

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-level 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 selected exams. The title “radiologist assistant” reflects the nature of the relationship between the radiologist and the radiologic technologist working in an advanced clinical role. The title clearly places the technologist’s professional role and clinical responsibilities within the radiology environment. The curriculum is suitable for programs offered at a baccalaureate and post baccalaureate level.

The foundations section of the document represents content taken from the ASRT Bachelor of Science in Radiologic Sciences (B.S.R.S.) Core Curriculum. This section identifies a common body of knowledge and skills essential for radiologic science professionals at the baccalaureate level. The foundations section is followed by specific content areas that represent the essential components of a radiologist assistant program. Readers will note that overlapping or duplicate objectives exist between the bachelor of science in radiologic sciences foundations and radiologist assistant content. This duplication of objectives is intentional. It is intended to aid planners in aligning a radiologist assistant program with an existing baccalaureate of radiologic sciences structure, as well as assist those program planners in designing a radiologist assistant curriculum at the post baccalaureate 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 selected radiology procedures including, but not limited to, fluoroscopy.
3. Participate in the systematic analysis of the quality of patient care delivered within the radiology environment.

The radiologist assistant will not only perform each function competently, but is expected to understand how each activity fits into the entire continuum of a patient’s care. The radiologist assistant is unique because of his or her ability to enhance the quality of care each patient receives.

The 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 radiology community that will lead to the building of meaningful professional dependencies.

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Radiologist Assistant Curriculum

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Foundations

Communications

Content is designed to expand the knowledge base and skills necessary for the practitioner to communicate effectively. Existing communication skills will be enhanced to include professional presentations, business communication, and research publication and evaluation. The practitioner's role and responsibility with regard to written and oral communication will also focus on patient education, advocacy and confidentiality. A heightened awareness of human diversity will be emphasized.

Directed Readings and Research

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

Technological innovations result in new procedures, equipment and expanded or new modalities that require technologists to remain current in their knowledge and skills. One method of meeting this professional obligation is to read, study professional literature or conduct research.

Learning does not end when a student completes the formal educational process; therefore, as a professional, the technologist must develop inquiry skills, determine continuing education needs and pursue methods to meet those needs.

Health Care Law and Regulations

Content is designed to provide 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. Radiologic technologist scope of practice issues and situations will be investigated.

Health Care Systems

Content is designed to impart an understanding of the forces shaping the present and future health care delivery system. The political context of health care organization and delivery in the United States will be discussed. Specific attention will focus on the concepts of health policy, as well as the mechanisms for policy formulation and implementation. Contemporary social and ethical issues and appropriate professional roles are examined using concepts and principles of ethical decision making, human diversity, global health care and epidemiology. The impact of information and health care technologies on patient care will be discussed.

Human Diversity

Content is designed to promote better understanding of patients, patients' families and professional peers by comparing characteristics of diverse populations, such as their value system, cultural and ethnic influences, communication styles, socioeconomic influences, health risks and life stages. Content will include the study of factors that influence the interrelationships with patients and professional peers. Understanding human diversity assists the student in providing better patient care.

Leadership Principles

Content is designed to provide the skills and knowledge necessary for the radiologic professional to provide leadership in workplace performance and professional development, thus promoting efficient and effective patient care. It is based on the concept that leadership is exercised through personal example, initiating actions and communication that influences and encourages professional excellence. A clarification of mission, understanding of rules and an awareness of interdependencies within complex organizations evolves through team building.

Patient Assessment, Management and Education

Content introduces a model for clinical thinking to aid in patient assessment. Content includes the application of normal anatomy and physiological phenomena to ill and injured individuals. Interviewing skills and assessment techniques with clinical focus will be discussed. An emphasis on the analysis and interpretation of physiological data to assist in patient assessment and management will be introduced.

Patient Information Management

Content is designed to provide the basic concepts of patient information management. Medical records management including privacy and regulatory issues will be examined. The role of the B.S.R.S. technologist will be identified and discussed.

Pharmacology

Content is designed to broaden the technologist's knowledge of pharmacology. Topics include consumer safety and drug regulation, sources and effects of drugs and safe dose preparation. Types of drug preparations, principles of responsible drug administration including routes and techniques are examined. An introduction to clinical drug trials and a classification of drugs related to body systems are included as topics for presentation.

Quality Management

Content is designed to impart an understanding of the tasks and protocols making up the quality management activities of a typical radiology department. The roles and responsibilities of all parties contributing to the quality management effort will be presented. Tools, procedures and evaluation criteria used in the performance assessment of imaging modalities and image processing will be discussed. The role of the B.S.R.S. technologist will be identified and discussed. Special attention is given to American College of Radiology (ACR) and Mammography Quality Standards Act (MQSA) guidelines for mammography.

Risk Management

Content is designed to establish a knowledge base in risk management. Sources of risk, target populations and incident reporting will be examined. Emphasis will be given to the systematic gathering and use of data as a strategy to reduce and minimize the possibility of a specific loss. Included is the formulation of a risk management action plan.

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 to include interviewing skills and assessment techniques. The focus is on the application of anatomy and physiology knowledge to assist in patient assessment and management.

Prerequisite or Corequisite

It is required that radiologist assistants possess or obtain certification in advanced cardiac life support (ACLS) in support of their role in the patient care setting.

Objectives

1. Apply the clinical thinking 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 patients undergoing radiologist assistant directed exams 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. Participate in relationship-centered patient care.
8. Adapt communications techniques to address patient needs.
9. Review patient medical data for indications and contraindications with patient procedure.

Content

I. The Clinical Thinking Model

- A. Identify abnormal findings
- B. Anatomically localize findings
- C. Interpret findings in terms of probable causes
- D. Develop one or two hypotheses about the nature of the patient's problem
 1. Select the most specific and central finding
 2. Match findings against conditions
 3. Weigh competing possibilities
 4. Give attention to potentially life-threatening and treatable conditions
- E. Identify steps and procedures to test the hypothesis
- F. Establish a working definition 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 illness
 1. Skills of good interviewing
 - a. Nonverbal communication
 - b. Facilitation
 - c. Reflection
 - d. Clarification
 - e. Summarization
 - f. Validation
 - g. Empathic responses
 - h. Transitions
 2. Challenges to the clinician
 - a. Patients at different ages and comprehension abilities
 - b. Situations that call for specific responses
 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 illness
 - d. Past history
 - e. Current health status

- f. Review of systems for indications/contraindications to procedure or change in patient management
 - 1) General
 - 2) Skin
 - 3) Head, eyes, ears, nose and throat
 - 4) Respiration
 - 5) Cardiac
 - 6) Gastrointestinal
 - 7) Urinary
 - 8) Male genital
 - 9) Female genital
 - 10) Peripheral vascular
 - 11) Musculoskeletal
 - 12) Neurologic
 - 13) Hematologic
 - 14) Endocrine
 - 15) Psychiatric
4. ICD-9 code (International Classification of Diseases, 9th Edition)

D. Physical assessment of the patient

1. Level of consciousness
2. Signs of distress
3. Apparent state of health
4. Vital statistics
5. Skin condition
6. Posture, gait, motor activity
7. Personal grooming
8. Odors of breath and body
9. Facial expression
10. Vital signs
 - a. Pulse
 - b. Respiration
 - c. Blood pressure
 - d. Body temperature

E. Documentation of findings

1. Characteristics required to describe a symptom
 - a. Site
 - b. Severity
 - c. Quality
 - d. Time course
 - e. Setting
 - f. Aggravating and relieving factors
 - g. Associated features

III. Performing the Patient Physical Assessment

- A. Patient preparation
- B. Method and technique for obtaining a patient's vital signs
 - 1. General considerations
 - 2. Temperature
 - 3. Respiration
 - 4. Pulse
 - a. Regular
 - b. Irregular
 - 5. Blood pressure
 - a. Normal
 - b. Isolated systolic hypertension
 - c. Mild hypertension
 - d. Moderate hypertension
 - e. Severe hypertension
 - f. Crisis hypertension

IV. Assessment of the Abdomen

- A. General considerations
- B. Patient preparation
- C. Characteristics of common signs and symptoms associated with causes of abdominal pain such as:
 - 1. Peptic ulcer
 - 2. Biliary colic and acute cholecystitis
 - 3. Renal colic
 - 4. Acute pancreatitis

V. Assessment of the Thorax and Lungs

- A. General considerations
 - 1. Patient preparation
 - 2. Finger clubbing, cyanosis, air hunger
- B. Inspection
 - 1. Respiratory rate, rhythm, depth and breathing effort
 - 2. Wheezes or unusual sounds
 - 3. Chest symmetry
 - 4. Palpation
 - 5. Auscultation
- C. Percussion
 - 1. Technique
 - 2. Posterior chest
 - a. Diaphragmatic excursion

3. Anterior chest
 - a. Interpretation
 - 1) Flat or dull
 - 2) Normal
 - 3) Hyperresonant

D. Auscultation

1. Posterior chest
2. Anterior chest
3. Interpretation
 - a. Crackles
 - b. Wheezes
 - c. Rhonchi

E. Special tests

F. Characteristics of common signs and symptoms associated with causes of chest pain, such as:

1. Angina pectoris
2. Myocardial infarction
3. Acute pericarditis
4. Pleurisy
5. Esophageal disease/disorder
6. Pneumothorax
7. Pulmonary embolus

G. Characteristics of common signs and symptoms associated with shortness of breath, such as:

1. Left ventricular failure and pulmonary edema
2. Bronchial asthma
3. Chronic obstructive airway disease
4. Pneumothorax
5. Metabolic acidosis
6. Neurologic disease/damage
7. Tumor
8. Infection
9. Anxiety – emotions

VI. Assessment of the Cardiovascular System

A. General considerations

B. Arterial pulses

1. Rate and rhythm
2. Amplitude and contour
3. Auscultation for bruits and thrills
4. Blood pressure
 - a. Interpretation

- b. Problems/situations
 - 1) Apprehensive patient
 - 2) Obese arm
 - 3) Leg pulse and pressures
 - 4) Weak or inaudible sounds
 - 5) Arrhythmias

C. Jugular venous pressure (JVP)

- 1. Pulsations

D. Precordial movement

E. Auscultation

- 1. Interpretation

VII. Assessment of the Musculoskeletal System

A. Inspection and palpation

B. Range of motion and maneuvers

- 1. Temporomandibular joint
- 2. Shoulder
- 3. Elbow
- 4. Wrist and hand
- 5. Spine
- 6. Hip
- 7. Knee
- 8. Ankle and foot

C. Characteristics of common signs and symptoms associated with causes of joint pain, such as:

- 1. Rheumatoid arthritis
- 2. Osteoarthritis
- 3. Gout
- 4. Ankylosing spondylitis
- 5. Psoriatic arthritis

VIII. Assessment of the Peripheral Vascular System

A. Inspection and palpation

- 1. Arms
- 2. Legs
- 3. Pulses

B. Evaluation for edema

IX. Assessment of the Nervous System

A. Mental status and speech

- B. Knowledge for interpretation of neurology and assessment data
- C. Characteristics of common signs and symptoms associated with sudden loss of consciousness, such as:
 - 1. Vasovagal response
 - 2. Epilepsy
 - 3. Cardiac etiology
 - 4. Postural hypotension
 - 5. Hypoglycemia
 - 6. Cerebrovascular accident (CVA)

X. Assessment of the Breasts and Axillae

- A. Breast inspection
 - 1. Appearance of the skin
 - 2. Size and symmetry
 - 3. Contour
 - 4. Nipple characteristics
- B. Breast palpation – clinical exam
 - 1. Consistency of tissues – lumps, cysts
 - 2. Tenderness
 - 3. Nodules – lymph, size, shape, adherence
 - 4. Nipple
 - 5. Lumps, thickness
- C. The axillae
 - 1. Inspection
 - 2. Palpation
- D. General considerations
 - 1. Aging and hormonal effects on breast characteristics
- E. Patient education
 - 1. Breast self examination
 - 2. Breast cancer risk factors
 - 3. Breast cancer screening

XI. The Foundation of Patient Care Delivery

- A. Relationships formed in the delivery of care
- B. Relationship-centered care
 - 1. Dimensions of relationship-centered health care
 - a. The patient-radiologist assistant relationship
 - b. The community-radiologist assistant relationship
 - c. The radiologist assistant-radiologist assistant relationship

- C. Knowledge, skills and values of relationship-centered care
 - 1. Self awareness
 - 2. Patient experience of health and illness
 - 3. Developing and maintaining caring relationships
 - 4. Effective communication

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Clinical Knowledge and Activities Associated with Patient Assessment, Management and Education

The radiologist assistant, with the supervision of a radiologist mentor, participates in patient assessment, management and education functions in the radiology setting.

Patient Assessment

The radiologist assistant collects pertinent data about the patient and the procedure.

The radiologist assistant:

1. Uses consistent and appropriate techniques to gather relevant information from the medical record, significant others and health care providers (the collection of information is determined by the patient's needs or condition).
2. Reconfirms patient identification and verifies the procedure requested or prescribed.
3. Verifies the patient's pregnancy status when appropriate.
4. Determines whether the patient has been appropriately prepared for the procedure.
5. Assesses factors that may contraindicate the procedure, such as medications, medical or psychological indicators, insufficient patient preparation or artifacts.

Patient Management

The radiologist assistant analyzes the information obtained during the assessment phase and develops an action plan for completing the procedure.

The radiologist assistant:

1. Selects the most appropriate action plan after reviewing all pertinent data and assessing the patient's abilities and condition.
2. Uses his or her professional judgment to recommend or adapt protocols for fluoroscopic and selected radiologic procedures to improve diagnostic quality and outcome.
3. Consults with the radiologist mentor to determine a modified action plan when necessary.
4. Determines the need for accessory equipment.
5. Modifies protocol to reduce patient exposure dose.
6. Monitors and documents the total fluoro time for medical records.
7. Verifies QA/QC to ensure safely operating equipment before patient exposure.

Patient Education

The radiologist assistant provides information about the procedure to the patient, significant others and health care providers.

The radiologist assistant:

1. Verifies/obtains patient consent prior to initiating a procedure and verifies that the patient fully understands its risks, benefits, alternatives and follow-up.
2. Provides accurate explanations and instructions at an appropriate time and at a level the patient can understand.
3. Addresses and documents patient questions and concerns regarding the procedure.

4. Follows departmental protocols to provide appropriate information to authorized individuals involved in the patient's care.

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Pharmacology and Clinical Decision-Making in Radiology

Description

This content is designed to enhance the radiologist assistant's knowledge of pharmaceuticals commonly used by and given to radiology patients. The content addresses the intent of the drug and its effect on diseases, conditions and physiology. After learning this content and possessing the appropriate clinical skills, the radiologist assistant will analyze the patient's current condition with regards to medications and other therapies and determine the significance to the radiology procedure. He or she will suggest the appropriate action plan for the procedure for the specific patient. The radiologist assistant will be responsible for the delivery and documentation of procedure-related pharmaceuticals and for patient assessment and monitoring before, during and after the procedure and drug administration. It is essential the radiologist assistant have a clear understanding of the laws and policies related to pharmaceuticals in his or her practice setting.

Objectives

1. Identify key drug laws impacting consumer safety.
2. Identify the five schedules of controlled substances and cite a drug example of each.
3. Identify the role of the Food and Drug Administration (FDA) and Drug Enforcement Administration (DEA) in the regulation and control of consumer drugs.
4. Explain strategies for health care workers involved in dispensing medications to comply with the restrictions of drug laws.
5. Identify common 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 designation of: over the counter, legend drug and controlled substance.
8. Research drug reference information from standard pharmacological resources.
9. Describe the biological processing of drugs in the body.
10. List common variables affecting drug action within the body.
11. Describe common 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 error.
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 may lead to cumulative effects in the elderly.
19. List the categories of drugs that frequently cause adverse side effects in older adults.
20. Identify guidelines and competencies for sedation and analgesia according to Joint Commission on Accreditation of Healthcare Organizations (JCAHO) requirements.
21. Describe the side effects and cautions with preoperative medications.
22. Describe the methods for administering local anesthetics.
23. Describe the goals and desired effects of conscious sedation.
24. Describe the undesirable effects of conscious sedation.

25. Perform assessments of the patient and patient's records prior to and during examinations requiring the use of conscious sedation.
26. Participate in patient management during examinations that require the use of conscious sedation.
27. Identify drugs for sedation and analgesia.
28. Recognize the side effects, contraindications and interactions common to each category of anti-infectives.
29. List the side effects common to antineoplastic agents.
30. Explain precautions in caring for patients receiving radioactive isotopes.
31. Demonstrate an awareness of the clinical side effects of major analgesics, sedatives and hypnotics.
32. Recognize common seizure disorder medications.
33. Recognize the side effects, contraindications and interactions for psychotropic medications in common use.
34. Identify the uses, side effects, cautions and interactions associated with the use of diuretics.
35. Describe the side effects, contraindications and interactions of antacids, antiulcer agents, antidiarrheal, antiflatulents, cathartics and laxatives and antiemetics.
36. Describe conditions that may be treated with corticosteroids.
37. List potential side effects of long-term steroid therapy.
38. Identify diabetes medications.
39. Identify the symptoms of hyperglycemia and hypoglycemia, and appropriate interventions.
40. Identify the use, side effects and precautions associated with estrogens and progestins.
41. Identify types of antiarrhythmics and the side effects.
42. Identify types of antihypertensives and the side effects.
43. Identify types of coronary vasodilators and the side effects.
44. Compare and contrast heparin and coumarin derivatives in terms of administration, action and antidotes.
45. Describe the uses of and precautions necessary with oxygen therapy.
46. Identify the uses, side effects and contraindications for bronchodilators and antitussives.
47. Describe the action and uses of antihistamines and decongestants.
48. Identify commonly used skeletal muscle relaxants and the side effects.
49. Describe medications used for osteoporosis therapy.

Content

I. Consumer Safety and Drug Regulations

- A. Drug laws
 - 1. 1906 Pure Food and Drug Act
 - a. Drug standards
 - 2. 1938 Federal Food, Drug, and Cosmetic Act
- B. 1970 Controlled Substances Act
 - 1. Five schedules of controlled substances
- C. Role of the FDA
- D. Role of the DEA
- E. Health care workers and the law

II. Abbreviations and Systems of Measurement

- A. Common abbreviations for medication orders
- B. Medication order components
 - 1. Date
 - 2. Patient's name
 - 3. Medication name
 - 4. Dosage or amount of medication
 - 5. Route/manner of delivery
 - 6. Time to be administered or frequency

III. Pharmaceutical Terminology References

- A. Classifications
- B. Identifying names
 - 1. Generic name
 - 2. Chemical name
 - 3. Trade name
 - 4. Official name (as it appears in the United States Pharmacopoeia - USP/ National Formulary - NF)
- C. Legal terms referring to drugs
 - 1. Over-the-counter
 - 2. Legend (or prescription) drug
 - 3. Controlled substance
- D. Terms indicating drug actions
 - 1. Indications
 - 2. Actions
 - 3. Contraindications
 - 4. Cautions

5. Side effects and adverse reactions
6. Interactions

IV. Sources of Drug Information

- A. Drug references
 1. *Physicians' Desk Reference Companion Guide*
 2. United States Pharmacopoeia/dispensing information
 3. American Hospital Formulary Service
 4. *Compendium of Drug Therapy (Physician's ed.)*
 5. Electronic drug databases and analysis

V. Pharmacotherapeutic Decision-Making

- A. Effects of drugs
 1. Systemic effects
 2. Local effects

- B. Pharmacokinetics
 1. Absorption
 2. Distribution
 3. Metabolism
 4. Excretion
 5. Other variables
 - a. Age
 - b. Weight
 - c. Sex
 - d. Psychological state
 - e. Drug interactions
 - 1) Synergism
 - 2) Potentiation
 - 3) Antagonism
 - f. Dosage
 - 1) Minimum and maximum dose
 - 2) Loading dose
 - 3) Maintenance dose
 - 4) Toxic dose
 - 5) Lethal dose
 - 6) Therapeutic dose
 - g. Route
 - 1) GI tract/enteral
 - 2) Parenteral
 - 3) Inhalation respiratory

- C. Undesirable responses to drugs
 1. Teratogenic effect
 2. Tolerance
 3. Dependence
 4. Hypersensitivity

5. Anaphylactic reaction

VI. Clinical Drug Trials

- A. Principles of the controlled trial
- B. Pragmatic and explanatory trials
- C. Protection of subjects
- D. Efficacy assessment
- E. Randomization
- F. Single-blind and double-blind trials
- G. Sample size
- H. Choice of comparator
- I. Preparing a protocol
- J. Auditing the clinical trial

VII. Safe Dosage Preparation

- A. Calculation guidelines
- B. Basic calculation
- C. Ratio and proportion
- D. Pediatric dosage
- E. Geriatric dosage

VIII. Responsibilities and Principles of Drug Administration

- A. Responsible drug administration
- B. Medication error avoidance

IX. Administration Routes, Techniques and Preparations

- A. Gastrointestinal
 - 1. Oral
 - 2. Nasogastric tube
 - 3. Gastric tube
 - 4. Rectal

- B. Parenteral
 - 1. Buccal
 - 2. Transcutaneous
 - 3. Inhalation therapy
 - 4. Injections
 - 5. Topical
 - 6. Application to mucous membranes

- C. 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

X. Pediatric Considerations

- A. Anatomic and physiologic variables

- B. Pharmacokinetic and pharmacodynamic considerations

- C. Concerns with neonates
 - 1. Blood-brain barrier permeability
 - 2. Renal function

- D. Factors affecting dose
 - 1. Body surface area
 - 2. Weight
 - 3. Age

XI. Geriatric Considerations

- A. Anatomic and physiologic variables

- B. Pharmacokinetic and pharmacodynamic considerations

- C. Drugs and geriatrics
 - 1. Cumulative effect of drugs
 - 2. Gray list drugs (inappropriate for use in nursing homes)
 - 3. Drugs that may cause mental impairment
 - 4. Nonsteroidal anti-inflammatory drugs
 - 5. Polypharmacy

XII. Preoperative Medication and Local Anesthetics

- A. Sedation and analgesia
 - 1. Policies and procedures
 - 2. Guidelines

3. Competencies
- B. Typical exams requiring conscious sedation
 1. Endoscopic exams
 2. Vascular and cardiac catheterizations
 3. Bronchoscopy
 4. Bone marrow aspiration
 5. Computed tomography
 6. Magnetic resonance imaging
- C. Applied definitions
 1. Conscious sedation and analgesia
 2. Premedication
 3. General anesthesia
 4. Local anesthesia
 5. Postprocedural and postoperative pain management
- D. 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
- E. Desired effects of conscious sedation
 1. Relaxation
 2. Cooperation
 3. Purposeful responses to verbal communication and instruction
 4. Purposeful responses to tactile stimulation
 5. Easy and prompt arousal from sleep
- F. Undesirable effects of conscious sedation
 1. Deep unarousable sleep
 2. Hypotension
 3. Bradycardia
 4. Agitation and combativeness
 5. Hypoventilation
 6. Respiratory depression
 7. Airway obstruction
 8. Apnea
- G. Assessment and documentation prior to starting a study
 1. Informed consent
 2. Preprocedural assessment

3. Laboratory evaluation

H. Assessments during a procedure

1. Vital signs
2. The dose, route, medication, time of administration and effects of conscious sedation agents and other medications
3. Oxygen therapy
4. Level of consciousness throughout the procedure
5. Any reactions and required interventions
6. Type and amount of IV fluids, blood and blood products used

I. Airway management

1. Positioning of the airway
2. Use of oropharyngeal and nasopharyngeal airways
3. Application of positive pressure ventilation
 - a. Ambu Bag use

J. The recovery period

1. Preprocedural/presedation state
 - a. Airway
 - b. Breathing
 - c. Level of consciousness

K. Drugs used for sedation and analgesia

XIII. Vitamins, Anti-infective and Antineoplastic Drugs

A. Vitamins, minerals and herbs and alternative medicines

1. Impact on procedures
2. Interactions

B. Anti-infective drugs

1. Impact on procedures
2. Interactions

C. Antineoplastic drugs

1. Impact on procedures
2. Interactions

XIV. 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. Analgesics, sedatives, and hypnotics
 - a. Analgesics
 - b. Sedatives and hypnotics
 2. Anticonvulsants, antiparkinsonian drugs, and agents for Alzheimer disease
 - a. Anticonvulsants
 - b. Drugs for absence epilepsy
 - c. Drugs for grand mal and psychomotor epilepsy
 - d. Antiparkinsonian drugs
 - e. Agents for Alzheimer disease
 3. Psychotropic medications, alcohol and drug abuse
 - a. CNS stimulants
 - b. Antidepressants
 - c. Antimanic agents
 - d. Anxiolytics
 - e. Antipsychotic medications
 - f. Alcohol
 - g. Drug abuse
- C. Urinary system drugs
1. Diuretics
 2. Medications for gout
 3. Antispasmodics
 4. Cholinergics
 5. Analgesics
 6. Treatment of benign prostatic hypertrophy
 7. Alpha blockers
- D. Gastrointestinal drugs
1. Antacids
 2. Agents for treatment of ulcers and gastroesophageal reflux disease
 3. Antispasmodics/anticholinergics
 4. Agents for treatment of inflammatory bowel disease
 5. Antidiarrhea agents
 6. Antiflatulents
 7. Laxatives and cathartics
 8. Antiemetics
- E. Endocrine system drugs
1. Pituitary hormones
 2. Adrenal corticosteroids
 3. Thyroid agents
 4. Diabetic agents
- F. Reproductive system drugs
1. Androgens
 2. Impotence agents

3. Estrogens
 4. Progestins
- G. Cardiovascular drugs
1. Cardiac glycosides
 2. Antiarrhythmic agents
 3. Antihypertensives
 4. Coronary vasodilators
 5. Antilipemic agents
 6. Vasoconstrictors
 7. Anticoagulants
 8. Platelet inhibitor therapy
- H. Respiratory system drugs and antihistamines
1. Oxygen
 2. Respiratory stimulants
 3. Bronchodilators
 4. Corticosteroids
 5. Asthma prophylaxis
 6. Mucolytics and expectorants
 7. Antihistamines
 8. Decongestants
 9. Smoking cessation aids
- I. Musculoskeletal and anti-inflammatory drugs
1. Skeletal muscle relaxants
 2. Anti-inflammatory drugs
 3. Osteoporosis therapy

Contrast Media

Description

Content imparts an understanding of contrast media used during common diagnostic procedures. Topics include an overview of the chemical makeup and physical properties of select contrast agents, selection of contrast agents for given exams, patient risk factors, premedication strategies, indicators/symptoms of a patient contrast media reaction and recommendations for care and treatment of patients experiencing an adverse reaction to a given contrast agent.

Objectives

1. Discuss the rationale for the use of contrast media.
2. Differentiate between negative and positive contrast agents.
3. Identify the physical properties of select contrast agents.
4. Describe the structural differences and characteristics of low and high osmolar injectable contrast media.
5. Identify the desired contrast agent employed for select exams.
6. Discuss the resources used to identify patients at risk of an adverse reaction to contrast media used to perform a given diagnostic procedure.
7. Identify patient indicators for altering the selection of contrast media used to perform a given procedure.
8. Recite the patient preparation necessary for various contrast and special studies.
9. Identify the strategies employed when faced with patients with a known history of a previous allergic reaction.
10. Recognize the indicators/symptoms associated with a patient experiencing a mild, moderate or severe reaction to contrast media.
11. Implement strategies for treating a patient experiencing an adverse reaction to contrast media.
12. Discuss patient counseling and recommended follow-up care for patients undergoing a procedure requiring the use of contrast media.

Content

I. Rationale for the Use of Contrast Media

II. Agents

- A. Negative agents
 - 1. Air
 - 2. Carbon dioxide
 - 3. Nitrous oxide

- B. Positive agents
 - 1. Barium sulfate
 - 2. Iodinated
 - a. Water soluble
 - b. Oily

- C. Paramagnetic agents
 - 1. Gadolinium-DTPA

- D. Echogenic agents
 - 1. Gas microbubble

III. Contrast preparations

- A. Barium sulfate (Ba_2SO_4)
 - 1. Dry powder or premixed
 - 2. Suspension
 - 3. Paste
 - 4. Tablets

- B. Iodinated water soluble
 - 1. Types
 - a. Diatrizoic acid (Hypaque and Renografin)
 - b. Iothalamate (Conray)
 - c. Metrizamide (Amipaque)
 - d. Iohexol (Omnipaque)
 - e. Ioxaglate (Hexabrix)
 - f. Iopamidol (Isovue and Niopam)
 - g. Ioversol (Optiray)

- C. Gas microbubble
 - 1. Particulate suspension or emulsion

IV. Characteristics of Iodinated Contrast Materials

- A. Water solubility and hydrophilicity

- B. Osmality
 - 1. High osmolar contrast media (HOcm)

- a. Molecular structure
- 2. Low osmolar contrast media (LOCM)
 - a. Molecular structure
 - b. Advantages of LOCM
 - c. Disadvantages of LOCM

C. Viscosity

D. Calcium binding

E. Chemical stability

V. Media in Use

A. Barium sulfate

- 1. Procedures requiring the use of barium
- 2. Low occurrence of allergic reaction
- 3. Cause(s) of allergic reaction
- 4. Patient risks following the administration of barium
- 5. Characteristics of patients at risk
- 6. Glucagon administration
 - a. Rationale for use
 - b. Administration

B. Iodinated contrast materials

- 1. Procedures requiring the use of iodinated contrast
- 2. Oily iodinated contrast
 - a. Procedures requiring the use of oily iodinated media
- 3. Contrast used for intrathecal injections
 - a. Oily contrast
 - b. Aqueous contrast
 - c. Patient management to reduce the rate and severity of adverse reactions
- 4. Instructions given to diabetes patients receiving antihyperglycemic agents (Metformin, Glucophage)

VI. Strategies for Dealing With Patients With a Known History of Allergic Reaction

A. Steroid premedication for intravascular contrast media

B. Indications for steroid premedication

C. Contraindications for steroid premedication

D. Dosage

- 1. Nonemergency cases
 - a. Two-dose regimen
- 2. Emergency cases

- E. Suggesting alternative procedures

VII. Adverse Reactions to Contrast Administration, Symptoms, Indicators and Recommended Patient Care

- A. Minor reaction
 - 1. Symptoms
 - 2. Recommended response
- B. Moderate reaction
 - 1. Symptoms
 - 2. Recommended response
- C. Severe reaction
 - 1. Symptoms
 - a. Early symptoms
 - b. Late symptoms
 - 2. Recommended response
- D. Infiltration
 - 1. Symptoms
 - 2. Recommended response

VIII. Patient Counseling and Recommended Follow-up Care for Patients Undergoing a Procedure Requiring the use of Contrast Media

- A. Following barium procedures
- B. Following iodinated contrast media procedures
- C. Following adverse reactions to administered contrast agents

Pathophysiology

Description

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

Objectives

1. Define terminology used in the study of disease.
2. Describe the general principles and mechanisms of disease including neoplasms.
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. Assess the relationship between morphologic and functional changes to the origins of signs and symptoms and to their clinical significance.
7. Differentiate between the mechanisms of tissue repair and healing.
8. Identify common tests used to diagnose disease or injury.
9. Examine the role of genetics in disorders.
10. Examine the role of nutrition in disorders.
11. Describe the common etiology, signs and symptoms, diagnostic tests, typical course and management of common diseases and disorders of body systems.
12. Discuss the common effects of aging on each of the body systems.
13. Identify etiologic influence in the identification of prevention and screening programs for the common diseases.
14. Assess the epidemiological influence in the identification and treatment of disorders or injuries.

Content

I. Alterations in Cell Function and Growth

- A. Cell and tissue characteristics
 - 1. Functional components of the cell
 - 2. Cellular energy metabolism
 - 3. Tissue types

- B. Cellular adaptation and injury
 - 1. Cellular adaptation
 - 2. Cell injury
 - 3. Types of cell injury
 - 4. Genetic control of cell function and inheritance
 - 5. Genetic control of cell function
 - 6. Chromosomes
 - 7. Patterns of inheritance
 - 8. Gene mapping

- C. Genetic and congenital disorders
 - 1. Genetic chromosomal disorders
 - 2. Disorders due to environmental agents
 - 3. Disorders due to environmental influences

- D. Alterations in cell differentiation: neoplasia
 - 1. Concepts of cell growth and replication
 - 2. Terminology
 - a. The cell cycle
 - b. Cell proliferation
 - c. Cell differentiation
 - 3. Characteristics of benign and malignant neoplasms
 - 4. Staging and grading of tumors
 - 5. Carcinogenesis
 - 6. Cancer treatment

- E. Tissue repair and wound healing
 - 1. Regeneration
 - 2. Connective tissue repair
 - 3. Factors that affect wound healing

II. Alterations in Body Defenses

- A. Stress and adaptation
 - 1. Stress
 - 2. Adaptation
 - 3. Treatment of stress

- B. Alterations in temperature regulation
 - 1. Body temperature regulation
 - a. Mechanism of heat production
 - b. Mechanism of heat loss
 - 2. Increased body temperature
 - a. Fever
 - b. Hyperthermia
 - 3. Decreased body temperature
 - a. Hypothermia

- C. Infectious processes
 - 1. Infectious disease
 - 2. Host-parasite relationship
 - 3. Manifestations of infectious disease

- D. Inflammation and repair
 - 1. The inflammatory response
 - 2. Systematic signs of inflammation
 - 3. Tissue healing and repair

- E. The immune response
 - 1. The immune system
 - 2. Developmental aspects of the immune system
 - a. Transfer of immunity from mother to infant
 - 3. Immune mechanism

- F. Alterations in the immune response
 - 1. Immunodeficiency disease
 - 2. Allergy and hypersensitivity
 - 3. Transplant rejection
 - 4. Autoimmune disease

- G. Acquired immunodeficiency syndrome (AIDS)
 - 1. Transmission of human immunodeficiency virus (HIV) infection
 - 2. Pathophysiology of AIDS
 - a. Diagnosis
 - b. Phases of the disease
 - c. Clinical course
 - d. Early management
 - e. Treatment

- H. White blood cell and lymphoproliferative disorders
 - 1. Lymphoreticular system
 - 2. Disorders of white blood cells
 - 3. Lymphoproliferative disorders

- I. Alterations in hemostasis and blood coagulation
 - 1. Mechanisms associated with hemostasis
 - 2. Disorders of hemostasis and blood coagulation

III. Alterations in Oxygenation of Tissues

- A. Blood cells and the hematopoietic system
 - 1. Composition of blood and blood formation
 - a. Plasma
 - b. Plasma proteins
 - c. Blood cells
 - d. Hematopoiesis
 - e. Blood count
 - f. Erythrocyte sedimentation rate
 - g. Bone marrow aspiration and biopsy

- B. The red blood cell and alterations in oxygen transport
 - 1. The red blood cell
 - 2. Anemia
 - 3. Transfusion therapy
 - 4. Polycythemia
 - 5. Age-related changes in red blood cells

- C. The circulatory system and control of blood flow
 - 1. Functional organization of the circulatory system
 - 2. Blood vessel structure
 - 3. Principles of blood flow
 - 4. Control of blood flow

- D. Alterations in blood flow
 - 1. Mechanisms of vessel obstruction
 - 2. Alterations in arterial flow
 - 3. Alterations in venous flow
 - 4. Impairment of local blood flow: pressure sores

- E. Control of arterial blood pressure
 - 1. Arterial pressure pulses
 - 2. Blood pressure measurement
 - 3. Determinants of blood pressure
 - 4. Control of blood pressure
 - 5. Pulmonary blood pressure

- F. Alterations in blood pressure
 - 1. Hypertension
 - 2. Orthostatic hypotension

- G. Control of cardiac function
 - 1. Functional anatomy of the heart
 - 2. Conduction system and electrical activity of the heart
 - 3. The cardiac cycle
 - 4. Regulation of cardiac performance
 - 5. Coronary circulation
 - 6. Diagnostic methods

- H. Alterations in cardiac function
 - 1. Disorders of the pericardium
 - 2. Coronary artery disease
 - 3. Dysrhythmias and conduction disorders
 - a. Types of dysrhythmias
 - 1) Sinus node
 - 2) Premature atrial contraction
 - 3) Atrial flutter
 - 4) Atrial fibrillation
 - 5) Junctional
 - 6) Ventricular
 - b. Diagnostic methods
 - 4. Disorders of the endocardium
 - 5. Valvular disease
 - 6. Cardiomyopathies
 - 7. Congenital heart disease
 - 8. Diagnosis and treatment

- I. Heart failure
 - 1. Compensatory mechanisms
 - 2. Congestive heart failure
 - 3. Acute pulmonary edema
 - 4. Diagnosis and treatment

- J. Circulatory shock
 - 1. Types of shock
 - 2. Manifestations
 - 3. Complications of shock
 - 4. Treatment measures

- K. Control of respiratory function
 - 1. Structural organization of the respiratory system
 - 2. Exchange of gases between the atmosphere and the alveoli
 - 3. Exchange and transport of gases in the body
 - 4. Control of respiration

IV. Alterations in Respiratory Function

- A. Respiratory infections
- B. Disorders of the pleura
- C. Obstructive lung disorders
- D. Interstitial lung disorders
- E. Pulmonary vascular disorders
- F. Cancer of the lung

V. Alterations in Control of Ventilation and Respiratory Failure

- A. Alterations in the control of ventilation
- B. Acute respiratory failure

VI. Alterations in Body Fluids

- A. Alterations in body fluids and electrolytes
 - 1. Regulation of body fluids
 - 2. Alterations in body water
 - 3. Electrolytic disorders
- B. Alterations in the distribution of body fluids
 - 1. Regulation of interstitial fluid volume
 - 2. Edema
- C. Alterations in acid-base balance
 - 1. Regulation of acid-base balance
- D. Control of renal function
 - 1. Kidney structure and function
 - 2. Tests of renal function
 - 3. Actions of diuretics
- E. Alterations in renal function
 - 1. Congenital disorders
 - 2. Urinary tract infections and pyelonephritis
 - 3. Obstructive disorders

4. Disorders of the nephron and glomerulus
5. Neoplasms

- F. Renal failure
1. Acute renal failure
 2. Chronic renal failure

VII. Alterations in genitourinary function

- A. Alterations in urine elimination
1. Control of urine elimination
 2. Alterations in bladder function
 3. Cancer of the bladder
- B. Structure and function of the male genitourinary system
1. Genitourinary structures
 2. Reproductive function
- C. Alterations in the structure and function of the male genitourinary system
1. Disorders of the penis
 2. Disorders of the scrotum and testes
 3. Disorders of the prostate
- D. Structure and function of the female reproductive system
1. Reproductive structures
 2. The menstrual cycle
 3. The breast
 4. Alterations in the structure and function of the female reproductive system
 5. Menstrual disorders
 6. Alterations in uterine position and pelvic support
 7. Inflammation and infection
 8. Benign growths and aberrant tissue
 9. Cancer of the genital structures
 10. Diseases of the ovary
 11. Diseases of the breast
- E. Sexually transmitted diseases
1. Major sexually transmitted diseases
 2. Minor sexually transmitted diseases

VIII. Alterations in Endocrine Function, Metabolism and Nutrition

- A. Mechanism of endocrine control
1. The endocrine system
 2. General aspects of altered endocrine function
- B. Control of metabolism
1. Metabolism

2. Hormonal control of metabolism
- C. Alterations in endocrine control of growth and metabolism
 1. Growth hormone disorders
 2. Thyroid disorders
 3. Disorders of adrenal cortical function
 - D. Diabetes mellitus
 1. Types of diabetes
 2. Manifestations
 3. Diagnosis and management
 - E. Control of gastrointestinal function
 1. Structure and organization of the gastrointestinal tract
 2. Motility
 3. Secretory function
 4. Digestion and absorption
 - F. Alterations of gastrointestinal function
 1. Manifestations of gastrointestinal tract disorders
 - a. Anorexia
 - b. Nausea
 - c. Vomiting
 - d. Gastrointestinal tract bleeding
 2. Disorders of the esophagus
 - a. Dysphagia
 - b. Esophageal diverticulum
 - c. Gastroesophageal reflux disease
 - d. Cancer of the esophagus
 3. Disorders of the stomach
 - a. Gastric mucosal barrier
 - b. Gastritis
 - c. Ulcer disease
 - d. Cancer of the stomach
 4. Disorders of the small and large bowel
 - a. Irritable bowel syndrome
 - b. Inflammatory bowel disease
 - c. Infectious colitis
 - d. Diverticular disease
 - e. Appendicitis
 - f. Alterations in intestinal motility
 - g. Alterations in intestinal absorption
 - h. Neoplasm
 - i. Obstruction
 5. Disorders of the peritoneum
 - a. Peritonitis

6. Alterations in the integrity of the gastrointestinal tract wall
7. Malabsorption

G. Alterations in function of the hepatobiliary system and pancreas

1. Hepatobiliary function
2. Alterations in liver function
3. Alterations in gallbladder function
4. Alterations in pancreatic function

IX. Alterations in Neuromuscular Function

A. Properties of the nervous tissue

1. Nervous tissue cells
2. Excitable properties of nervous tissue

B. Control of neuromuscular and autonomic nervous system function

C. Development and segmental organization of the nervous system

1. The spinal cord
2. The brain
3. Supporting and protective structures
4. The autonomic nervous system
5. Higher-order functions

D. Disorders of cerebral function

1. Increased cranial pressure
2. Infections
3. Seizures
4. Consciousness and unconsciousness
5. Organic brain syndrome

E. Alterations in motor function

1. Control of motor function
2. Alterations in cerebral circulation
3. Disorders of the myelin
4. Spinal cord injury
5. Alterations in neuromuscular function

F. Pain

1. Pain mechanisms and response
2. Pain disorders
3. Treatment for pain

X. Alterations in Skeletal Support and Movement

A. Structure and function of the skeletal system

1. Characteristics of skeletal tissue

2. Joints and articulations

B. Alterations in skeletal function: trauma and infection

1. Injury and trauma of musculoskeletal structures
2. Bone infections
 - a. Osteomyelitis and osteitis
 - b. Tuberculosis of the bone or joint

C. Alterations in skeletal function: congenital disorders, metabolic bone disease and neoplasms

1. Alterations in skeletal growth and development
 - a. Bone growth and remodeling
2. Metabolic bone disease

D. Neoplasms

1. Benign
2. Malignant
3. Metastatic

E. Alterations in skeletal function

1. Rheumatoid arthritis
2. Osteoarthritis
3. Spondyloarthropathies
4. Crystal-induced arthropathies
5. Gout

XI. Alterations in Skin Defenses

A. Alterations in skin function and integrity

1. Structure of the skin
2. Manifestations of skin disorders
3. Lesions and rashes
4. Pruritus
5. Dry skin

B. Burns

1. Classification
2. Systematic complications
3. Treatment
4. Rehabilitation

XII. Concepts of Altered Health in Children: Common Health Problems

A. Infants

B. Early childhood

C. Adolescence

XIII. Theories of Aging

- A. Physiologic changes of aging
 - 1. Skin
 - 2. Structure and musculoskeletal function
 - 3. Cardiovascular function
 - 4. Respiratory function
 - 5. Neurologic function
 - 6. Special senses
 - 7. Immune function
 - 8. Gastrointestinal function
 - 9. Renal function
 - 10. Genitourinary function

- B. Functional problems of aging
 - 1. Functional assessment
 - 2. Urinary incontinence
 - 3. Instability and falls
 - 4. Sensory impairment
 - 5. Depression
 - 6. Dementia
 - 7. Delirium

ASRT

Radiologic Procedures

Description

Content establishes a framework for radiologist assistant participation in patient examinations for the purpose of diagnostic inspection and/or therapeutic treatment. Examination procedures should follow American College of Radiology Guidelines for principles and practices producing high-quality radiographic care.

Objectives

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

Content

I. Exam Preparation

- A. Patient preparation
- B. Informed consent
- C. Patient history and instructions
- D. Exam room/personnel requirements
- E. Potential modifiers

II. Exam Protocol

- A. Imaging sequence
 - 1. Dynamic
 - 2. Static
- B. Postprocessing
 - 1. Image sequencing
 - 2. Archiving
 - 3. Accessing/retrieving images
- C. Exam modifiers

III. Exam Risks

- A. Patient risks
- B. Impact on patient treatment/diagnosis
- C. Impact on patient health

IV. Evaluation of Results

- A. Exam requirements satisfaction
- B. Clinical data

V. Post Examination Patient Care and Instructions

Radiologist Mentored Clinical Experience

Description

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

Prerequisite or Corequisite

It is required that radiologist assistants 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 supervision of a radiologist mentor. Typical procedures include:
 - Assisting radiologists with invasive procedures.
 - Performing fluoroscopy for noninvasive procedures with the radiologist providing supervision of the service.
 - Monitoring and tailoring selected exams under radiologist supervision (e.g., IVU, CT urogram, GI studies, VCUG and retrograde urethrograms).
 - Communicating radiologists' reports to the referring physician or an appropriate representative with appropriate documentation.
 - Providing nasogastric and orogastric feeding tube placement in uncomplicated patients.
 - Performing selected peripheral venous diagnostic procedures.
2. Generate a memorandum of initial observations and outcomes of exams performed for review, interpretation and approval by the radiologist mentor.
3. Assess, evaluate and formulate priorities in daily practice.
4. Establish concepts of team practice.
5. Establish patient-centered clinically effective service delivery strategies.
6. Implement and perform diagnostic/therapeutic procedures adhering to acceptable departmental, institutional, governmental and professional standards.
7. Implement and perform diagnostic/therapeutic procedures adhering to acceptable federal and state regulations.
8. Assess and evaluate the patient's status and condition prior to and during diagnostic/therapeutic procedures.
9. Analyze, apply and demonstrate the principles of radiation protection standards.
10. Apply principles of total quality management.
11. Detect equipment malfunctions and select appropriate actions.
12. Establish appropriate and effective written, oral and nonverbal communication with patient, family, other health care personnel, the public and legal practices.
13. Demonstrate safe, ethical and legal practices.

14. Be receptive to the clinical significance of the patient's personal beliefs and values for adaptation of an exam protocol.
15. Demonstrate awareness of and operate within the radiologist assistant scope of practice.
16. Assess and evaluate psychological and physical changes in the patient's condition and formulate appropriate actions.
17. Appraise cultural and age differences that influence patient compliance with exam requirements.
18. Apply principles for transferring, positioning and immobilizing patients.
19. Apply concepts of teaching and learning theories in design, implementation and evaluation in the education of patient, family, colleagues and the community.
20. Plan and implement programs designed to promote and maintain health and wellness.
21. Interact with the patient and family in a manner that provides the desired psychosocial support.
22. Document care in the patient's record in accordance with institutional and legal guidelines.
23. Assess, evaluate and demonstrate life support procedures with ACLS skills.
24. Demonstrate knowledge of the institution's procedures and respond to emergencies, disasters and accidents.
25. Identify and respond to changes in the patient's condition.
26. Encompass strategies that assure professional development at a level of clinical practice consistent with acceptable standards.
27. Establish values and attitudes congruent with the profession's standards and ethics.

Clinical Knowledge and Activities Associated with Radiology Procedures

Implementing Exam Protocol

The radiologist assistant, with supervision of a radiologist mentor, implements the action plan.

The radiologist assistant:

1. Implements an action plan that falls within established protocols and guidelines.
2. Elicits the cooperation of the patient to execute the action plan.
3. Uses an integrated team approach as needed.
4. Modifies the action plan according to changes in the clinical situation.
5. Administers first aid or provides advanced life support in emergency situations.
6. Uses accessory equipment when appropriate.
7. Assesses and monitors the patient's physical and mental status.

Adapting Exam Protocol

The radiologist assistant implements the revised action plan.

The radiologist assistant:

1. Bases the revised plan on the patient's condition and the most appropriate means of achieving the intended outcome.
2. Takes action based on patient and procedural variances.
3. Measures and evaluates the results of the revised action plan.
4. Notifies appropriate health provider when immediate clinical response is necessary based on procedural findings and patient condition.

Measuring Outcomes

The radiologist assistant reviews and evaluates the outcome of the procedure.

The radiologist assistant:

1. Reviews all diagnostic or therapeutic data for completeness and accuracy.
2. Determines whether the actual outcome is within established criteria.
3. Evaluates the process and recognizes opportunities for future changes.
4. Assesses the patient's physical and mental status prior to discharge from the radiologist assistant's care.

Documentation

The radiologist assistant documents information about patient care, the procedure and the final outcome.

The radiologist assistant:

1. Documents diagnostic, treatment and patient data in the appropriate record.
2. Documents any exceptions from the established criteria or procedures.
3. Forwards a memorandum of initial observations made during the exam and evaluation of images to the radiologist mentor.

ASRT

Clinical Knowledge and Activities Associated with Image and Procedure Observations and Communication

Observing Images/Procedures

The radiologist assistant correlates the radiologic and patient findings to the patient's clinical presentation and symptoms.

The radiologist assistant:

1. Provides an analysis of images and makes recommendations to enhance diagnostic image quality.
2. Records observations or procedure data according to approved protocols.
3. Documents diagnostic, procedure and patient data in the appropriate record.
4. Documents any exceptions from the established criteria or procedures.

Communicating Observations

The radiologist assistant generates an internal memorandum containing a summary of observations to the interpreting radiologist.

The radiologist assistant:

1. Documents diagnostic and patient data in the appropriate medical record, according to departmental practices.
2. Ensures that the documentation is timely, accurate, concise and complete.
3. Communicates the report(s) of radiologist's findings to the referring physician or an appropriate representative with appropriate documentation.

Clinical Audit

The radiologist assistant participates in the systematic analysis of the quality of care including the diagnosis and treatment, resources, outcomes and patient quality of life.

The radiologist assistant:

1. Participates in the auditing of clinical services offered within the radiology department.
2. Assists in formulating a report of clinical audit findings to the radiologist mentor.

Fluoroscopic Unit Operation and Safety

Description

Content promotes the conscientious operation of the fluoroscopic device used in diagnostic/therapeutic patient exams. Content complements guided practice in operating the fluoroscopic device. Analysis of the functional components of fixed and mobile fluoroscopic devices heightens operator awareness of the features and limitations of this imaging medium. Procedures and techniques to optimize image quality while reducing potential radiation exposure to patients, operator and ancillary personnel are included.

Objectives

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

Content

I. Components of the Fixed Fluoroscopic Unit

- A. Table

- B. Radiation source

- C. Image intensifier carriage
 - 1. Table controls
 - 2. Fluoro controls
 - 3. Image controls

- D. Optics system
 - 1. Video interface
 - 2. Image recording devices
 - 3. Video monitor

II. Components of the Mobile Fluoroscopic Unit

- A. Control panel

- B. Radiation source

- C. Image intensifier

- D. Optics system

- E. Video interface

- F. Image recording unit

- G. Video monitor

- H. Locks and angle indicators

- I. Structural provisions for radiation shielding
 - 1. When used routinely in one area for both fixed and mobile equipment

- J. Equipment provisions
 - 1. Source-to-skin distance (SSD) control
 - 2. Control of radiation field
 - 3. Maximum exposure rate
 - 4. Lead apron requirements
 - 5. Maximum entrance dose vs. equipment setup and technique
 - 6. Scatter/isodose curves with relation to mobile equipment setup and personnel placement

- K. Limiting the use of “high level control” or “boost position” during fluoro

- L. Personnel monitoring of radiation exposure
- M. Image recording, archiving and retrieval

III. Technical Factors Affecting the Radiation Dose Rate for Patients and Operators

- A. Direct factors
 - 1. Milliamperage (mA)
 - 2. Kilovoltage (kVp)
 - 3. Collimation
 - a. Impact on integral dose
 - 4. Filtration
 - a. Inherent and added
 - 5. Exposure time
 - 6. Source-to-skin distance
 - 7. Grids
- B. Indirect factors
 - 1. Fluoroscopic room lighting
 - 2. Poor image receptor quality
 - 3. Low-absorption tabletop
- C. Patient and/or operator dose reducers
 - 1. Gonadal shielding
 - 2. Lead drape
 - 3. Bucky slot cover
 - 4. Lead apron
 - 5. Thyroid shield
 - 6. Leaded glasses
 - 7. Three-phase and high-frequency generators
 - 8. Protective barriers
 - 9. Cumulative timer
 - 10. Mobile equipment setup
- D. Image intensifier
 - 1. Image quality considerations
 - 2. Quantum mottle
 - 3. Contrast resolution
 - a. Low contrast
 - b. High contrast
 - 4. Image resolution
 - 5. Image distortion
 - 6. Lag
 - 7. Vignetting
 - 8. Magnification

- E. Ancillary equipment
 - 1. Optics system
 - 2. Television systems
 - a. Camera device
 - b. Camera control unit
 - c. Monitor
 - 1) Brightness control
 - 2) Contrast control
 - 3. Cinefluorography
 - a. Synchronous
 - b. Framing frequency
 - c. F-number of the optical system
 - d. Framing and patient radiation dose
 - 4. Videotape and video disc recording
 - 5. Pulsed fluoroscopy
 - 6. Limiting use of high-level control fluoroscopy
 - 7. Cassette spot filming
 - 8. Photofluorospot film camera
 - 9. Contrast media
 - 10. Accessories
 - 11. Gonadal shields
 - 12. Grids vs. dose and procedures
 - 13. Cassettes
 - a. Low attenuation front
 - b. Intensifying screens
- F. Image processing
- G. Digital systems
 - 1. Image storage and retrieval
 - 2. Image archiving
- H. Emulsion based images
 - 1. Spot films
 - a. Film speed vs. resolution
 - 2. Cine film
 - a. Influences of film processing
- I. Patient and patient position
 - 1. Patient characteristics
 - 2. Absorption of scatter
 - a. Scatter radiation isodose curves
- J. Ancillary factors
 - 1. Automatic brightness control vs. dose
 - 2. X-ray generator

- K. Operating the fluoroscopic unit
- L. Operator controls of the fluoroscopic unit:
 - 1. Control panel setting(s) for fluoroscopy vs. dose
 - 2. Fluoro tower movement
 - 3. Table top movement
 - 4. Collimator control
 - 5. Compression devices
 - 6. Fluoro grid device
 - 7. Exposure switch(es)
 - 8. Spot film device
 - a. Cassette
 - b. Spot film camera
 - 1) Frame rate
 - c. Fluoro carriage locks
 - 1) Vertical lock
 - 2) Park position
- M. Patient supports/restraints
 - 1. Footboard
 - 2. Shoulder restraints
 - 3. Other restraining apparatus

IV. Patient Dose and Image Quality Comparisons

- A. Spot film image
- B. Digital or Photospot
- C. Cine
- D. Videotape/Disc
- E. Risks of low-level radiation exposure
- F. Somatic dose indicators
 - 1. Definition of somatic injury
 - a. Local injuries
 - b. General injuries
 - 2. Injuries to superficial tissue
 - a. High-dose exams offering superficial tissue risks
 - 1) Cardiac-interventional procedures
 - 2) Vascular-interventional procedures
 - 3. Induction of cancer
 - 4. Cataract formation
 - 5. Impaired fertility

6. Life span shortening
 7. Injuries to the developing embryo
 8. Bone marrow effects
 - a. High dose exams offering bone marrow risks
 - 1) Barium enema
 - 2) Upper GI series
 - 3) Abdominal angiography
 9. Thyroid
 10. Skin injury
- G. Genetic dose indicators
1. Definition of genetic injury
 2. Variation in radiosensitivity between spermatogonia and oocytes
 3. Exams yielding a potential for high dose to the gonads
 - a. Barium enema
 - b. Intravenous urography
 - c. Lumbar spine
 - d. Pelvis
 - e. Hips
 - f. Upper femur
- H. Genetically significant dose (GSD)
1. Definition of genetically significant dose
 2. Modifiers
 - a. Number of future children
 - b. X-ray examination rate
 - c. Mean gonad dose per exam
- I. Personnel radiation protection
1. As low as reasonably achievable (ALARA) applied to fluoroscopy
 2. Sources of potential exposure to the operator
 3. Operator protection during the fluoroscopic exam
- J. Protective apparel and accessories
1. Lead apron
 2. Overhanging shields
 3. Mobile screens
 4. Protective curtain
 5. Protective gloves
 6. Thyroid shields
 7. Protective goggles/glasses
- K. Other safety hazards
1. Electrical hazards
 - a. Frayed cables
 - b. Broken switches

2. Physical hazards
 - a. Wet floor
 - b. Faulty locks/interfaces
3. Standard precautions

V. Pediatrics

- A. Grid
- B. Automatic brightness control (ABC)
- C. Anesthesia
- D. Spot film vs. camera

ASRT

Radiation Safety, Radiobiology and Health Physics

Description

Content is designed to impart an understanding of protection of individual and population groups against the harmful effects of ionizing and nonionizing radiation. This includes an overview of the regulatory bodies and patient radiation safety regulations affecting the modern diagnostic imaging environment. The effect of ionizing radiations on biological samples will be included. Interaction of ionizing radiation with matter, units of exposure and dose, radiation detection and measurement devices will be discussed. Practical techniques and QA/QC procedures for reducing patient and operator risk of exposure to ionizing radiation will be introduced.

Objectives

1. Identify organizations that set standards for radiation safety.
2. Identify the movement of radioactivity through the environment.
3. Describe the mechanism by which radiation interacts with matter.
4. Explain the quantitative relationships between radiation exposure and biological damage.
5. Describe the probability of select interactions with radiation.
6. Identify instruments used for measuring accumulated dose, measured dose and dose rate.
7. Describe the operating principles of common radiation measuring devices.
8. Distinguish between radiation exposure and radiation absorbed dose.
9. Apply techniques for reducing exposure to external and internal sources of radiation to the patient and personnel.
10. Evaluate the design of radiologically safe equipment, processes and environments.
11. Describe surveillance methods for maintaining a radiation safe environment for personnel and the general public.
12. Describe the QA/QC procedures employed to establish that the radiographic/fluoroscopic equipment is operating in a safe/standardized manner prior to patient examinations.

Content

I. Organizations That Set Standards

- A. International Commission on Radiological Protection (ICRP)
 - 1. International Commission on Radiological Units and Measurements (ICRU)
 - 2. National Council on Radiation Protection and Measurements (NCRP)
 - 3. Environmental Protection Agency (EPA)
 - 4. Nuclear Regulatory Commission (NRC)
 - 5. State regulatory/public health agencies

II. Philosophy of Radiation Protection

- A. Public Health and Radiation Protection
 - 1. Genetically significant dose and population mutation rate
- B. Dose Limitation System
 - 1. Patient
 - 2. Personnel

III. Basic Radiation Safety Criteria

- A. Occupational exposure
 - 1. Monitoring options
 - 2. Exposure limits
- B. Medical exposure
- C. Effective dose equivalent
- D. Exposure to individuals in the general public
- E. Exposure to populations
- F. Annual limit of intake

IV. Radiation Detection and Measurement Devices

- A. Dose measuring devices
 - 1. Personal monitoring
 - 2. Pocket dosimeters
 - 3. Film badge
 - 4. Thermoluminescent dosimeters
 - 5. Optically stimulated luminescence device
 - 6. Electronic dosimeters
 - 7. Survey meters: ion current chamber

V. Dose-Response Characteristics

- A. Direct action
- B. Indirect action

VI. Radiation Effects

- A. Acute effects
- B. Treatment of acute overexposure
- C. Delayed effects
- D. Mental retardation
- E. Genetic effects
- F. Quality factor and radiation weighting factor

VII. Effect of Ionizing Radiations on Biological Systems

- A. Survival
- B. Repair of damage
- C. Dose rate effects
- D. Linear energy transfer
- E. Oxygen effect
- F. Radiological effectiveness
- G. Hyperthermia
- H. Cell cycle effects
- I. Molecular check points
- J. Mitotic block
- K. Repopulation
- L. Cancer and mutation risks
- M. Tumor and normal tissue effects

VIII. Expressions of Risks

- A. Perceived risk
- B. Risk comparison

IX. Expressing Cancer Risks

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

X. Interaction of Ionizing Radiation With Matter

XI. Stochastic Effects

XII. Fetal Irradiation

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

XIII. System Response to Irradiation

- A. Hematopoietic syndrome
- B. Gastrointestinal syndrome
- C. Central nervous system syndrome
- D. Immune system
- E. Reproductive system
 - 1. Female
 - 2. Male
- F. Skin
 - 1. Erythema
 - 2. Desquamation

XIV. Posting Requirements

- A. Restricted vs. unrestricted areas
- B. Caution-radioactive materials

- C. Caution-radiation area
- D. Caution-high radiation area
- E. Grave danger-very high radiation area

XV. 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)

XVI. Units of Radiation Measurement

- A. Roentgen and coulombs/kg
- B. Radiation absorbed dose and grays
- C. Dose equivalent and sieverts

XVII. Units of Exposure and Dose

- A. Absorbed dose
- B. Exposure
- C. Exposure measurement
 - 1. Free air chamber
 - 2. Solid state crystal detector
 - 3. Exposure-dose relationship
 - 4. Absorbed dose measurement: Bragg-Gray Principle
 - 5. Kerma

XVIII. Practical Techniques for Reducing Dose

- A. External radiation protection
 - 1. Time
 - 2. Distance
 - 3. Shielding
 - 4. Optimization and ALARA
- B. Internal radiation protection
 - 1. Control the source:
 - a. Confinement

- b. Environmental control
- 2. Control of the worker:
 - a. Protective clothing
 - b. Respiratory protection

XIX. Waste Management

- A. Airborne wastes
- B. High-level waste
- C. Intermediate and low-level wastes

ASRT

Image Correlation to 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. Protocols for drafting memoranda of initial observations based on image assessment is included.

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.
2. Make recommendation(s) for additional images or alternative imaging procedures as warranted for diagnostic purposes.
3. Formulate an internal memorandum of initial observations presented to the radiologist mentor for analysis.

ASRT

Content

I. Chest Imaging

- A. The normal chest radiograph
 1. Systematic observation of the chest radiograph
 2. Soft tissues
 3. Skeleton
 4. Mediastinum
 5. Heart
 6. Lungs
 7. Diaphragm
 8. Pleura

- B. Clinical information

- C. Pulmonary infection
 1. Pneumonia patterns
 - a. Lobar pneumonia
 - b. Bronchopneumonia
 - c. Cavitating or necrotizing pneumonia
 - d. “Ground glass” pneumonia pattern
 2. Pulmonary tuberculosis (TB)
 - a. Primary pulmonary TB
 - b. Secondary or post primary TB
 - c. Military TB
 3. Abscess

- D. Lung cancer
 1. Solitary pulmonary nodule
 2. Hilar mass
 3. Pancost’s tumor (apical sulcus tumor)
 4. Pulmonary atelectasis
 5. Multiple masses
 6. Multiple micronodular or military pattern

- E. Pulmonary hypertranslucency and cystic lungs
 1. Hyperinflated lung
 2. Cystic lung pattern
 3. Cavities
 4. Mycetomas

- F. Pleural and extrapleural disease
 1. Pleural effusions
 2. Empyema
 3. Pleural mass
 4. Extra pleural masses

- G. Rib lesions
 - 1. Focal rib lesions
 - a. Lytic lesions
 - b. Erosive lesions
 - 2. Diffuse rib lesions

- H. Chest trauma
 - 1. Blunt trauma
 - a. Bony injury
 - b. Pneumothorax
 - c. Hemothorax
 - d. Pulmonary lesions
 - e. Vascular injuries
 - f. Trauma to the tracheobronchial tree
 - g. Diaphragmatic injury
 - 2. Penetrating trauma

- I. Pulmonary AIDS
 - 1. Tuberculosis patterns in AIDS
 - 2. Ground glass pattern
 - 3. Bacterial infection patterns
 - 4. Viral infection patterns
 - 5. Neoplasm patterns
 - 6. Lymphoproliferative interstitial pneumonia (LIP) pattern

- J. Pediatric chest
 - 1. Neonatal chest patterns
 - a. Ground glass pattern in premature babies
 - b. Cystic or “Bubbly” lungs
 - c. Meconium aspiration pattern
 - 2. Infant chest patterns
 - a. Bilateral air trapping pattern
 - b. Unilateral lung hyperinflation
 - c. Bronchopneumonia pattern
 - d. Pulmonary atelectasis pattern
 - 3. Childhood pneumonia patterns
 - a. Round pneumonia
 - b. Staphylococcal pneumonia
 - c. Primary TB pattern

- K. Cardiac disease
 - 1. Cardiac size
 - 2. Causes of enlargement
 - a. Infection
 - b. Neoplasm
 - c. Trauma

3. Mitral valve disease
4. Aortic valve disease
5. Cardiac failure pattern

L. Mediastinal masses

1. Superior mediastinum
2. Anterior mediastinum
3. Middle mediastinum
4. Posterior mediastinum

M. Diaphragmatic lesions

1. Diaphragmatic elevation
 - a. Eventration
 - b. Phrenic nerve palsy
 - c. Subphrenic mass
 - d. Diaphragmatic injury

N. Pneumoconiosis

1. Small nodules
2. Asbestos exposure

II. Musculoskeletal Images

A. Approach to focal bone lesions

1. Clinical information
2. Lesion margins
3. Tumor matrix calcification
4. Bone destruction pattern
5. Soft tissue extension
6. Multiplicity of lesions
7. Tumor and tumor-like lesions
8. Nonneoplastic processes

B. Periosteal reactions

1. Patterns of periosteal reactions
 - a. Solid reactions
 - b. Interrupted periosteal reaction

C. Extremities trauma

1. Principles of radiographic exam
2. Indirect signs of trauma
3. Pitfalls of imaging
4. Stress fractures
5. Intra-articular fracture
 - a. Radial head
 - b. Bennett fracture
 - c. Barton fracture

- d. Tibial plateau fracture
- e. Ankle fracture
- f. Calcaneal fracture
- 6. Nonarticular fracture
 - a. Colles fracture
 - b. Smith's fracture
 - c. Supracondylar fracture
 - d. Jones fracture
- 7. Fractures associated with increased risk of avascular necrosis (AVN)
 - a. Scaphoid
 - b. Neck of femur
- 8. Fracture dislocation
 - a. Galeazzi
 - b. Monteggia
 - c. Transcaphoid prelunate dislocation
 - d. Maisonneuve fracture
 - e. Lisfranc fracture
- 9. Joint subluxation/dislocation
 - a. Shoulder dislocation
 - b. Wrist dislocation
- 10. Immature skeleton trauma
 - a. Epiphyseal plate injury
 - 1) Salter-Harris Types 1,2,3,4,5
 - b. Incomplete
 - 1) Greenstick
 - 2) Torus
 - 3) Bowing

D. Fractures

- 1. Classification
 - a. Complete
 - 1) Transverse
 - 2) Oblique
 - 3) Spiral
 - 4) Impacted
 - 5) Comminuted
 - 6) Intra-articular
 - 7) Avulsion fracture
 - 8) Compression fractures
- 2. Union
 - a. Early callus formation
 - b. Late callus formation
- 3. Complications
 - a. Delayed union
 - b. Nonunion
 - c. Reactive/hypertrophic nonreactive/atrophic

- d. Malunion
 - e. Infection
 - f. Avascular necrosis
 - g. Growth disturbances
- E. Spinal trauma
- 1. Cervical spine radiographs
 - a. Jefferson fracture
 - b. Odontoid fracture
 - 1) Types 1,2,3
 - c. Hangman's fracture
 - d. Clay shoveler's fracture
 - e. Flexion teardrop fracture
 - f. Bilateral facet dislocation
 - g. Unilateral facet dislocation
 - 2. Upper thoracic fractures
 - 3. Thoraco-lumbar fractures
 - a. Chance fractures
 - 4. Burst fracture
 - 5. Wedge compression fracture
- F. Facial and pelvic trauma
- 1. Nasal fracture
 - 2. Mandibular fracture
 - 3. Zygomatic and malar fractures
 - 4. Maxillary fracture
 - a. Le Fort I, II, III
 - 5. Orbital fracture
 - 6. Pelvic fractures
 - a. Stable fractures
 - b. Unstable fractures
- G. Bone infections
- 1. Osteomyelitis
 - 2. Septic arthritis
 - 3. Tuberculous arthritis
 - 4. Infective spondylitis
 - 5. Pyogenic discitis and spondylitis
 - 6. Tuberculous spondylitis

III. Images of the Gastrointestinal and Urinary Tracts

- A. Plain abdominal radiographs
 - 1. Systematic observation of the plain abdominal radiograph
- B. The acute abdomen
 - 1. Free intraperitoneal air pattern

2. Intramural gas pattern
3. Extramural gas
4. Bowel obstruction pattern
5. Paralytic ileus
6. Cholecystitis
7. Pancreatitis
8. Abdominal fluid collections and abscesses
9. Appendicitis

C. Gastrointestinal contrast studies

1. Barium swallow
2. Small bowel follow-through
3. Barium enema
4. Gastrointestinal tract patterns
 - a. Esophageal patterns
 - 1) Ulcer patterns
 - 2) Reflux esophagitis pattern
 - a) Esophageal webs
 - b) Carcinoma
 - c) Benign stricture
 - d) Corrosive strictures
 - e) Extrinsic compression
 - 3) Carcinoma of the esophagus
 - 4) Esophageal varices
 - 5) Hiatal hernia
 - b. Stomach
 - 1) Mass lesions
 - a) Single gastric mass
 - (1) Polyp leiomyoma or leiomyosarcoma
 - (2) Bezoar
 - (3) Extrinsic tumor: pancreas adenosarcoma
 - b) Multiple gastric masses
 - (1) Polyps
 - (2) Fundal varices
 - (3) Gastric cancer
 - (4) Lymphomas
 - (5) Kaposi sarcoma
 - 2) Thickened stomach folds
 - 3) Ulcers
 - c. Small bowel patterns
 - 1) Small bowel stricture
 - 2) Terminal ileum
 - 3) Small bowel wall thickening
 - a) Ischemia: acute
 - b) Ischemia: chronic
 - c) Edema: hypoproteinemia

- d) Inflammatory: TB, Crohn
- e) Venous: Budd Chiari, cirrhosis
- f) Lymphatic obstruction
- g) Infiltration: Lymphoma, carcinoma, metastases, eosinophilic enteritis
- 4) Nodular small bowel pattern
- d. The colon
 - 1) Colon stricture pattern
 - a) Neoplastic: adenocarcinoma, lymphoma
 - b) Inflammatory: diverticular disease, ulcerative colitis, Crohn, amoebiasis
 - c) Tuberculosis
 - d) Radiation
 - e) Ischemia
 - f) Extrinsic compression from tumors or inflammatory masses
 - 2) Colonic mass pattern
 - a) Polyps: adenomas, hamartomas
 - b) Carcinoma
 - c) Lymphoma
 - d) Post inflammatory following colitis
 - 3) Colitis pattern
 - 4) Megacolon
 - 5) Diverticular disease
- D. Pediatric abdomen
 - 1. The neonatal abdomen
 - 2. Esophageal and duodenal atresia
 - 3. Neonatal bowel obstruction
 - 4. Anorectal malformations
 - 5. Necrotizing enterocolitis
 - 6. Acute abdomen in infants
 - a. Intussusception
- E. Urinary tract imaging
 - 1. Kidney-ureter-bladder (KUB) film
 - a. Normal pattern
 - 2. Intravenous urography
 - a. Nephrographic patterns
 - 1) Unilateral small kidney
 - a) Renal infarction
 - b) Radiation nephritis
 - c) Congenital hypoplasia
 - d) Postobstructive atrophy
 - e) Postinflammatory atrophy
 - 2) Unilateral small irregular kidney
 - a) Reflux nephropathy
 - b) Lobar infarction

- 3) Bilateral small kidneys
 - a) Chronic arteriosclerosis
 - b) Chronic renal infection
 - c) Chronic papillary necrosis
 - d) Post obstructive atrophy
 - e) Hereditary nephropathies
- 4) Bilateral large smooth kidneys
 - a) Bilateral hydronephrosis
 - b) Acute glomerulonephritis
 - c) Acute tubular necrosis
 - d) Acute cortical necrosis
 - e) Infiltrative renal diseases
 - (1) Leukemia
 - (2) Lymphoma
 - (3) Amyloidosis
 - (4) Multiple myeloma
- 5) Unilateral large smooth kidney
 - a) Hydronephrosis
 - b) Renal vein thrombosis
 - c) Acute pyelonephritis
 - d) Compensatory hypertrophy
 - e) Duplicated pelvicaliceal system
- b. Renal masses
 - 1) Unilateral renal mass
 - a) Benign and malignant solid renal tumors
 - b) Simple cyst
 - c) Inflammatory mass (abscess)
 - d) Focal hydronephrosis
 - 2) Bilateral renal masses
 - a) Polycystic kidney disease
 - b) Acquired cystic kidney disease
 - c) Lymphoma
 - d) Metastases
- c. Pelvicaliceal patterns
 - 1) Hydronephrosis
 - 2) Ulcers
 - 3) Clubbing
 - 4) Displacement
 - 5) Filling defects
 - 6) Ureter patterns
- d. Bladder patterns
3. Voiding cystourethrogram
 - a. Normal appearance
 - b. Small bladder
 - c. Large bladder
 - d. Prostate enlargement

- e. Filling defects
- 4. Urethrogram
- 5. Variants and developmental anomalies
 - a. Anomalies in number
 - 1) Renal agenesis
 - 2) Supernumerary kidney
 - b. Anomalies in size
 - 1) Hypoplasia
 - 2) Hyperplasia
 - c. Fusion anomalies
 - 1) Horseshoe kidney
 - 2) Cross ectopy with fusion
 - d. Anomalies in position
 - 1) Ectopic kidney (sacral or pelvic kidney)
 - 2) Cross ectopy without fusion
 - e. Other anomalies

ASRT

Image Post Processing

Description

Content is designed to establish a knowledge base in the fundamentals of digital image post processing that support guided skill development using clinical based image workstations.

Objectives

1. Describe the benefits of post processing digital images.
2. Retrieve image data stored on DICOM enabled archive systems.
3. Techniques and procedures for recording post processed images/image sets.
4. Differentiate voxel-based from grid-based models of data interpretation.
5. Identify clinical uses of cine viewing.
6. Describe the principle of multiplanar reformation.
7. Identify applications of multiplanar reformation.
8. Describe the principles that create and clinical applications of images using maximum intensity and minimum intensity projections.
9. Identify the imaging requirements for producing 3D surface (shaded surface rendering) displays.
10. Identify the requirements necessary for creating volume rendered images.
11. Describe the principles and uses of image segmentation.
12. Identify the techniques for producing a virtual endoscopy data set.
13. Identify sources of post processing image noise and image artifacts, as well as techniques to reduce their presence.

Content

I. Image Post-processing

- A. Definition

- B. Benefits to the observer

II. Retrieval and Exporting Image Data

- A. Communication with configured DICOM devices
 - 1. Query to retrieve study

- B. Preview images as acquired by scanner

- C. Loading one or multiple CT/MR volumes

- D. Exporting/recording DICOM images

III. Processing Techniques

- A. 2D Display Tools
 - 1. Cine Displays
 - 2. Multiplanar reformation (MPR)
 - a. Thick MPR
 - 3. Curved planar reformation (CPR)
 - a. Vessel tracking

- B. 3D Display Tools
 - 1. Maximum intensity projection (MIP)
 - 2. Minimum intensity projection (MinIP/minIP)
 - 3. Shaded surface display (SSD)
 - 4. Volume rendering technique (VRT)
 - a. Tissue transition projection (TTP)
 - 5. Ray sum projection

- C. Segmentation Tools
 - 1. Cutting functions
 - 2. Region growing
 - 3. Dilation/erosion
 - 4. Closing functions (removal of holes)
 - 5. Removal of flying pixels (floaters)
 - 6. Watershed algorithms
 - 7. Automated bone removal
 - 8. Automated volume analysis

IV. Data Volume

- A. Voxel-based models

- B. Grid-based models

- C. 3D sampling function
- D. Secondary raw data set
 - 1. Image noise

V. Cine Viewing

- A. Uses
- B. Pitfalls

VI. Multiplanar Reformations

- A. Principle
 - 1. Definition/description
 - 2. Defining the plane of image reformation
 - 3. Thick MPR
 - 4. Ray-sum projection
- B. Artifacts
- C. Applications
 - 1. Anatomically corrected datasets
 - 2. Problem-solving
 - 3. Noise reduction in standard displays
 - a. Use with low dose applications
- D. Image Analysis and Documentation
 - 1. Image workstation

VII. Maximum Intensity Projection (MIP) and Minimum Intensity Projection (MinIP)

- A. Principle
 - 1. Defining the volume of interest (VOI)
 - 2. Preserving attenuation information
 - 3. Image background
 - 4. Image contrast
 - 5. Viewing angle
 - 6. Cine loop to improve 3D orientation
 - 7. Image noise
- B. Thin-Slab MIP
 - 1. Improvement in spatial orientation
- C. Minimum Intensity Projections (MinIP)
 - 1. Tracheobronchial imaging
 - 2. Image contrast, noise and VOI

3. Imaging volume and viewing angle

D. Artifacts Pitfalls

1. CT angiography
 - a. Intravascular lesions
 - b. Intimal flaps
 - c. Calcifications
2. Pulmonary MIP and MinIP
 - a. Endobronchial lesions
 - b. Vascular pulsations

E. Applications of MIP and MinIP

1. CT angiography
2. Pulmonary lesions
3. Central tracheobronchial system
4. Intrahepatic bile ducts
5. Pancreatic duct

VIII. 3D Surface Rendering (Shaded Surface Display)

A. Principle

1. Segmentation
2. Illumination with virtual light source(s)
3. Shadowing effect
4. Color encoding
5. Rendering the image
 - a. Orthographic rendering
 - b. Perspective rendering
6. Threshold selection and size representation
 - a. Impact of lowering or raising the threshold
 - 1) Appearance of
 - a) “Flying pixels”
 - b) “Pseudo-stenosis”

B. Applications

1. Clarification of complex three-dimensional relationships
2. Image rotation and viewing angle
3. Pre-surgical planning
4. Presentation of findings
5. Virtual endoscopy

IX. Volume Rendering Techniques

A. Principle

1. Opacity curve
2. Transmission display
3. Surface display
4. Reflectivity constant

5. Color coding
6. Spatial resolution and matrix size
7. Interactive rendering-movies

B. Special Techniques

1. Air casts (inverted opacity curves)
2. Tissue transition projections
3. MPR-like rendering

C. Artifacts and Pitfalls

1. Venetian blind artifacts
2. Image noise

D. Applications

1. CT angiography
2. Skeletal imaging
3. Tracheobronchial imaging
4. Liver
5. Lungs
6. Colon

X. Segmentation

Principle

7. Positive and negative editing
8. Cutting functions
9. Threshold techniques
10. Connectivity
11. Morphologic operators
 - a. Erosion
 - b. Dilation

Automated Techniques, Computer-assisted Diagnosis

12. Bone removal
13. Lung extraction
14. Vessel analysis

Applications

XI. Virtual Endoscopy

A. Principle

1. Perspective rendering along a path

B. Alternative Viewing Techniques

1. Casts
2. Tissue transition projections
3. Thick MPR

4. Sliding thin-slab VRT
5. Coned-down VRT
6. Virtual dissection
7. Panoramic view
8. Multiplanar reformations

C. Artifacts and Pitfalls

1. Poor patient prep
2. Breathing and pulsations

D. Applications

1. Virtual colonoscopy
2. Virtual bronchoscopy
3. Virtual cystoscopy
4. Virtual angiography

ASRT

Clinical Pathways Related to Radiology

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

14. Define clinical pathways as related to radiology.
15. Identify the rationale for the use of clinical pathways in the patient care setting.
16. Compose a model clinical pathway related to a radiologic diagnostic/therapeutic procedure.
17. Implement the use of clinical pathway knowledge in the clinical setting.
18. Identify criteria for evaluating clinical pathways.
19. Explain variance analysis as it relates to clinical pathway assessment.
20. Participate in the analysis of clinical pathway variance.
21. List the outcomes created through the implementation of clinical pathways in radiology.
22. Explain the relationship between clinical pathways and total quality management in radiology.

Content

XII. Clinical Pathways Defined

- A. Alternative phrases
 1. Care maps/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

- C. Benefits of clinical pathways
 1. Patient
 2. Health team members
 3. Health care agency

- D. Variances
 1. Evaluation and planning tool

XIII. Rationale for Developing Clinical Pathways

- A. Patient benefits

- B. Benefits gained by physician and other health professionals

- C. Health care agency benefits

- D. Benefits to third-party payors

XIV. Clinical Pathways Development Plan

- A. Administrative support

- B. Staff member “champion”

- C. Managing change in practice patterns

- D. Identification of expected patient outcomes

- E. Clinical pathway selection
 1. High-volume, high-cost, high-risk procedures
 2. Problem-prone procedures
 3. Insurance denials
 4. Quality improvement initiatives

- F. Planning an analysis of variance
 - 1. Data collection plan
 - 2. Data analysis
 - 3. Action planning

XV. Sample Clinical Pathways

- A. Identification of health problem
 - 1. ICD-9 code (International Classification of Diseases, 9th Edition)
- B. Expected hospital length of stay
 - 1. Center for Medicare and Medicaid Services (CMS), formerly known as Health Care Financing Administration (HCFA) guidelines
- C. Nursing diagnosis and collaborative problems
- D. Timeline for sequencing interventions
- E. Aspects of patient care
 - 1. Assessment
 - a. Physical and psychological
 - 2. Teaching
 - a. Patient and family members
 - b. Related to hospital stay, home care or alternative care setting
 - 3. Consults
 - a. Interdisciplinary team members
 - 4. Laboratory tests
 - 5. Other tests
 - a. Forecast of scheduled events
 - 6. Medications
 - 7. Treatments/interventions
 - a. Physician-directed treatments
 - b. Interventions following facility protocols
 - 8. Nutrition
 - a. Needs and restrictions
 - 9. Lines/tubes/monitors
 - a. Infusion therapy routes, monitors and tubes
 - b. Solutions being delivered
 - 10. Mobility/self-care
 - a. Physical and/or occupational therapies
 - 11. Discharge planning
 - a. Patient needs
 - b. Required resources
 - c. Assessment of outcomes

XVI. Clinical Pathways Implementation Plan

- A. Change management
- B. Staff/personnel educational requirements
 - 1. Purpose and correct use of pathways
 - 2. Contribution(s) to patient care
- C. Teams and team building
- D. Interprofessional relationships
- E. Accountability
- F. Professional practice
- G. Documenting clinical pathway variance

XVII. Clinical Pathways Evaluation Plan

- A. Variance Analysis
 - 1. Measures consistency of expected outcomes to actual outcomes
 - 2. Positive and negative variance
 - 3. Causes of variance
 - a. Hospital or system
 - b. Clinician or caregiver
 - c. Patient or family
 - d. Community related
 - 4. Data collection
 - a. Concurrent data collection
 - b. Retrospective data collection
 - 5. Automated systems
 - 6. Relationship to quality patient care

XVIII. Managing Outcomes

- A. Clinical outcomes
 - 1. Objectively measured outcomes
 - a. Mortality rates
 - b. Morbidity rates
 - c. Complication rates
 - d. Infection rates
 - e. Hospitalization rates
 - f. Emergency department admission rates
 - 2. Subjective outcomes
 - a. Willingness to recommend care
 - b. Patient perceptions with satisfaction
 - c. Patient and provider satisfaction
 - d. Health plan re-enrollment rates

3. Description of variance
 - a. Patient
 - b. System
 - c. Process

- B. Quality outcomes
 1. Patient and setting specific
 2. Expressed in term of benchmarks related to radiology services
 3. Humanistic and quality-of-life outcomes
 - a. Physical functioning
 - b. Role functioning
 - c. Social functioning
 - d. Pain levels
 - e. Energy levels
 - f. Fatigue levels
 - g. Mental well-being
 - h. Overall perception of health status

- C. Communication outcomes
 1. Patient and family education
 2. Staff orientation

- D. Financial outcomes
 1. Economic outcomes
 - a. Overall radiology services costs/time period saved
 - b. Costs/time period saved

Quality of Care Review and Audit

Description

Content introduces guidelines for reporting initial observations made by the radiologist assistant during radiology procedures and image assessment. The radiologist assistant role in the systematic analysis of the quality of care – the diagnosis and treatment, the resources, procedures and resulting outcomes, including the patient’s quality of life – will be discussed. Topics of sensitivity and specificity as they relate to diagnostic testing will be presented. Predictive values, prior probability and bias as they relate to the analysis of information obtained from diagnostic testing will be discussed.

Objectives

1. Relate the term “benchmark” as it applies to diagnostic testing.
2. Describe how sensitivity and specificity measurements apply to diagnostic testing.
3. Distinguish between positive and negative predictive values applied to evaluate the results of diagnostic testing.
4. Describe how prior probability impacts the predictive value of diagnostic testing.
5. Discuss the impact that the selection of images, observers and judges, together with decisions about the design of the assessment procedure, can have on the internal and external validity of assessments of diagnostic accuracy.
6. Identify the required legal components of a report of findings following diagnostic testing.
7. State the rationale for performing clinical audits.
8. Identify select audit schemes applied to the clinical setting.
9. List clinical audit categories.
10. Identify measurement criteria and instruments employed during a clinical audit.
11. Conduct a clinical audit and produce a summary of findings for review and analysis.

Content

I. Relate the Term “Benchmark” as it Applies to Diagnostic Testing

II. Factors Influencing Diagnostic Accuracy of Exams

- A. Clinical perspective
- B. Sensitivity and specificity of diagnostic testing
- C. Predictive values
 - 1. Positive predictive value
 - 2. Negative predictive value
- D. Prior probability
- E. Bias

III. Clinical Reporting

- A. Legal considerations and requirements
- B. Composing, recording and archiving a report of initial observations
 - 1. Demographics
 - 2. Patient name and identification source
 - 3. Name of referring physician
 - 4. Name or type of examination
 - 5. Date of the examination
 - 6. Time of the examination
 - 7. Other data
 - a. Date of report of initial observations
 - b. Date of transcription
 - c. Birth date or age
 - d. Gender
 - 8. Body of Report
 - a. Procedures and materials
 - 1) Contrast media
 - 2) Medications
 - 3) Catheters
 - 4) Devices used
 - 5) Any patient reaction or complication
 - b. Observation details
 - 1) Anatomic, pathologic and radiographic terms to describe observed findings accurately
 - c. Potential limitations
 - 1) Limits to the sensitivity and specificity of the examination
 - d. Clinical issues

- e. Comparative data
 - 1) Previous examinations or reports
- f. Observation summary

IV. Clinical Audit

- A. Rationale

- B. Involved parties

- C. Audit schemes
 - 1. External quality assessment
 - 2. Internal quality assessment
 - 3. Accreditation
 - 4. Audit and clinical governance

- D. Audit categories
 - 1. Access
 - 2. Process
 - 3. Output
 - 4. Outcome
 - 5. Use of resources

- E. Measurement criteria and instruments

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Directed Readings and Research

Description

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

Technological innovations result in new procedures, equipment and expanded or new modalities that require technologists to remain current in their knowledge and skills. One method of meeting this professional obligation is to read, study professional literature or conduct research.

Learning does not end when a student completes the formal educational process; therefore, as a professional, the technologist must develop inquiry skills, determine continuing education needs and pursue methods to meet those needs.

Objectives

1. Improve didactic and clinical performance through exposure to research.
2. Facilitate professional and personal growth through continued exposure to current trends in health care.
3. Enhance inquiry abilities through development of research skills.
4. Raise the level of professional competence through the continuing development of communication and writing skills.
5. Become familiar with the ethical principles and legal constraints of research.
6. Identify the types of research.
7. Evaluate research topic for sufficient depth and breadth.
8. Conduct a comprehensive literature review.
9. Develop an appropriate outline for research study.
10. Develop a research paper for publication.
11. Evaluate the significance of research question.
12. Critique the research results for bias and study validity.
13. Analyze the appropriateness of references.

Content

I. Intellectual Inquiry and Analysis of Research Articles

- A. Proper use of library, Internet and other research data services
- B. Selection of a topic of appropriate depth and breadth
- C. Analysis of journal articles and peer-reviewed sources
 - 1. Scholarly publications
 - 2. Information that should be documented
 - 3. New knowledge created
 - 4. Application of new knowledge
 - 5. Support of previous learning
 - 6. Research design
 - 7. Research bias
 - 8. Study validity, including significance tests and confidence intervals
 - 9. Application for future research and recommendations
 - 10. Implications for professional practice
- D. Bibliography/reference documentation

II. Preparing a Research Paper

- A. Ethical principles and legal consideration
- B. Development of central topics
- C. Development of research plan
- D. Qualitative and quantitative research
- E. Types of research projects
 - 1. Literature review
 - 2. Experimental
 - 3. Descriptive/survey research
 - 4. Case study projects
 - 5. Randomized clinical trials
- F. Selection of a research topic
- G. Purpose and scope of literature review
- H. Review of the literature
- I. Research design
- J. Preparation of the research topic outline

- K. Writing the first draft of a research paper
- L. Preparation of the final draft of research paper
- M. Submission for publication

III. Evaluation of Research Projects

- A. Research quality
 - 1. Technical accuracy
 - 2. Reader comprehension
 - 3. Scholarship
 - 4. Effectiveness of writing style
 - 5. Appropriate form and style
- B. Systematic literature analysis
- C. Research plan and paper organization
 - 1. Appropriate title
 - 2. Title page
 - 3. Abstract
 - 4. Introduction
 - 5. Definition of terms
 - 6. Literature review
 - 7. Research design or methodology
 - 8. Hypothesis or purpose of research
 - 9. Results or analysis
 - 10. Conclusions, discussions and recommendations

Medical Legal, Professional Standards, Governmental 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's/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 JCAHO 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. Define medical informatics and describe examples of informatics systems found in today's patient care setting.

Content

I. Scope of Practice

II. Practice Standards

III. Legal Issues

- A. Civil liability
- B. Intentional torts
 - 1. Elements
 - 2. Assault
 - 3. Battery
 - 4. False imprisonment
 - 5. Emotional distress
 - 6. Fraud
 - 7. Invasion of privacy
 - 8. Defamation
 - a. Slander
 - b. Libel
 - 9. Vicarious liability
- C. Unintentional torts/negligence
 - 1. Elements
 - 2. Contributory
 - 3. Comparative
- D. Criminal law
 - 1. Criminal negligence
 - 2. Falsification of records
 - 3. Drugs
 - 4. Fraud
 - 5. Patient abuse
 - 6. Theft

IV. Civil Procedures

- E. Pleadings
- F. Summons and complaint
- G. Discovery
- H. Motions
- I. Trial procedure
- J. Evidence

K. Verdict

L. Appeals

V. Standard of Care

VI. Burden of Proof

VII. Res Ipsa Loquitur

VIII. Respondeat Superior

IX. Consent

A. Informed

B. Uninformed

C. Implied

X. Patient Directives

A. Living wills

B. Do-not-resuscitate orders (DNR)

C. Power of attorney

XI. Employer and Employee Responsibilities

A. Labor laws

B. Unions

C. Discrimination laws

D. Harassment in the workplace

1. Quid pro quo
2. Hostile work environment
3. Protected persons
4. Unwelcome conduct
5. Employer's liability
6. Sexual harassment
7. Harassment
8. Assault and battery
9. Infliction of emotional distress
10. Invasion of privacy
11. Wrongful discharge

- E. Conditions of employment
 - 1. Position descriptions
 - 2. Drug screening
 - 3. Background checks
 - 4. Misrepresentation
- F. Liability coverage
 - 1. Employer
 - 2. Personal
- G. Equipment safety regulations
- H. Safety
 - 1. Hazard identification and control
 - 2. Policies and procedures
 - a. Occupational Safety and Health Administration
 - b. Centers for Disease Control and Prevention
 - 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/quality improvement committees
 - 8. Risk management
- I. Whistleblower protection

XII. Accreditation and Regulatory Issues

- A. Purpose of accreditation
- B. Education program accreditation
 - 1. Programmatic accreditation
 - 2. Regional accreditation
 - 3. National proprietary agencies
 - 4. State agencies and others
- C. Health care facility accreditation
 - 1. Governmental
 - 2. National
 - 3. State
- D. Health care professional credentialing
 - 1. Certification
 - 2. Licensure

3. Registration
- E. Credentialing agencies
 1. National organizations
 2. State agencies
- F. Regulatory agencies
 1. Food and Drug Administration
 2. Nuclear Regulatory Commission
 3. Occupational Safety and Health Administration
 4. U.S. Department of Transportation
 5. State agencies
- G. Advisory agencies
 1. International Commission on Radiation Units and Measurement
 2. National Council on Radiation Protection and Measurement
 3. National Academy of Sciences Advisory Committee on the Biologic Effects of Ionizing Radiation
 4. United Nations Scientific Committee on the Effects of Atomic Radiation

XIII. JCAHO Standards

- A. Accountability for protecting patient information
 1. Information collection
 2. Information maintenance
 3. Use of personally identifiable health information
 4. Contractual agreements
 - a. Confidentiality clause
 5. Monitoring compliance
 6. Demonstrating compliance
 - a. Audits
 - b. External reviews
- B. Consents
 1. Informed
 2. Specific
 3. Voluntary
 4. Release of information
 - a. Purposes
 - b. Types of information released
 - c. Recipients of information
- C. Education regarding policies, rights and responsibilities
 1. Patient education
 2. Provider education

XIV. Challenges to the Protection of Patient Information

- A. Patient issues
 - 1. Trust in the physician
 - 2. Who gets what information
 - 3. Rights in the case of an error or unauthorized disclosure of information
- B. Provider issues
 - 1. Implementation of confidentiality procedures
 - 2. Patient education on confidentiality rights
- C. Managed care organizations
 - 1. Information shared with external parties
- D. Research
 - 1. Access to information without breaching patient rights

XV. The Patient Record

- A. Patient-centered medical record
- B. Problem-oriented medical record
 - 1. SOAP
 - a. Subjective (patient's complaints)
 - b. Objective (physician's findings)
 - c. Assessment (interpretations and conclusions)
 - d. Plan (medical policy)
- C. Source-oriented medical record
- D. Computer-based patient record
 - 1. Natural language processing
 - 2. Structured data entry
- E. Coding and standardization

XVI. Medical Record Contents: Paper and Electronic

- A. Patient identification
- B. History
- C. Physical exam
- D. Psychosocial needs
- E. Treatment plan

- F. Physician's 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
- Q. Patient education
- R. Interventions
- S. Outcomes

XVII. Techniques and Procedures for Proper Documentation

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

XVIII. Procedures for Document Administration

- A. Consent forms
- B. Preprocedure and postprocedure instructions
- C. Interventions
- D. Outcomes (evaluation)
- E. Vital signs
- F. Contrast administration
- G. Patient baseline status
- H. Changes in patient status
- I. Contrast/medication reactions
- J. Patient education
- K. Information exchange and lines of communications

XIX. Patient Information Standards

- A. Privacy issues
 - 1. HIPAA
 - a. HIPAA goals
 - 1) Uniformity of electronic data interchange
 - 2) Confidentiality of electronic health data
 - 2. Parties HIPAA regulations apply to
 - a. Health care providers
 - 1) Definition of health care provider
 - b. Health plans
 - c. Health care clearinghouses
 - 3. Parties not covered by HIPAA regulations
 - 4. Electronic transactions and code sets
 - a. Technical standards for formats and data content when conducting electronic transactions
 - 1) Claims/referral inquiry and submission
 - 2) Eligibility inquiry
 - 3) Financial transactions
- B. Privacy standards
 - 1. Confidentiality policies and procedures governing the use and procedures for protection of health information

- C. Security standards
 - 1. Physical and technical safeguards for the storage and transmission of protected health information
 - 2. Unique identifiers
 - a. Providers
 - b. Employers
 - c. Health plans
 - d. Individuals
 - 3. Electronic digital signature
- D. Enforcement
 - 1. Centers for Medicaid and Medicare Services (CMS)
 - 2. Electronic code sets
 - 3. Office of Civil Rights (OCR)
 - 4. Privacy standards
 - 5. State laws and regulations affecting the use and disclosure of health information
- E. Medical informatics
 - 1. Definition of informatics
 - 2. Application in medicine
 - 3. Telemedicine
 - 4. Management
 - a. Data
 - b. Information
 - c. Knowledge
 - 5. Information systems and standards
 - a. Hospital information system (HIS)
 - b. Radiology information system (RIS)
 - c. Picture archiving and communications system (PACS)
 - 1) Computed radiography (CR)
 - 2) Digital radiography (DR)
 - d. Digital imaging and communications in medicine (DICOM)
 - 6. Information as a commodity
 - a. Potential abuses

Implementation Strategies for Mentored Clinical Experience

Introduction

Each patient care setting offers a unique environment for RA student-radiologist mentored clinical experience. Each radiologist mentor must be afforded the latitude to facilitate RA student development and engage the student in the learning experience. Learning contracts combined with the development of individual RA student portfolios are recommended for structuring the content and critical assessment of this segment of the planned curriculum.

Learning Contracts

A learning contract is a practical arrangement between a “mentor” and “student” to enable both to make the most of learning opportunities in the time available. It spells out the objectives and responsibilities of each person in the situation so that both are clear about expectations and assignment of responsibility. It takes the form of a written statement.

Learning contracts focus on the process of learning. This feature is believed to be a key element in the development of radiologist assistants. The learning contract helps the radiologist mentor and RA student structure what is to be learned, how it is to be learned and how learning will be verified. Contracts, though not legally binding, are written agreements or commitments reached between the radiologist mentor and RA student.

A typical learning contract specifies the following:

1. The knowledge, skill, attitudes and values to be acquired by the learner.
2. How these objectives are to be accomplished through an identification of learning resources and strategies.
3. Plans for interim feedback to the learner, self reflection on progress in accomplishing learning objectives, with the option to modify the learning contract if needed.
4. The target date for completion.
5. The evidence presented to demonstrate that the objectives have been accomplished.
6. How the evidence is to be judged or validated.

Throughout the mentored clinical experience, a fabric of learning contracts will assure that the radiologist assistant is fully prepared to assume his or her advanced-level technical role in the patient care setting.

Sample Learning Contract

Describe the skills, knowledge or experiences you will accomplish.

A: Demonstrate proficiency in performing the adult single contrast barium enema examination and producing an internal memorandum of exam specific clinical observations.

B: (Second learning Objective)

List the steps needed to accomplish each objective. Then list the resources needed to complete the steps and the proposed completion dates for each step.

Objective A:	Resources Needed	Target Dates
Exam Indicators: Demonstrate knowledge of patient indicators and symptoms consistent with the need for this exam.	Directed readings and written assessment.	[insert date(s)]
Exam Specifications: Identify the protocol for patient preparation for this exam. Identify the methods and decision points for evaluating the adequacy of patient preparation for this exam.	Directed readings and written assessment.	[insert date(s)]
Exam Preliminaries: Identify information gained through an evaluation of the patient's medical history that pertains to this exam. Identify information obtained that would contraindicate the need for this exam.	Directed readings and written assessment. Form to record findings from patient's medical history and data obtained from patient interview relative to the exam.	[insert date(s)]
Exam Techniques/general guidelines: Develop skills for preparing a report of observations for this exam. Properly prepare patient for the exam. Direct the administration of contrast media. Apply proper technique for evaluating all accessible segments of the colon during fluoroscopy and document the exam according to routine filming protocol. Produce an internal memorandum of observations following fluoroscopic inspection and recorded image critique demonstrating skill in evaluating exam outcomes for technical accuracy and observation of abnormal or suspicious anatomical features.	Observe radiologist dictations and review written reports Barium preparation and materials for administration Directed readings and written assessment regarding technical requirements for performing the exam, followed by assisting in the performance of patient exams leading to performing exams under radiologist supervision. Departmental form or vehicle for recording clinical observations.	[insert date(s)]

Objective B:	Resources Needed	Target Dates
(Second learning Objective)		

Evaluation Criteria

<p>I will have accomplished Objective A when:</p> <p>a) I have observed (<i>insert number</i>) radiologist readings of adult single contrast barium enema exams.</p> <p>b) I have assisted Dr. (<i>insert name</i>) in performing (<i>insert number</i>) adult single contrast barium enemas and the recording of exam observations.</p> <p>c) I have performed, under radiologist supervision, (<i>insert number</i>) adult single contrast barium enemas including recording exam observations that have been signed off by my radiologist mentor as meeting exam standards.</p> <p>d) I have participated in weekly performance summaries/reflections with my radiologist mentor.</p>

<p>I will have accomplished Objective B when: _____</p> <p>_____</p> <p>_____</p>

Support Resources: Who will you share your learning plan with and ask that he or she provide you with feedback and motivation? (List radiologist mentor and any designate.)

Additional learning plan impacts (list strategies, resources, potential barriers, prior knowledge or experience that may affect the plan, etc.):

- RA student is required to document the successful completion of a fluoroscopic unit operation and safety training module prior to beginning this clinical sequence.
- RA student must successfully complete preclinical assessment(s) of the lower GI tract including pathophysiology, applied image pattern recognition and clinical reporting.

Your signature and date

Mentor's signature and date

Student Portfolios

Portfolios are purposeful collections of examples of RA student work annotated with RA student reflective commentary. Examples may be drawn from assignments associated with a single clinical event, or from curricular and cocurricular activities spanning a broad period of time.

Portfolio development consists of five stages:

1. **Collection:** RA students learn to save artifacts that represent the successes (and “growth opportunities”) in their day-to-day teaching and learning.
2. **Selection:** RA students review and evaluate the artifacts they have saved, and identify those that demonstrate achievement of specific objectives and goals.
3. **Reflection:** RA students become reflective individuals, evaluating their own growth and their clinical achievements over time, as well as the gaps in their development.
4. **Direction:** Radiologist mentors and RA students compare their reflections to performance indicators and set learning goals for the future. This portion of individual professional development supports key elements of lifelong learning
5. **Presentation:** RA students share their portfolios with their peers. This stage helps to encourage collaboration and commitment to professional development and lifelong learning.

RA student portfolios offer another bridge that deepens the RA student-radiologist mentor relationship. Portfolios also provide insights for tailoring learning contracts as the RA student progresses through the clinical experience.

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Appendix A

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Communications

Description

Content is designed to expand the knowledge base and skills necessary for the practitioner to communicate effectively. Existing communication skills will be enhanced to include professional presentations, business communication, and research publication and evaluation. The practitioner's role and responsibility with regard to written and oral communication will also focus on patient education, advocacy and confidentiality. A heightened awareness of human diversity will be emphasized.

Objectives

1. Summarize the ways in which communication affects our daily lives.
2. Possess a general understanding of the communication principles and theories that are used to explain and analyze people's actions.
3. Apply principles of effective communication in a variety of contexts.
4. Critically interpret messages from a variety of sources.
5. Assess cultural, ethnic, linguistic and socioeconomic variables that impact client/health care provider communication.
6. Demonstrate technical writing ability in a variety of venues, including scholarly writing and business communications.

Directed Readings and Research

Description

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

Technological innovations result in new procedures, equipment and expanded or new modalities that require technologists to remain current in their knowledge and skills. One method of meeting this professional obligation is to read, study professional literature or conduct research.

Learning does not end when a student completes the formal educational process; therefore, as a professional, the technologist must develop inquiry skills, determine continuing education needs and pursue methods to meet those needs.

Objectives

1. Improve didactic and clinical performance through exposure to research.
2. Facilitate professional and personal growth through continued exposure to current trends in health care.
3. Enhance inquiry abilities through development of research skills.
4. Raise the level of professional competence through the continuing development of communication and writing skills.
5. Determine the ethical principles and legal constraints of research.
6. Identify the types of research.
7. Evaluate research topic for sufficient depth and breadth.
8. Conduct a comprehensive literature review.
9. Develop an appropriate outline for research study.
10. Develop a research paper for publication.
11. Evaluate the significance of research question.
12. Critique the research results for bias and study validity.
13. Analyze the appropriateness of references.

Health Care Law and Regulations

Description

Content is designed to provide 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. Radiologic technologist scope of practice issues and situations will be investigated.

Objectives

1. Explain how scope of practice affects the radiologic technologist.
2. Discuss the contents of the practice standards.
3. Compare civil and criminal law.
4. Explain civil procedures.
5. Describe the concept of standard of care.
6. Distinguish between the different types of consent.
7. Describe the client's/patient's legal responsibilities.
8. Describe the employer's legal responsibilities.
9. Describe the employee's legal responsibilities.
10. Discuss regulatory and accreditation issues related to health care.

Health Care Systems

Description

Content is designed to impart an understanding of the forces shaping the present and future health care delivery system. The political context of health care organization and delivery in the United States will be discussed. Specific attention will focus on the concepts of health policy, as well as the mechanisms for policy formulation and implementation. Contemporary social and ethical issues and appropriate professional roles are examined using concepts and principles of ethical decision making, human diversity, global health care and epidemiology. The impact of information and health care technologies on patient care will be discussed.

Objectives

1. Identify the historical forces that shaped the current delivery system and their relevance for an emerging system.
2. Describe the mechanisms that affect the formulation and implementation of health policy.
3. Describe the relationship between national health policy and local health care delivery.
4. Determine the appropriate role of the radiographer when addressing contemporary social and ethical issues impacting patient care.
5. List epidemiological resources of information used to monitor the current health care delivery system.
6. Describe the impact of information and health care technologies on modern patient care.

Human Diversity

Description

Content is designed to promote better understanding of patients, patients' families and professional peers by comparing characteristics of diverse populations, such as their value system, cultural and ethnic influences, communication styles, socioeconomic influences, health risks and life stages. Content will include the study of factors that influence the interrelationships with patients and professional peers. Understanding human diversity assists the student in providing better patient care.

Objectives

1. Explain the development of a personal value system.
2. Discuss the interrelationship between personal, community and societal values.
3. Explain the influence a person's value system has on his or her behavior.
4. Discuss the development of personal and professional values.
5. Describe how professional values influence patient care.
6. Examine Kohlberg's theory on how an individual's morality influences his or her behavior.
7. Differentiate between culture and ethnicity.
8. Explain how a person's cultural beliefs towards illness affect his or her recovery.
9. Explain the origins of medical ethnocentrism.
10. Discuss the societal factors that influence the quality of health care.
11. Compare alternative/complementary medicine to the traditional Western model.
12. Describe the culture of poverty and its effect on health care.
13. Discuss family dynamics in a cultural, social, ethnic and lifestyle context.

Leadership Principles

Description

Content is designed to provide the skills and knowledge necessary for the radiologic professional to provide leadership in workplace performance and professional development, thus promoting efficient and effective patient care. It is based on the concept that leadership is exercised through personal example, initiating actions and communication that influences and encourages professional excellence. A clarification of mission, understanding of rules and an awareness of interdependencies within complex organizations evolves through team building.

Objectives

1. Indicate the elements of an effective team.
2. Illustrate ways to improve teamwork.
3. Appraise the purposes and uses of groups and teams.
4. Distinguish the roles of the team leader and other team members.
5. Discuss the terms vision, mission and goals as they relate to team effectiveness.
6. Express an understanding of the impact that styles have on team membership and working relationships.
7. Create a list of common skills found in productive teams.
8. Assess the relationship between job and work design and job satisfaction.
9. Describe connective process components.
10. Examine the procedures involved in performing a job analysis.
11. Plan training objectives to satisfy job requirements and expectations.
12. Describe the function of competency evaluations.
13. Prepare a list of essential elements making up a competency assessment program.
14. Compare select methods competency verification.
15. Describe avenues of professional advocacy.

Patient Assessment, Management and Education

Description

Content introduces a model for clinical thinking to aid in patient assessment. Content includes the application of normal anatomy and physiological phenomena to ill and injured individuals. Interviewing skills and assessment techniques with clinical focus will be discussed. An emphasis on the analysis and interpretation of physiological data to assist in patient assessment and management will be introduced.

Objectives

1. Develop clinical-thinking skills applied to the patient care setting.
2. Develop skills in conducting patient interviews to document a patient's medical history.
3. Apply the techniques and procedures for conducting a patient physical assessment and procedures to document findings.
4. Obtain and critically analyze a patient's vital signs.
5. Compose a plan for managing the patient based upon patient needs.
6. Participate in patient education.
7. Foster relationship-centered patient care.
8. Adapt communications techniques to address patient needs.

Patient Information Management

Description

Content is designed to provide the basic concepts of patient information management. Medical records management including privacy and regulatory issues will be examined. The role of the B.S.R.S. technologist will be identified and discussed.

Objectives:

1. Discuss the JCAHO standards regarding the accountability and protection of patient information.
2. List the requirements of a patient consent document.
3. Identify challenges to the protection of patient information.
4. Distinguish between various models to manage the patient records.
5. Explain the contents of the medical record.
6. Demonstrate proper charting.
7. Explain what types of procedures require charting.
8. Discuss privacy and regulatory issues related to patient information.
9. Apply the Health Insurance Portability and Accountability Act (HIPAA) to patient information systems.
10. Identify potential abuses of confidential patient information.
11. Define medical informatics and describe examples of informatics systems found in today's patient care setting.

Pharmacology

Description

Content is designed to broaden the technologist's knowledge of pharmacology. Topics include consumer safety and drug regulation, sources and effects of drugs and safe dose preparation. Types of drug preparations, principles of responsible drug administration including routes and techniques are examined. An introduction to clinical drug trials and a classification of drugs related to body systems are included as topics for presentation.

Objectives

1. Identify key drug laws impacting consumer safety.
2. Identify the five schedules of controlled substances and cite a drug example of each.
3. Identify the role of the Food and Drug Administration (FDA) and Drug Enforcement Administration (DEA) in the regulation and control of consumer drugs.
4. Implement strategies for health care workers involved in dispensing medications to comply with drug law restrictions.
5. Interpret common abbreviations and symbols used for medication orders.
6. Translate drug measurements across measurement systems.
7. Differentiate among drug names (generic, chemical, trade, official).
8. Explain the restrictions of drug sales implied by these designations: over-the-counter, legend drug and controlled substance.
9. List common material sources from which drugs are developed.
10. Describe the biological processing of drugs in the body.
11. List common variables affecting drug action within the body.
12. Describe common unexpected responses to drugs.
13. Accurately perform calculations for drug dose delivery.
14. Describe dose modifiers for pediatric and geriatric patients.
15. Describe various forms of drug preparations and supplies.
16. Incorporate the principles of responsible drug administration in the patient care setting to prevent medication error.
17. Describe administration routes and techniques for select medications.
18. Describe the principles associated with a controlled clinical drug trial.
19. Distinguish between single-blind and double-blind drug trials.
20. Organize drugs according to body system.

Quality Management

Description

Content is designed to impart an understanding of the tasks and protocols making up the quality management activities of a typical radiology department. The roles and responsibilities of all parties contributing to the quality management effort will be presented. Tools, procedures and evaluation criteria used in the performance assessment of imaging modalities and image processing will be discussed. The role of the B.S.R.S. technologist will be identified and discussed. Special attention is given to American College of Radiology (ACR) and Mammography Quality Standards Act (MQSA) guidelines for mammography.

Objectives

1. Differentiate between quality management (QM), quality assurance (QA) and quality control (QC).
2. Develop an understanding of the QM process.
3. State the purpose of a QM program.
4. Discuss the rationale for implementing a QM program.
5. Discuss the need for a radiographic QM program.
6. Describe the impact of QM on image quality.
7. Analyze the benefits of a QM program to the patient and to the department.
8. Describe how QM can reduce patient dose and save money.
9. Discuss how QM can improve consistency in image quality.
10. Analyze areas of patient care that can be improved through a QM program.
11. Identify tools that are used in QA.
12. Apply the QA tools to given situations.
13. Analyze QA data to determine system function.
14. Compare and contrast QA data with system standards.
15. Identify QC procedures associated with the radiographic suite, darkroom and accessory devices.
16. Discuss rationale for doing each QC test.
17. Identify the required equipment for each test.
18. Discuss the acceptance parameters for each test.
19. Explain the importance of record keeping.
20. Define trend, run and point out of control.
21. Explain the rationale behind testing frequency.
22. Discuss problems that might result in erroneous findings for each test.
23. Describe and discuss the procedure for doing each test.
24. Identify and discuss how often each test is performed.
25. Identify and discuss potential problems that might arise during or after each test.
26. Perform each test.
27. Analyze and interpret test results.
28. Discuss the role and responsibilities of each member of the QA team.
29. Discuss the importance of QA program evaluation.
30. Differentiate between mammography QM, QA and QC.
31. Discuss the importance of the medical outcomes audit.

32. Identify and discuss the QC procedures associated with mammography.
33. Perform each test procedure according to ACR and MQSA guidelines.
34. Perform sensitometric and densitometric measurements.
35. Evaluate sensitometric and densitometric data as related to darkroom environmental control.
36. Evaluate sensitometric film strips to determine and evaluate characteristic curves, speed, contrast (gamma and average gradient) and base-fog values.
37. Adjust for variations in film response to exposure as compared to other films or film-screen combinations using sensitometric measurements.
38. Evaluate processor, cine and cut-film for preventive maintenance.
39. Develop a procedure manual for equipment quality control.
40. Perform tests and collect data on radiographic equipment including mA, kVp, timer accuracy and screen response.
41. Perform tests to determine safety and operability of the pressure injector, serial film changer, defibrillator and monitoring equipment.
42. Clean and evaluate recording equipment including the videotape recorder, cine cameras, spot film cameras and projectors, physiological monitors and serial film changers.
43. Develop adequate warm-up procedures for radiographic tubes.
44. Collect data and check protocols for sterile technique, surgical procedures, universal precautions and Occupational Safety and Health Administration (OSHA) regulations.

Risk Management

Description

Content is designed to establish a knowledge base in risk management. Sources of risk, target populations and incident reporting will be examined. Emphasis will be given to the systematic gathering and use of data as a strategy to reduce and minimize the possibility of a specific loss. Included is the formulation of a risk management action plan.

Objectives

1. Develop diagnostic skills to identify sources of risk in the patient care setting.
2. Articulate the importance of good medical records and patient communications.
3. Recognize the roles of federal, state, commercial and other agencies involved in risk management and other medical liability issues.
4. Assess the probability of adverse effects from a risk situation.
5. Formulate a risk management action plan to meet department needs.
6. Discuss the basic principles of risk management.
7. Properly complete and investigate an incident report.

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Resources

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