

# Bachelor of Science in Radiologic Sciences (B.S.R.S.) Core Curriculum

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# Introduction

The ASRT recognizes the baccalaureate degree as the professional level of radiologic science education. The need for sophisticated imaging management and leadership to respond to the clinical, organizational and fiscal demands facing the health care industry supports the creation of advanced educational and skill development opportunities for imaging and therapeutic practitioners.

Long-term career satisfaction must provide avenues for personal and professional growth and development to meet the demands of an increasingly complex health care environment. Individual progress toward the bachelor of science in radiologic sciences (B.S.R.S.) degree provides for such growth and development.

Baccalaureate degree programs in radiography currently exist. These programs take on varying models from straight four-year programs, two plus two year (2+2) and one plus two plus one year (1+2+1) programs. Content within this document is applicable to any of these program models. This document has been developed with input from multiple parties of interest, including individuals from institutions with long-standing baccalaureate programs.

The composition of this document is somewhat different from other curricula developed through the ASRT. Unlike other documents that support the development of instruction and practical clinical experience centered on specific imaging and therapeutic technologies, this document is intended to establish curriculum elements for educational programs offering a B.S.R.S. This B.S.R.S. core curriculum is an expression of content that enhances entry-level education and supports multiple postprimary specialty certifications as well as a transition to education in advanced clinical practice. The core content areas should be seen as the essential foundation of any B.S.R.S. program. Sponsors of B.S.R.S. degrees are encouraged to create a favorable environment for graduates of associate degree and certificate programs to transfer into the B.S.R.S. degree track.

Elements making up the core should be viewed as the minimum necessary; expansion or addition of areas is encouraged in developing an overall curriculum plan. Items within the core may be modified for regional, state or institutional variations. The descriptions and objectives are general in nature and not all inclusive. Instructors may modify the descriptions and objectives to reflect personal knowledge and experience. Curriculum content in outline form is intended to provide the general aspects that should be covered in the curriculum, while allowing instructor latitude in choosing specific content to make up individual courses. Program faculty should decide whether to combine topics in a single course or divide the information in one content area into separate courses.

Information literacy skills, including research, should be a priority. Information literacy is a key component of, and contributor to, lifelong learning. Information literacy augments the student's competency with evaluating, managing and using information. Through

research, professionals in the imaging sciences can test, refine and advance the knowledge base on which improved education and practice rests.

The proposed B.S.R.S. core curriculum continues to emphasize areas found in the entry-level radiography curriculum, such as critical thinking, human diversity and written and oral communication. Students at the B.S.R.S. level engage these topics with more depth and breadth, resulting in a broader knowledge base and skill set than the entry-level radiographer.

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## Advanced Patient Care

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

### Objectives

1. Describe the areas required for patient education in medical imaging.
2. Contribute to treatment plan based on a patient assessment.
3. Define the types of communication and describe how each should or should not be used.
4. Perform proper charting and documentation using manual or electronic formats.
5. Analyze a situation requiring drug dispensing to determine the proper drug amount and route of administration.
6. List the parameters used in the current American Heart Association (AHA) Advanced Cardiac Life Support Guidelines.
7. Recognize normal and abnormal cardiac rhythms.

- I. **Patient Education**
  - A. Preprocedure
  - B. Postprocedure
- II. **Assessment of Physiological Parameters of Recommended Vitals**
  - A. Introduction to basic patient assessment
    - 1. Subjective, objective, assessment, plan (SOAP format)
    - 2. Chief complaint, history, assessment, rendered treatment, transport/transfer (CHART format)
  - B. Vitals
    - 1. Blood pressure
    - 2. Pulse
    - 3. Respiration
    - 4. Temperature
    - 5. Pulse oximetry
    - 6. Level of consciousness
    - 7. Signs of patient distress
  - C. Components of the cardiac cycle
    - 1. Electrocardiogram (ECG)
      - a. Normal
      - b. Dysrhythmia
  - D. Visual inspections
    - 1. Skin
    - 2. Eyes
    - 3. Nails
- III. **Communication**
  - A. Types
    - 1. Indications
    - 2. Contraindications
  - B. The non-English speaking patient
- IV. **Charting and Documentation**
  - A. Recognizing proper documentation
  - B. Manual vs. electronic
  - C. Ethical and legal aspects
- V. **Procedure Specific Patient Care**
  - A. Preprocedural

B. Postprocedural

**VI. Drug Dispensing**

A. Emergency situations

1. Types of drugs to use
2. When to use the drugs

B. Drug actions

1. Therapeutic
2. Adverse effects
  - a. Minor
  - b. Moderate
  - c. Severe
3. Interventions

**VII. AHA Advanced Cardiac Life Support**

A. Technologist role

B. Drugs

C. Cardiac rhythms

D. Life-support

# Advanced Sectional Anatomy

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

## Objectives

1. Distinguish normal anatomical structures on CT, MR ,ultrasound, nuclear medicine, fusion interventional and cardiac catheterization lab images in the transverse axial, coronal, sagittal and orthogonal (oblique) cross-sectional imaging planes common to each modality within the:
  - a. Head
  - b. Neck
  - c. Thorax
  - d. Abdomen
  - e. Pelvis
  - f. Body imaging
  - g. Extremities – large joints
2. Distinguish common pathologies recorded on multiplanar images.



## I. Head and Brain

### A. Surface anatomy of the brain

1. Fissures (sulci)
  - a. Longitudinal cerebral
  - b. Lateral (Sylvian)
  - c. Central (of Rolando)
2. Convolutions (gyri)
  - a. Precentral
  - b. Postcentral

### B. Sinuses

1. Frontal
2. Maxillary
3. Ethmoid
4. Sphenoid

### C. Facial bones

1. Mandible
2. Maxillae
3. Zygomas
4. Nasal bones
5. Inferior nasal conchae
6. Lacrimal
7. Palatine
8. Vomer

### D. Facial muscles

1. Orbicularis oculi
2. Orbicularis oris
3. Masseter

### E. Cranial bones

1. Frontal
2. Ethmoid
  - a. Nasal conchae (turbinates)
  - b. Nasal septum
3. Parietal
4. Sphenoid
  - a. Lesser wings
    - 1) Tuberculum sellae
    - 2) Sella turcica
    - 3) Dorsum sellae
    - 4) Anterior and posterior clinoid process
    - 5) Optic canals
  - b. Greater wings

- 1) Foramen rotundum
    - 2) Foramen ovale
    - c. Foramen spinosum
  - 5. Occipital
    - a. Foramen magnum
    - b. Internal and external occipital protuberance
    - c. Jugular foramen
  - 6. Temporal
    - a. Zygomatic process
    - b. External auditory meatus (EAM)
    - c. Internal auditory canal
    - d. Mastoid process
    - e. Petrous portion or ridge
- F. Lobes of the brain and midline cerebral hemisphere structures
  - 1. Frontal
  - 2. Parietal
  - 3. Occipital
  - 4. Temporal
  - 5. Insula (island of Reil)
  - 6. Cerebellum
  - 7. Corpus callosum (genu, rostrum, body and splenium)
  - 8. Septum pellucidum
- G. Cranial nerves
  - 1. Olfactory
  - 2. Optic
  - 3. Oculomotor
  - 4. Trochlear
  - 5. Trigeminal
  - 6. Abducens
  - 7. Facial
  - 8. Vestibulocochlear
  - 9. Glossopharyngeal
  - 10. Vagus
  - 11. Accessory
  - 12. Hypoglossal
- H. Brainstem
  - 1. Diencephalon
    - a. Thalamus
    - b. Hypothalamus
    - c. Optic chiasm
    - d. Optic tracts
    - e. Infundibulum (pituitary stalk)
    - f. Pituitary gland

- g. Mammillary bodies
  - h. Pineal gland
  - 2. Midbrain
  - 3. Pons
  - 4. Medulla oblongata
    - a. Spinal cord
- I. Arteries (Circle of Willis)
- 1. Vertebral
  - 2. Basilar
  - 3. Internal carotid
  - 4. Anterior and posterior communicating
  - 5. Anterior and posterior cerebral
  - 6. Middle cerebral
- J. Veins
- 1. Venous sinuses
    - a. Superior sagittal sinus
    - b. Vein of Galen
    - c. Straight sinus
    - d. Confluence of sinuses (torcular herophili)
    - e. Transverse sinus
    - f. Sigmoid sinus
  - 2. Internal jugular
- K. Ventricular system
- 1. Lateral ventricles (anterior, body, posterior, inferior or temporal and trigone or atrium)
  - 2. Interventricular foramen (of Monro)
  - 3. Third ventricle
  - 4. Cerebral aqueduct (of Sylvius)
  - 5. Fourth ventricle
  - 6. Foramen of Luschka
  - 7. Foramen of Magendie
  - 8. Choroid plexus
- L. Meninges
- 1. Dura mater
    - a. Extensions of the dura mater
      - 1) Falx cerebri
      - 2) Falx cerebelli
      - 3) Tentorium cerebelli
      - 4) Diaphragma sellae
  - 2. Arachnoid
  - 3. Pia mater
    - a. Epidural

b. Subdural

M. Basal ganglia

1. Caudate nucleus
2. Putamen
3. Globus pallidus
4. Claustrum
5. Internal capsule
6. External capsule
7. Extreme capsule

N. Orbit

1. Globe
2. Lens
3. Optic nerve
4. Lacrimal gland
5. Lateral rectus muscle
6. Medial rectus muscle
7. Superior rectus muscle
8. Inferior rectus muscle
9. Superior oblique muscle
10. Inferior oblique muscle
11. Orbital fat
12. Ophthalmic artery
13. Retinal vein

O. Anatomical structures of brain

1. Diploe
2. Subcutaneous soft tissue
3. Superior sagittal sinus (anterior and posterior)
4. Central sulcus
5. Interhemispheric fissure
6. Falx cerebri
7. Centrum semiovale
8. Corpus callosum (genu, rostrum, body and splenium)
9. Septum pellucidum
10. Fornix
11. Sylvian fissure
12. Insula
13. Lentiform nucleus (putamen and globus pallidus)
14. Caudate nucleus (head)
15. Internal capsule (anterior, body and posterior sections)
16. External capsule
17. Claustrum
18. Hippocampus
19. Tentorium cerebelli

20. Petrous portion or ridge
21. Cerebellar tonsil
22. Internal auditory canal (IAC)
23. Nasal septum
24. EAM
25. Clivus
26. Mastoid air cells

P. Lines of angulation (imaging baselines)

1. Orbitomeatal line
2. Infraorbitomeatal line
3. Acanthomeatal line
4. Mentomeatal line

Q. Anatomical landmarks

1. Glabella
2. Nasion
3. Acanthion
4. Mental point
5. EAM

**II. Neck**

A. Bones

1. Cervical vertebrae
  - a. Bony structures
  - b. Intervertebral disks
  - c. Spinal cord and nerves
  - d. Spinal ligaments

B. Organs

1. Pharynx
2. Larynx
3. Esophagus
4. Trachea
5. Salivary glands
6. Thyroid gland
7. Parathyroid glands
8. Lymph nodes

C. Vasculature and neurovasculature

1. Carotid arteries
2. Vertebral arteries
3. Jugular veins
4. Carotid sheath

D. Musculature

1. Anterior triangle
2. Posterior triangle

### III. Chest and Mediastinum

#### A. Bony thorax

1. Thoracic vertebrae
  - a. Bony structures
  - b. Intervertebral disks
  - c. Spinal cord and nerves
  - d. Spinal ligaments
2. Sternum
3. Ribs
4. Costal cartilages
5. Scapulae
6. Clavicles

#### B. Pulmonary

1. Apices (lung)
2. Diaphragm
3. Angles
4. Hilum
5. Lobes (lungs)
6. Trachea
7. Carina
8. Primary (mainstem) bronchi
9. Secondary bronchi

#### C. Mediastinum

1. Thymus gland
2. Heart
  - a. Coronary vessels and valves
  - b. Musculature and septal walls
3. Ascending aorta
4. Aortic arch
5. Branches of the aortic arch
6. Descending (thoracic) aorta
7. Inferior vena cava
8. Esophagus
9. Trachea
10. Thoracic duct
11. Lymph nodes
12. Azygos vein
13. Hemiazygos vein

#### D. Breasts

1. Musculature

2. Soft tissues

#### IV. Abdomen

- A. Bones
  1. Lumbar vertebrae
    - a. Bony structures
    - b. Intervertebral disks
    - c. Spinal cord and nerves
    - d. Spinal ligaments
- B. Diaphragm and openings
- C. Surface landmarks and regions
  1. Quadrants
    - a. Upper left
    - b. Upper right
    - c. Lower left
    - d. Lower right
- D. Addison's planes (regions)
  1. Left hypochondric
  2. Epigastric
  3. Right hypochondric
  4. Left lumbar
  5. Umbilical
  6. Right lumbar
  7. Left iliac
  8. Hypogastric
  9. Right iliac
- E. Branches of the abdominal aorta
  1. Anterior visceral branches
    - a. Celiac axis
      - 1) Left gastric artery
      - 2) Splenic artery
      - 3) Hepatic artery
  2. Superior mesenteric artery
    - a. Jejunal and ileal artery
    - b. Inferior pancreaticoduodenal artery
    - c. Middle colic artery
    - d. Right colic artery
    - e. Ileocolic artery
  3. Inferior mesenteric artery
    - a. Left colic artery
    - b. Sigmoid artery
    - c. Superior rectal artery

4. Lateral visceral branches artery
    - a. Suprarenal artery
    - b. Renal artery
    - c. Testicular or ovarian artery
  5. Parietal branches artery
    - a. Inferior phrenics artery
    - b. Lumbar artery
    - c. Middle sacral artery
  6. Terminal branches artery
    - a. Common iliac artery
- F. Tributaries of the vena cava
1. Anterior visceral vein
    - a. Hepatic veins
  2. Lateral visceral vein
    - a. Right suprarenal vein
    - b. Renal veins
    - c. Right testicular or ovarian vein
  3. Tributaries of origin
    - a. Common iliac vein
    - b. Median sacral vein
- G. Tributaries of the portal vein
1. Splenic vein
  2. Inferior mesenteric vein
  3. Superior mesenteric vein
    - a. Left gastric vein
    - b. Right gastric vein
    - c. Cystic vein
- H. Abdominal organs and structures
1. Abdominal cavity
    - a. Peritoneum
    - b. Peritoneal space
    - c. Retroperitoneum
    - d. Retroperitoneal space
  2. Liver
  3. Gallbladder and biliary system
  4. Pancreas and pancreatic ducts
  5. Spleen
  6. Adrenal glands
  7. Urinary system and tract
    - a. Kidneys
    - b. Ureters
  8. Stomach
  9. Small intestine



10. Colon
11. Musculature

## V. Pelvis

- A. Bony structures
  1. Proximal femur
  2. Ilium
  3. Ischium
  4. Pubis
  5. Sacrum
  6. Coccyx
  
- B. Pelvic vasculature
  1. Arterial
    - a. Common iliacs artery
    - b. Internal iliacs artery
    - c. External iliacs artery
    - d. Ovarian/testicular artery
  2. Venous
    - a. External iliacs vein
    - b. Internal iliacs vein
    - c. Common iliacs vein
    - d. Ovarian/testicular vein
  
- C. Pelvic organs
  1. Urinary bladder
    - a. Ureter
    - b. Urethra
  2. Small intestine
    - a. Terminal ilium and ileocecal valve
  3. Colon
    - a. Ascending
    - b. Descending
    - c. Sigmoid
    - d. Rectum
    - e. Vermiform appendix
  4. Female reproductive organs
    - a. Vagina
    - b. Cervix
    - c. Uterus
    - d. Fallopian tubes
    - e. Ovaries
  5. Male reproductive organs
    - a. Testes/scrotum
    - b. Prostate gland
    - c. Seminal vesicles

- d. External to pelvis
  - 1) Penis

**VI. Extremities**

- A. Large joints and associated soft-tissue structures
  - 1. Shoulder
  - 2. Elbow
  - 3. Wrist
  - 4. Hip
  - 5. Knee
  - 6. Ankle

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# Communication

Communication is important because the radiologic technologist needs to effectively relate and communicate with patients and other health care professionals. This content focuses on expanding the knowledge base and skills necessary for interpersonal, internal, external and written communications. Sensitivity to human diversity will be emphasized.

## Objectives

1. Apply the appropriate interpersonal communication methods to a given health care relationship.
2. Apply intracommunication principles that affect health care relationships.
3. Develop an internal communication strategy for a small group and its organization.
4. Develop a presentation and deliver it to an audience.
5. Determine the appropriate communication tool for delivering information to a specific audience.
6. Compose written communication.

## **I. Interpersonal Communications**

### **A. Communication types**

1. Verbal
  - a. Intentional and unintentional language nuances
  - b. Style
  - c. Empathy and sympathy
2. Nonverbal
  - a. Kinesics and body movement
    - 1) Emblems
    - 2) Illustrators
    - 3) Regulators
    - 4) Affect (internal emotion) displays
    - 5) Body manipulators
    - 6) Body movement and posture
    - 7) Personal appearance and clothing
    - 8) Touching
  - b. Spatial zones
    - 1) Intimate
    - 2) Personal
    - 3) Social
    - 4) Territorial
3. Formal and informal
4. Symbols
5. Negotiation

### **B. Listening and feedback**

1. Hearing vs. listening
2. Active vs. inactive listening
3. Reflecting
4. Feedback

### **C. Building rapport**

1. Self-disclosure
2. Trust
3. Respectful social interactions
4. Respect for human diversity
5. Barriers to communication

### **D. Types of health care relationships**

1. Professional – patient
  - a. Translation of medical terminology into lay terms
2. Professional – professionals
3. Professional – family
4. Patient – family
5. Conflict management

## **II. Intrapersonal Communication**

- A. Self-perception
  - 1. Roles
  - 2. Personal orientation
  - 3. Personality traits
- B. Maslow's hierarchy of needs
- C. Defense mechanisms

## **III. Internal Communication**

- A. Small group
  - 1. Group types
  - 2. Roles and responsibilities
  - 3. Factors affecting group performance
    - a. Personality
    - b. Cohesion
    - c. Conflict
    - d. Conformity
    - e. Networks
- B. Organizational communication
  - 1. Message types
  - 2. Communication structure
  - 3. Channels
  - 4. Professionalism
  - 5. Interviewing

## **IV. Oral Communication**

- A. Speaker preparation
  - 1. Topic identification
  - 2. Audience analysis
  - 3. Environment
  - 4. Approach
- B. Speech creation and delivery
  - 1. Topic selection
  - 2. Narrowing a topic
  - 3. Source materials
  - 4. Parts of a speech
  - 5. Informative speech patterns
  - 6. Persuasive speech patterns
  - 7. Supporting materials for clarification
  - 8. Speech delivery
    - a. Speaker-audience interactions

**V. Communication Tools**

A. Presentation tools

1. Software
2. Slides
3. Overheads

B. Multimedia

1. CD-ROM
2. Video
3. Internet
4. Text

C. Mass media

1. Functions of mass communication
2. Effects of mass media

**VI. Written Communication**

A. Types

B. Interpretation/synthesis

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# Ethics and Diversity

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

## Objectives

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

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## **I. Values and Ethics**

### **A. Personal**

1. Values development
2. Effect on medical care
3. Impact on patient care
4. Values clarification
5. Moral development

### **B. Societal**

1. Rights and privileges
2. Community values
3. Impact on patient care
4. Moral development

### **C. Professional**

1. Values development
2. Values conflict
3. Impact on patient care
4. Moral development

### **D. Contemporary issues**

## **II. Culture, Ethnicity and Diversity**

### **A. Cultural beliefs and norms**

### **B. Societal and individual factors**

1. Socioeconomic
2. Gender
3. Sexual orientation
4. Age
  - a. Infancy
  - b. Childhood
  - c. Adolescence
  - d. Adulthood
  - e. Middle age
  - f. Elderly
5. Family structure
6. Religion
7. Lifestyle choices and behaviors
8. Mentally and physically challenged



# Health Care Delivery

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

## Objectives

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

- I. Evolution of the American Health Care System**
  - A. Historical perspective
  - B. Evolution of national standards
  - C. Evolution of state standards
  - D. Landmark events
- II. Health Policy Formulation**
  - A. National policy-making process
  - B. State policy-making process
- III. Policy Influences on Direct Patient Care**
  - A. National
  - B. State
  - C. Local
  - D. Private
    - 1. For profit
    - 2. Not for profit
- IV. Health Care Delivery Systems**
  - A. Philosophy/mission
  - B. Organizational structure
  - C. Recipients of care
  - D. Health care providers
- V. Sources of Research and Monitoring Health Care Delivery**
  - A. International agencies
  - B. National agencies
  - C. State (academic health centers)
  - D. Professional organizations/societies
- VI. The Impact of Imaging Technology on Health Care Delivery**
  - A. Teleradiography

- B. Fusion technologies
- C. Patient information/education resources
- D. Rapid development of technology

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# Health Care Law and Compliance

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

## Objectives

1. Analyze various scenarios involving roles and responsibilities of radiologic technologists to determine if they are working within the scope of practice and using appropriate practice standards.
2. Evaluate an existing risk management plan to determine if it complies with effective risk management principles.
3. Properly complete and investigate an incident report.
4. Analyze a case study to determine implications of civil and criminal law upon professional licensing/certification and accreditation.
5. Outline civil procedures followed when a complaint is filed against an R.T.
6. Given a legal complaint scenario, determine which party has the burden of proof and the party's responsibilities.
7. Analyze a situation to determine the type of patient consent granted.
8. Appraise a scenario to determine if the radiologic technologist is violating the patient's rights.
9. Differentiate between the employer's and employee's legal responsibilities.
10. Classify the accreditation and compliance issues relevant to health care facilities.

## **I. Scope of Practice and Practice Standards**

- A. Scope of practice
  - 1. State laws and regulations
    - a. Body of laws
  - 2. National certification
  - 3. Institutional authority
  - 4. National organizations
    - a. Persuasive authority
- B. Practice standards
  - 1. Clinical performance standards
  - 2. Quality performance standards
  - 3. Professional performance standards

## **II. Components of a Risk Management Program**

- A. Decision making as an outcome of risk analysis
  - 1. Impact evaluation
  - 2. Probability
  - 3. Time frame
  - 4. Risk classification
  - 5. Risk prioritization
  - 6. Determining responsibilities
- B. Planning to reduce risk
  - 1. Present and future actions
- C. Risk management team
  - 1. Involvement of other departments/agents
  - 2. Application of policy and procedures
    - a. Claims prevention
    - b. Incident reporting
      - 1) Components of the report
      - 2) Timeliness
      - 3) Documenting details of the occurrence
        - a) Objectivity in reporting
      - 4) Witnesses
      - 5) Recording the report
      - 6) Record of inspection and care delivered
      - 7) Recording follow-up care and/or resolution of injury
  - 3. Assignment of tasks
  - 4. Monitoring risk indicators and mitigating actions
  - 5. Frequency of plan assessment
  - 6. Indicators for education and training
  - 7. Communicating results

### III. Legal Issues

#### A. Types of law

##### 1. Civil

###### a. Civil liability intentional torts

- 1) Assault
- 2) Battery
- 3) False imprisonment
- 4) Emotional distress
- 5) Fraud
- 6) Invasion of privacy
- 7) Defamation
  - a) Slander
  - b) Libel

###### 8) Vicarious liability

###### b. Unintentional torts/negligence

- 1) Standard of care
- 2) Contributory
- 3) Comparative

##### 2. Criminal law

- a. Criminal negligence
- b. Falsification of records
- c. Drugs
- d. Fraud
- e. Patient abuse
- f. Theft

##### 3. Administrative law

- a. Federal
  - 1) HIPAA
  - 2) Equal Employment Opportunity (EEO)
  - 3) Others
- b. State – licensure
- c. Local

### IV. Civil Procedures

#### A. Pleadings

#### B. Summons and complaint

#### C. Discovery

#### D. Motions

#### E. Trial procedure

#### F. Evidence

- G. Verdict
- H. Appeals
- V. **Burden of proof**
  - A. *Res Ipsa Loquitur*
  - B. *Respondeat Superior*
- VI. **Patient Consent**
  - A. Implied
  - B. Informed
  - C. Uninformed
  - D. Research (Institutional Review Board, or IRB)
- VII. **Advanced Directives**
  - A. Living wills
  - B. Do-not-resuscitate orders (DNR)
  - C. Power of attorney
- VIII. **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. Injury prevention
    - 6. Safety/quality improvement committees
    - 7. Risk management
  - I. Whistleblower protection
- IX. Accreditation and Compliance Issues**
- A. Purpose of accreditation
  - B. Health care facility accreditation
    - 1. Government
      - a. Nuclear Regulatory Commission (NRC)
    - 2. Private
      - a. The Joint Commission
      - b. American College of Radiology (ACR)
      - c. Intersocietal Commission on Accreditation (ICA)
    - 3. State (as applicable)
  - C. Health care professional credentialing
    - 1. Certification
    - 2. Licensure
    - 3. Registration
  - D. Credentialing agencies
    - 1. National organizations



2. State agencies
- E. 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
- F. 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
  5. Conference of Radiation Control Program Directors Inc. (CRCPD)

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# Pathophysiology

A rich appreciation of the characteristics and manifestations of diseases caused by alterations or injury to the structure or function of the body are essential to the radiologic science professional. The in-depth study of pathophysiology allows the professional to communicate better with other health care professionals, including physicians and scientists, as well as with the patient, for the history and physical assessment.

## Objectives

1. Discuss predictive factors influencing health and the development of disease, including genetics, lifestyle, age and environment.
2. Outline how the body responds to hereditary, lifestyle, and environmental influences on health.
3. Discuss the pathophysiology of the major body systems.
4. Describe clinical manifestations of disease processes occurring across the lifespan.

- I. **Concepts of Health and Disease Defined**
  - A. Genetic, lifestyle and environmental influences on health and the development of disease
  - B. Physiologic response to stress
  - C. Physiologic response to injury
  - D. Physiologic response to infectious agents
  - E. Physiologic response to disturbance in cell growth
- II. **Genetic Disorders**
  - A. Autosomal dominant
  - B. Autosomal recessive
  - C. X - linked
  - D. Chromosomal abnormalities
- III. **Immune Disorders**
  - A. Autoimmune diseases
  - B. Immunodeficiency
- IV. **Hematologic Disorders**
  - A. Platelet
  - B. Red blood cell
  - C. White blood cell
- V. **Fluid and Electrolyte Disorders**
- VI. **Acid/Base Disorders**
- VII. **Nutritional Disorders**
- VIII. **Pulmonary Disorders**
  - A. Obstructive diseases
  - B. Restrictive disease
  - C. Pulmonary vascular diseases

- D. Pulmonary cancers
- IX. **Cardiovascular Disorders**
  - A. Congenital heart defects
  - B. Coronary artery disease
  - C. Valvular disease
  - D. Congestive heart failure
  - E. Vascular disease
  - F. Cerebral vascular accident

- X. **GI Disorders**
  - A. Gastroesophageal disorders
  - B. Peptic disorders
  - C. Disorders of the small and large intestine
  - D. Disorders of the liver
  - E. Disorders of the gall bladder
  - F. Disorders of the pancreas
  - G. Neoplasms of the GI system

- XI. **Renal Disease**
  - A. Urolithiasis
  - B. Renal failure
  - C. Nephrosis
  - D. Acute tubular necrosis
  - E. Incontinence

- XII. **Neurologic Disorders**
  - A. Pain
  - B. Seizures

- C. Coma
  - D. Spinal cord injury
  - E. Alzheimer's disease
  - F. Neurologic tumors
  - G. Schizophrenia
  - H. Spina bifida
  - I. Cerebral palsy
  - J. Parkinson's disease
  - K. Myasthenia gravis
- XIII. Musculoskeletal Disorders**
- A. Fractures
  - B. Arthritis
  - C. Cancer
- XIV. Reproductive Disorders**
- A. Male disorders
  - B. Female disorders
  - C. Sexually transmitted diseases
- XV. Dermatologic Disorders**
- A. Thermal injury
  - B. Atopic dermatitis
  - C. Infectious and fungal disorders
- XVI. Sensory Disorders**
- A. Visual
  - B. Hearing

# Patient Information Management

## **Description**

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

## **Objectives:**

1. Relate The Joint Commission standards and Health Insurance Portability and Accountability Act (HIPAA) regulations regarding the accountability and protection of patient information.
2. Evaluate the patient record to ensure The Joint Commission standards and HIPAA regulations are satisfied.
3. Judge the potential abuses in maintaining confidential patient information.

- I. **The Joint Commission 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 and demonstrating compliance
  - B. Consents
    - 1. Informed
      - a. Patient and provider elements
    - 2. 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
- II. **Health Insurance Portability and Accountability Act (HIPAA)**
  - A. Evolution of HIPAA
  - B. Impact on health care providers and personnel
  - C. Disclosure
  - D. State laws and regulations affecting the use of disclosure of health information
- III. **Patient Information**
  - A. Patient record
    - 1. Information systems and standards
      - a. Hospital information system (HIS)
      - b. Radiology information system (RIS)
      - c. Picture archiving and communications system (PACS)
    - 2. Digital imaging and communication in medicine (DICOM)
    - 3. Patient-centered medical record
    - 4. Problem-oriented medical record
    - 5. Source-oriented medical record
    - 6. Computer-based patient record
    - 7. Coding and standardization
  - B. Challenges to the protection of patient information
    - 1. Patient issues
      - a. Trust in the physician

- b. Who gets what information
    - c. Rights in the case of an error or unauthorized disclosure of information
  - 2. Provider issues
    - a. Implementation of confidentiality procedures
    - b. Patient education on confidentiality rights
  - 3. Managed care organizations
    - a. Information shared with external parties
  - 4. Research
    - a. Access to information without breaching patient rights
- C. Physical or electronic medical records content
  - 1. Elements of proper charting and documentation
  - 2. Legal ramifications of improper charting and documentation

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# Pharmacology

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

## Objectives

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

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

- A. Federal drug laws
  1. 1906 Pure Food and Drug Act
  2. 1938 Federal Food, Drug and Cosmetic Act
  3. 1970 Controlled Substances Act
- B. State drug laws
- C. The Food and Drug Administration
- D. Drug Enforcement Administration
- E. Proper disposal procedures

## **II. Abbreviations and Systems of Measurement**

## **III. Drug Nomenclature and 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
  6. Adverse reactions
  7. Interactions
- E. Drug references
  1. *Physicians' Desk Reference*
  2. *United States Pharmacopoeia dispensing information*
  3. *American Hospital Formulary Service*
  4. *Compendium of Drug Therapy*

5. *Facts and Comparisons*
6. *American Hospital Formulary Service Drug Information*
7. *Mosby's GenRx*

#### IV. **Biopharmaceutics**

- A. Dosage forms
  1. Tablets
  2. Capsules
  3. Troches
  4. Compressed suppositories or inserts
  5. Injectables
  
- B. Pharmacokinetics
  1. Disintegration and dissolution
  2. Absorption
  3. Distribution
  4. Metabolism
  5. Excretion
  
- C. Other variables
  1. Age
    - a. Pediatric considerations
    - b. Geriatric considerations
  2. Weight
  3. Sex
  4. Psychological state
  5. Drug interactions
  6. Dosage
  7. Route
  
- D. Unexpected responses to drugs
  1. Teratogenic effect
  2. Tolerance
  3. Dependence
  4. Hypersensitivity
  5. Anaphylactic reaction

#### V. **Pharmacodynamics**

- A. Mechanisms of action
  1. Drug-receptor interactions
  2. Drug-enzyme interactions
  3. Nonspecific response relationships
  4. Drug response relationships
  
- B. Half-life

- C. Therapeutic index
  - D. Adverse effects
  - E. Drug-drug interactions
- VI. Safe Dosage Preparation**
- A. Calculation guidelines
  - B. Basic calculation
  - C. Ratio and proportion
  - D. Age-appropriate dosage
- VII. Responsibilities and Principles of Drug Administration**
- A. Responsible drug administration
    - 1. Informed consent
    - 2. Preprocedural/postprocedural assessment
    - 3. Laboratory evaluation
  - B. Medication error avoidance
- VIII. Administration Routes and Techniques**
- A. Gastrointestinal (GI)
    - 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

**IX. Frequently Used Drug Categories**

- A. Adrenergics (vasoconstrictors)
- B. Adrenergic blocking agents
- C. Analgesics
- D. Anesthetics
- E. Antiarrhythmics
- F. Antimicrobials
- G. Antichlorogenics
- H. Anticoagulants (blood thinners)
- I. Anticonvulsants
- J. Antidepressants
- K. Antiemetics
- L. Antifungals
- M. Antihistamines
- N. Antihypertensives
- O. Antiperistaltics
- P. Antipsychotics
- Q. Antipyretics
- R. Antitussives
- S. Antivirals
- T. Barbiturates
- U. Bronchodilators
- V. Cardiac depressants
- W. Cardiac stimulants

- X. Cathartics
- Y. Diuretics
- Z. Emetics
- AA. Hypoglycemics
- BB. Opioids (narcotics)
  - 1. Opioid antagonists
- CC. Radiographic contrast media
- DD. Radioactive isotopes
- EE. Radiopharmaceuticals
- FF. Sedatives
- GG. Skeletal muscle relaxants
- HH. Stimulants
  - II. Tranquilizers
- JJ. Vasodilators
- X. **Radiopaque Contrast Media**
  - A. Forms
    - 1. Parenteral
    - 2. Enteral
  - B. Pharmacology of parenteral (intravascular) contrast media
    - 1. Osmolality, osmolarity, osmotic activity
    - 2. Categories
    - 3. Distribution
    - 4. Excretion
  - C. Adverse pharmacodynamics of parenteral contrast media
    - 1. Osmolality
    - 2. Chelation
    - 3. Anticoagulation
    - 4. Immune system-like
    - 5. Nephrotoxicity
    - 6. Neurotoxicity

7. Thyrotoxicity
8. Drug-drug
9. Other (general)

D. Administration and dosage

E. Pharmacology of enteral contrast agents

1. Barium sulfate
2. Gastrografin
3. Other

F. Patient counseling and recommended follow-up care for patients undergoing a procedure requiring the use of contrast media

1. Following barium procedures
2. Following iodinated contrast media procedures

**XI. Adverse Reactions**

A. Patient assessment

1. Screening for potential adverse reactions
2. Monitoring (ongoing assessment)

B. Patient treatment

1. Department protocol for each pharmacologic agent
2. Technologist responsibilities
3. Symptoms and recommended response
  - a. Minor reaction
  - b. Moderate reaction
  - c. Infiltration

# Quality Management

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

## Objectives

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



- I. **Definitions**
  - A. Quality management
  - B. Quality assurance
  - C. Quality control
- II. **Concepts and Principles of Quality Management**
  - A. Philosophical basis
  - B. QM problem-solving strategies
  - C. Tools for problem identification and analysis
- III. **Collection and Analysis of QA Data**
  - A. Development of indicators
  - B. Data collection methods
  - C. Assessment of outcomes
  - D. Standards for quality
- IV. **Benefits**
  - A. Patient
  - B. Department
- V. **QM Requirements for Computed Radiography/Digital Radiography/PACS**
  - A. Initial acceptance testing
  - B. System reader preventive maintenance (PM)
  - C. Plate maintenance
  - D. Uniformity of processing codes
  - E. System detectors
  - F. Image quality
  - G. Image output
  - H. Repeat/reject analysis

# Research Methods and Information Literacy

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

## Objectives

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

## **I. Analysis of Research Articles**

- A. Assessing appropriateness of article for source material
  - 1. Scholarly (peer-reviewed) publications
  - 2. Newsmagazines, other non-peer-reviewed
- B. Assessing quality of information
  - 1. Research design
  - 2. Research bias
  - 3. Study validity
- C. Assessing value of article
  - 1. Application for future research and recommendations
  - 2. Implications for professional practice

## **II. Information Literacy Concepts**

- A. Research quality
  - 1. Technical accuracy
  - 2. Reader comprehension
  - 3. Scholarly
  - 4. Relevance to professional practice
  - 5. Effectiveness of writing style
  - 6. Appropriateness of form and style
- B. Systematic literature analysis
  - 1. Determining sources of information
  - 2. Using information search strategies
  - 3. Assessing value and appropriateness of source material
- C. 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

## **III. Preparing a Research Project**

- A. Topic selection
  - 1. Analysis of current literature on topic
  - 2. Identification of clinical practice issues

- B. Information search strategies
  - 1. Identifying information sources
  - 2. Types of searches (manual, electronic – (Ovid, PubMed, etc.))
- C. Ethical principles and legal consideration
- D. Types of research projects
  - 1. Literature review
  - 2. Survey
  - 3. Descriptive/technical
  - 4. Case study projects
  - 5. Abstracts
  - 6. Posters [Dissemination format – not project type, the first 5 types can be in poster format]
  - 7. Qualitative (observation or interview)
- E. Review of the literature
  - 1. Analysis of source material
  - 2. Integration of material into project
- F. Research design and data collection
  - 1. Qualitative
  - 2. Quantitative
  - 3. Mixed methods
- G. Data Analysis
  - 1. Terms (sensitivity, specificity, predictor values, false +/-, etc.)
  - 2. Statistical methods – determine significance of data
  - 3. Qualitative methods
  - 4. Triangulation of multiple data sources
- H. Dissemination of findings
  - 1. Format
    - a. Abstract
    - b. Article
    - c. Poster
    - d. PowerPoint presentation
    - e. Others
  - 2. References, (e.g. American Medical Association or AMA, American Psychological Association, or APA) and illustrations (images, charts, etc.)
- I. Preparation of draft and revisions of project
- J. Submission for publication
  - 1. Peer-reviewed
  - 2. Other (editorial, columns, etc.)

K. Funding resources

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# Teamwork

Teamwork is a vital component of all health care teams. To promote an effective team, the radiologic technologist must be able to exercise the ability to function within an interdisciplinary team. It is highly recommended for this information to be applied throughout the curriculum to ensure adequate understanding based on various situations.

## Objectives

1. Evaluate the elements of a team as they relate to the effectiveness of the team.
2. Debate the advantages and disadvantages of a team.
3. Justify the role of team members in the effectiveness of the team.

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- I. Nature of Committees and Teams**
  - A. Philosophy/definition of teamwork
  - B. Elements of an effective team
  - C. Team-building goals
  - D. Ways to improve teamwork
- II. Purposes and Uses of Groups and Teams**
  - A. Limitations
  - B. Disadvantages
  - C. Advantages of effectiveness
- III. Teams**
  - A. Members
    - 1. The leader
      - a. Coaching
      - b. Empowering
      - c. Facilitating
    - 2. Team members
      - a. Effective traits
      - b. Role recognition
  - B. The basics of the team
    - 1. Vision
    - 2. Mission
    - 3. Goals
  - C. Understanding other team members
    - 1. Management style of the team leader
    - 2. Understand types of styles
    - 3. Influencing the style of others
    - 4. Working with different styles
  - D. Key skills for productive teams
    - 1. Interdependence
    - 2. Trust
    - 3. Communication flow
    - 4. Decision making
      - a. Conflict management
      - b. Conflict resolution

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