to determine the proper drug amount and route of administration.
6. List the parameters used in the current American Heart Association (AHA) Advanced Cardiac Life Support Guidelines.
7. 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:
 - a. Head
 - b. Neck
 - c. Thorax
 - d. Abdomen
 - e. Pelvis
 - f. Body imaging
 - g. Extremities – large joints
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. Human diversity and respect is emphasized.

Objectives

1. Establish effective communication within the professional environment.
2. Apply communication strategies for conflict management.
3. Create and deliver professional presentations.
4. Integrate the values and beliefs of the profession and organization in daily communications.
5. Compose professional communications in a variety of electronic and written formats.
6. Demonstrate active listening skills.

Ethics and Diversity

Description

Ethics and diversity are important because all health care providers work in a global community that is increasingly diverse and complex. Health care providers must interact with individuals from a variety of backgrounds both ethically and with respect for their beliefs and values. This content builds on ethical and diverse issues that affect the radiologic technologist as an individual and interactions with patients, coworkers and the community.

Objectives

1. Assess situations to determine how a radiologic technologist would perform ethically based on personal, societal and professional standards within the United States.
2. Examine situations to determine if the radiologic technologist interacts appropriately and respectfully with a diverse population.

ASRT

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 Law and Compliance

Description

Health care law and compliance is important because of its impact on technologists, patients and health care facilities. This content is geared toward legal and compliance issues that affect the employee and employer directly regarding accreditation and compliance issues. In addition this content gives guidance on quality management techniques, including reporting, that can help mitigate noncompliance.

Objectives

1. Analyze various scenarios involving roles and responsibilities of radiologic technologists to determine if they are working within the scope of practice and using appropriate practice standards.
2. Evaluate an existing quality management plan to determine if it complies with effective quality management principles.
3. Determine implications of civil and criminal law upon professional licensing/certification and accreditation.
4. Outline civil procedures followed when a complaint is filed.
5. Analyze a situation to determine the type of patient consent granted.
6. Identify strategies to assure that patient's rights are maintained.
7. Differentiate between the employer's and employee's legal responsibilities.
8. Identify the accreditation and compliance issues relevant to health care facilities.

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 exercise the ability to 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.

ASRT

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

Patient Information Management

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.

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.

ASRT

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 their 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.

Resources

Textbooks

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- Helms CA. *Fundamentals of Skeletal Radiology*. 3rd ed. Philadelphia, PA: WB Saunders Co; 2005. ISBN 9780721605708.
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Websites

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www.accessmedicine.com/resourceTOC.aspx?resourceID=4

Micromedex 2.0
www.micromedex.com

Centers for Medicare and Medicaid Services
cms.gov

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

Physician's Desk Reference
<http://www.pdr.net>

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

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