Forensic Radiography Educational Framework

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

Introduction

Conducting examinations that use ionizing radiation to gather and analyze forensic evidence constitutes forensic radiography, an academic and scientific discipline. In 2007, the ASRT convened a task force to discuss and investigate the state of forensic radiography in the United States and the role of the professional organization in improving the quality of forensic imaging.

This educational framework is a result of the task force's work. It was developed by a committee of educators and forensic radiology practitioners to ensure safe and quality practice of forensic radiography. The committee recognized that personnel performing forensic radiology examinations follow three basic paths; this framework is designed to complement each of those paths:

1. Registered technologist.
2. Limited x-ray machine operator, or LXMO.
3. Forensic assistant (usually assistant to a forensic pathologist or medical examiner; for the purposes of this document, this term also is used to refer to any personnel in medical examiner and coroner officers or forensic laboratories, including morgue assistants, laboratory clerks and pathologists).

Although forensic assistants perform imaging tasks within a limited scope, the developers of the educational framework believe that the knowledge and cognitive skills underlying the safe and accurate performance of the forensic radiography examination must be equivalent to that of the registered technologist. Operation of equipment that emits ionizing radiation presents concerns regarding safety of operators and personnel near the equipment, as well as quality assurance issues, regardless of the equipment's purpose. The content is designed with special attention to proper radiation protection and production of quality images. Image quality not only is important to producing credible evidence in criminal and civil cases, but for comparing postmortem images to antemortem images in cases of autopsy and identification.

The framework also provides educational content for radiographers to gain knowledge specific to forensic sciences, such as law, evidence collection and administrative proceedings. At any given

time, a radiologic technologist practicing in a hospital or imaging center may perform a forensic examination. The nature of a patient's injuries and circumstances mean that the examination findings may be critical legal evidence. The framework helps LXMOs identify skills gaps in radiography and forensics.

The educational framework committee acknowledged that each individual will require varying amounts and types of additional education, depending on his or her background, skills and experience. The gap analysis provides the opportunity to identify educational needs for professionals in each of the three basic paths. Check marks indicate elements associated with forensic radiography that are present in existing curriculum documents and/or found in existing educational programs of the specialties indicated. Elements that are not checked for a given specialty are intended as a guide for the development of educational pathways (see the example below).

Radiation Protection	R.T.	LXMO	F.A.
I. Introduction			
A. Justification for radiation protection	☑	☑	
B. Potential biologic damage of ionizing radiation	☑	☑	
C. Objectives of a radiation protection program	☑	☑	
D. Sources of radiation	☑	☑	
E. Legal and ethical responsibilities	☑	☑	

Proposed minimum hours of didactic instruction and clinical experience have been included as guidelines to assist in program planning. Faculty members are encouraged to expand and broaden these fundamental objectives as they incorporate them into their curricula. Specific instructional methods, course level, course length and number of courses or units intentionally were omitted to allow for programmatic prerogative as well as creativity in instructional delivery. Resources are included to assist faculty members in program planning.

Table of Contents

Gap Analysis

Digital Image Acquisition and Display	R.T.	LXMO	F.A.
I. Basic Principles of Digital Radiography			
A. Digital image characteristics	☑		
B. Digital receptors	☑		
II. Image Acquisition Errors			
A. Scatter control	☑		
III. Fundamental Principles of Exposure			
A. Optimal receptor exposure	☑		
B. Receptor response – detective quantum efficiency (DQE)	☑		
C. Control patient exposure	☑		
D. Monitor patient exposure	☑		
IV. Image Evaluation			
A. Exposure level	☑		
B. Contrast	☑		
C. Recorded detail	☑		
D. Artifacts	☑		
V. PACS	☑		
A. Terminology	☑		
B. System components and function	☑		
C. Digital imaging in communications and medicine (DICOM)	☑		
Film-screen Image Production and Evaluation			
I. Imaging Quality Standards			
A. Pathologist's involvement in setting image standards	☑	☑	
B. Care and security of evidence concerns	☑	☑	
C. Procedures for maintaining image standards	☑	☑	

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	R.T.	LXMO	F.A.
II. Radiographic Density			
A. Definition	☑	☑	
B. Acceptable range	☑	☑	
C. Factors	☑	☑	
III. Radiographic Contrast			
A. Definition	☑	☑	
B. Types	☑	☑	
C. Components	☑	☑	
D. Factors	☑	☑	
IV. Recorded Detail			
A. Definition	☑	☑	
B. Components	☑	☑	
C. Factors	☑	☑	
V. Distortion			
A. Definition	☑	☑	
B. Types	☑	☑	
C. Factors	☑	☑	
VI. Exposure Latitude			
A. Definition	☑	☑	
B. Factors	☑	☑	
VII. Beam-limiting Devices			
A. Definition	☑	☑	
B. Purposes	☑	☑	
C. Types, function and application of each	☑	☑	
VIII. Beam Filtration			
A. Definition	☑	☑	
B. Rationale	☑	☑	
C. Composition	☑	☑	

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	R.T.	LXMO	F.A.
D. Types	☑	☑	
E. Image quality	☑	☑	
F. Patient exposure	☑	☑	
IX. Scattered and Secondary Radiation			
A. Definitions	☑	☑	
B. Factors	☑	☑	
C. Effects	☑	☑	
X. Control of Exit/Remnant Radiation			
A. kVp selection	☑	☑	
B. Grids	☑	☑	
XI. Technique Formulation			
A. Purpose	☑	☑	
B. Considerations	☑	☑	
C. Types	☑	☑	
XII. Exposure Calculations			
A. Factors	☑	☑	
B. Calculations	☑	☑	
XIII. Image Receptor Handling and Storage			
A. Processing considerations	☑	☑	
B. Storage considerations	☑	☑	
XIV. Characteristics of Image Receptors			
A. Film Types	☑	☑	
B. Composition	☑	☑	
C. Definition, influence and application of image receptor properties	☑	☑	
D. Digital systems	☑	☑	
E. Characteristic curves	☑	☑	

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	R.T.	LXMO	F.A.
XV. Image Receptor Holders and Intensifying Screens			
A. Image receptor holders	☑	☑	
B. Intensifying screens	☑	☑	
XVI. Processing of the Images			
A. Darkroom lighting	☑	☑	
B. Processor systems/functions	☑	☑	
C. Processing cycle	☑	☑	
D. Maintenance/cleaning	☑	☑	
XVII. Digital Processing			
A. Algorithms	☑		
B. Histograms	☑		
C. Resolution	☑		
D. Postprocessing	☑		
E. Exposure indicator (patient dose)	☑		
VIII. Artifacts			
A. Definition	☑		
B. Types	☑		
C. Causes	☑		
D. Effects	☑		
E. Preventive/corrective maintenance	☑		
XIX. Imaging Standards			
A. Purpose	☑		
B. Problem-solving process	☑		
C. Establishing acceptable limits	☑		
XX. Image Quality Factors			
A. Density	☑		
B. Contrast	☑		
C. Recorded detail	☑		
D. Distortion	☑		

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	R.T.	LXMO	F.A.
E. Automatic exposure control	☑		
F. Processing	☑		
G. Computed radiography (CR)	☑		
H. Digital radiography (DR)	☑		
XXI. Procedural Factors			
A. Image identification	☑		
B. Positioning	☑		
C. Centering	☑		
D. Radiation protection	☑		
E. Patient preparation	☑		
F. Artifacts	☑		
XII. Corrective Action			
A. Equipment	☑		
B. Technical factors	☑		
C. Procedural factors	☑		
D. Artifacts	☑		
Fluoroscopic Unit Operation and Safety			
I. X-ray Tubes			
A. Construction	☑		
B. Extending tube life	☑		
II. Components of the Fixed Fluoroscopic Unit			
A. Table	☑		
B. Radiation source	☑		
C. Image intensifier carriage	☑		
D. Image intensifier construction	☑		
E. Intensification principles/characteristics	☑		

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	R.T.	LXMO	F.A.
F. Viewing and recording systems	☑		
G. Digital fluoroscopy	☑		
III. Components of the Mobile Fluoroscopic Unit			
A. Control panel	☑		
B. Radiation source	☑		
C. Image intensifier/ flat panel detector	☑		
D. Optics system	☑		
E. Video interface	☑		
F. Locks and angle indicators	☑		
G. Equipment provisions	☑		
H. Limiting the use of "high level control" or "boost position" during fluoroscopy	☑		
I. Personnel monitoring of radiation exposure	☑		
IV. Technical Factors Affecting the Radiation Dose Rate for Patients and Operators			
A. Direct factors	☑		
B. Indirect factors	☑		
C. Patient and/or operator dose reducers	☑		
D. Image intensifiers and flat panel detectors	☑		
V. Operator Controls of the Fluoroscopic Unit			
A. Control panel setting(s) for fluoroscopy vs. dose	☑		
B. Collimator control	☑		
C. Compression devices	☑		
D. Fluoro grid device	☑		
E. Exposure switch(es)	☑		
F. Spot film device	☑		

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	R.T.	LXMO	F.A.
VI. Personnel Protection			
A. Personnel radiation protection	☑		
B. Protective apparel and accessories	☑		
C. Other safety hazards	☑		
Fundamentals, Ethics and Law of Health Care			
I. The Health Science Professions			
A. Radiologic technology	☑	☑	
B. Health care professions	☑	☑	
II. The Health Care Environment			
A. Health care systems	☑	☑	
B. Health care delivery settings	☑	☑	
C. Payment/reimbursement systems	☑	☑	
III. Facility Organization			
A. Philosophy and mission	☑	☑	
B. Administrative services	☑	☑	
C. Medical services	☑	☑	
IV. Radiology Organization			
A. Professional personnel	☑	☑	
B. Support personnel	☑	☑	
C. Patient services	☑	☑	
V. Accreditation			
A. Definition	☑	☑	
B. Institution accreditation	☑	☑	
C. Programmatic accreditation	☑	☑	
VI. Professional Credentialing			
A. Definition	☑	☑	
B. Agencies	☑	☑	

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	R.T.	LXMO	F.A.
VII. Professional Organizations			
A. Purpose, function, activities	☑	☑	
B. Local organizations	☑	☑	
C. State organizations	☑	☑	
D. National	☑	☑	
E. International	☑	☑	
F. Related associations, organizations	☑	☑	
VIII. Professional Development			
A. Methods of advancement	☑	☑	
B. Employment considerations	☑	☑	
C. Additional career ladders	☑	☑	
D. Continuing education and competency requirements	☑	☑	
IX. Ethics in Health Care			
A. Moral reasoning	☑	☑	
B. Personal behavior standards	☑	☑	
C. Competence	☑	☑	
D. Professional attributes	☑	☑	
E. Limited scope of practice defined	☑	☑	
F. Self-assessment and self-governance	☑	☑	
G. Continuing professional education	☑	☑	
H. Professional standards of clinical practice	☑	☑	
I. Code of professional ethics	☑	☑	
J. Ethical principles	☑	☑	
K. Organizational ethics	☑	☑	
L. Individual and societal rights	☑	☑	
M. Autonomy vs. behavior control	☑	☑	
N. Medical/health care research	☑	☑	
O. Ethical decision making	☑	☑	

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	R.T.	LXMO	F.A.
X. Legal Responsibilities			
A. Parameters of legal responsibility	☑	☑	
B. Scope of practice and responsibilities of the forensic assistant	☑	☑	
Human Structure and Function			
I. Anatomical Nomenclature			
A. Terms of direction	☑	☑	
B. Body planes	☑	☑	
C. Body cavities – structural limits, function, contents	☑	☑	
II. Landmarks and Underlying Anatomy			
A. Cranium	☑	☑	
B. Neck	☑	☑	
C. Spine	☑	☑	
D. Thorax	☑	☑	
E. Abdomen	☑	☑	
F. Pelvis	☑	☑	
G. Extremities	☑	☑	
III. Skeletal System			
A. Osseous tissue	☑	☑	
B. Divisions	☑	☑	
C. Articulations	☑	☑	
IV. Cardiovascular System			
A. Blood	☑	☑	
B. Heart and vessels	☑	☑	
V. Respiratory System			
A. Components and structure	☑	☑	
B. Physiology	☑	☑	

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VI. Abdomen			
A. Digestive system	☑	☑	
B. Urinary system – structure, function and location	☑	☑	
C. Reproductive systems – structure, function and location	☑	☑	
VII. Muscular System – Types, Characteristics and Functions			
A. Smooth	☑		
B. Cardiac	☑		
C. Skeletal	☑		
VIII. Nervous System			
A. Introduction	☑		
B. Neural tissue	☑		
C. Anatomy, functions	☑		
Imaging Equipment and Radiation Production			
I. X-ray Circuit			
A. Electricity	☑	☑	
B. Protective devices	☑	☑	
C. Transformers	☑	☑	
D. Rectification	☑	☑	
II. Radiographic Equipment			
A. Permanent installation	☑	☑	
B. AEC devices	☑	☑	
III. Diagnostic X-ray Tubes			
A. Design and function	☑	☑	
B. Extending tube life	☑	☑	

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IV. Electronic Imaging			
A. Purpose	☑	☑	
B. Principles	☑	☑	
C. Flat panel detectors	☑	☑	
V. Quality Control			
A. Definitions	☑	☑	
B. Benefits	☑	☑	
VI. Structure of the Atom			
A. Nucleus	☑	☑	
B. Structure	☑	☑	
C. Electron shells	☑	☑	
VII. Nature of Radiation			
A. Natural background radiation	☑	☑	
B. Artificial radiation	☑	☑	
VIII. X-ray Production			
A. Historical introduction	☑	☑	
B. Principles	☑	☑	
C. Types	☑	☑	
D. Common terms related to the x-ray beam	☑	☑	
E. Conditions necessary for production	☑	☑	
F. X-ray emission spectra	☑	☑	
G. Factors affecting emission spectra	☑	☑	
H. Efficiency in production	☑	☑	
IX. Interaction of Photons With Matter			
A. Transmission of photons	☑	☑	
B. Unmodified scattering (coherent)	☑	☑	
C. Photoelectric effect	☑	☑	
D. Modified scattering (Compton)	☑	☑	

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Legal Proceedings			
I. Admissibility of Scientific Evidence			☑
II. Federal Rules of Evidence			☑
III. The Expert Witness			☑
IV. Discovery and Deposition			☑
V. Testimony in Court			☑
VI. Admissibility of Radiological Images and Results			☑
Medical Terminology			
I. The Word-building Process			
A. Basic elements	☑	☑	
B. Parts of speech	☑	☑	
C. Translation of terms into common language	☑	☑	
D. Correct pronunciation of medical terms	☑	☑	
VII. Medical Abbreviations and Symbols			
A. Role in communications	☑	☑	
B. Abbreviations	☑	☑	
C. Symbols	☑	☑	
III. Radiologic Technology Procedures and Terminology			
A. Radiography	☑	☑	
B. Radiation oncology	☑	☑	
C. Nuclear medicine	☑	☑	
D. Sonography	☑	☑	

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IX. Understanding Orders, Requests and Diagnostic Reports			
A. Radiographic orders and requisitions – components	☑	☑	
B. Diagnostic reports	☑	☑	
Patient Care in Forensic Science			
I. Forensic Assistants and Health Care Team			
A. Responsibilities of the health care facility	☑	☑	☑
B. Responsibilities of the forensic assistant			☑
II. Attitudes and Communication in Patient Care			
A. Health-illness continuum	☑	☑	
B. Age-specific communication	☑	☑	
C. Communication	☑	☑	
D. Psychological considerations	☑	☑	
III. Patient/Forensic Assistant Interactions			
A. Patient identification methods	☑	☑	☑
IV. Safety and Transfer Positioning			
A. Environmental safety	☑	☑	
B. Body mechanics	☑	☑	
C. Patient transfer and movement	☑	☑	
D. Patient positions	☑	☑	
E. Immobilization techniques	☑	☑	
F. Accident and incident reporting	☑	☑	
V. Patient Records			
A. Aspects of patient records	☑	☑	☑
B. Confidentiality of patient information	☑	☑	☑
C. Retrieving specific information	☑	☑	☑

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	R.T.	LXMO	F.A.
D. Proper documentation in patient record	☑	☑	☑
E. Health Insurance Portability and Accountability Act (HIPAA)	☑	☑	☑
VI. Infection Control			
A. Terminology	☑	☑	
B. Centers for Disease Control and Prevention (CDC)	☑	☑	
C. Cycle of infection	☑	☑	
D. Preventing disease transmission	☑	☑	
E. Medical asepsis	☑	☑	
F. Environmental asepsis	☑	☑	
G. Standard precautions	☑	☑	
VII. Values			
A. Personal	☑	☑	
B. Professional	☑	☑	
VIII. Culture, Ethnicity and Diversity			
A. Societal and individual factors	☑	☑	
Principles of Computed Tomography (CT)			
I. Radiation Protection			
A. Personal protection and monitoring	☑		
B. Area/facilities monitoring	☑		
C. Medical events	☑		
II. The CT Computer			
A. Hardware	☑		
B. Data acquisition system	☑		
C. Software	☑		
D. Algorithms	☑		
E. Postprocessing techniques	☑		

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	R.T.	LXMO	F.A.
F. Keyboard orientation	☑		
G. Peripheral device orientation	☑		
H. Image display, manipulation, recording and archiving	☑		
III. Image Quality in CT			
A. Definition	☑		
B. Determinants	☑		
C. Influencing factors	☑		
D. Measurements	☑		
E. Quality control programs in CT	☑		
IV. Computed Tomography Process			
A. Single-slice scanners	☑		
B. Multislice scanners	☑		
C. Spiral scanners	☑		
D. Electron beam scanners	☑		
V. Spiral Computed Tomography			
A. Definition	☑		
B. Scanner design	☑		
C. Composite and wire brush scanners	☑		
VI. Physics/Instrumentation (System Operation and Components)			
A. Selectable scan factors	☑		
B. Data management	☑		
C. Image quality	☑		
VII. CT, Applied Terminology			
A. Pixel	☑		
B. Matrix	☑		
C. Voxel	☑		

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	R.T.	LXMO	F.A.
D. X, y, z coordinates	☑		
E. Scan field of view (SFOV)	☑		
F. Display field of view (DFOV)	☑		
G. Linear attenuation coefficient	☑		
H. CT/Hounsfield number	☑		
I. Partial volume averaging	☑		
J. Window width (WW) and window level (WL)	☑		
K. Spatial resolution	☑		
L. Contrast resolution	☑		
M. Noise aliasing	☑		
N. Digital imaging	☑		
O. Annotation	☑		
P. Scanogram	☑		
Q. Region of interest (ROI)	☑		
R. Standard vs. volumetric data acquisition	☑		
S. Half-scan, full-scan, overscan	☑		
T. Interscan delay	☑		
U. Rays and views	☑		
V. Sampling (angular and ray)	☑		
VIII. Cross-sectional Anatomy (Multiplane) With Pathologic Correlation			
A. Head	☑		
B. Neck	☑		
C. Spine	☑		
D. Thorax	☑		
E. Abdomen	☑		
F. Pelvis	☑		

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	R.T.	LXMO	F.A.
IX. Procedures Protocol			
A. Indicators for specific protocols	☑		
B. Contraindications for specific protocol	☑		
C. Indications for contrast media	☑		
D. Contraindications to the use of contrast media	☑		
E. Patient preparation	☑		
F. Charting	☑		
G. Protocol parameters	☑		
X. Procedures (CT)			
A. Head	☑		
B. Neck	☑		
C. Spine	☑		
D. Thorax	☑		
E. Abdomen	☑		
F. Pelvis	☑		
Radiation Biology			
I. Introduction			
A. Molecule	☑	☑	
B. Review of cell biology	☑	☑	
C. Types of ionizing radiations	☑	☑	
II. Biophysical Events			
A. Molecular effects of radiation	☑	☑	
B. The deposition of radiant energy	☑	☑	
III. Radiation Effects			
A. Subcellular radiation effects	☑	☑	
B. Cellular radiation effects	☑	☑	
C. Individual radiation effects	☑	☑	
D. Factors influencing radiation response	☑	☑	

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	R.T.	LXMO	F.A.
IV. Radiosensitivity and Response			
A. Law of Bergonié and Tribondeau	☑	☑	
B. Cell survival and recovery	☑	☑	
C. Systemic response to radiation	☑	☑	
D. Radiation dose-response curves	☑	☑	
E. Total body irradiation	☑	☑	
F. Late effects of radiation	☑	☑	
G. Risk estimates	☑	☑	
Radiation Protection			
I. Introduction			
A. Justification for radiation protection	☑	☑	
B. Potential biologic damage of ionizing radiation	☑	☑	
C. Objectives of a radiation protection program	☑	☑	
D. Sources of radiation	☑	☑	
E. Legal and ethical responsibilities	☑	☑	
II. Units, Detection and Measurement			
A. Radiation units	☑	☑	
B. Dose reporting	☑	☑	
III. Personnel Monitoring			
A. Historical perspective	☑	☑	
B. Requirements for personnel monitoring	☑	☑	
C. Methods and types of personnel monitors	☑	☑	
D. Records of accumulated dose	☑	☑	
E. Dose limits – 10 CFR part 20	☑	☑	
F. Responsibilities for radiation protection	☑	☑	
IV. Application			
A. Design	☑	☑	
B. Regulations and recommendations	☑	☑	

Check marks indicate elements of forensic radiography in existing curricula or existing educational programs of the designated specialty. Unchecked elements for a given specialty are intended to guide in developing educational pathways. R.T., radiologic technologist; LXMO, limited x-ray machine operator; F.A., forensic assistant.

	R.T.	LXMO	F.A.
C. Cardinal principles in protection	☑	☑	
D. Emergency procedures	☑	☑	
Radiographic Procedures of the Forensic Assistant			
I. Standard Terminology for Positioning and Projection			
A. Standard terms	☑	☑	
B. Positioning terminology	☑	☑	
C. General planes	☑	☑	
D. Terminology of movement and direction	☑	☑	
E. Positioning aids	☑	☑	
F. Accessory equipment	☑	☑	
II. Evaluation of Radiographic Orders			
A. Patient identification	☑	☑	☑
B. Verification of procedure(s) ordered	☑	☑	☑
C. Review of clinical history	☑	☑	☑
D. Special considerations for age, disability and cultural background	☑	☑	☑
E. Patient preparation	☑	☑	☑
F. Room preparation	☑	☑	☑
III. Positioning Considerations for Routine Radiographic Procedures			
A. Patient positioning	☑	☑	
B. Image receptor selection and placement	☑	☑	
C. Appropriate grid use	☑	☑	
D. Beam alignment and angulation	☑	☑	
E. Beam limitation and shielding	☑	☑	
F. Special considerations	☑	☑	

Check marks indicate elements of forensic radiography in existing curricula or existing educational programs of the designated specialty. Unchecked elements for a given specialty are intended to guide in developing educational pathways. R.T., radiologic technologist; LXMO, limited x-ray machine operator; F.A., forensic assistant.

	R.T.	LXMO	F.A.
G. Anatomy and positioning for the following studies:	☑	☑	
1. Chest and thorax	☑	☑	
2. Extremities	☑	☑	
3. Podiatric	☑	☑	
4. Vertebral column	☑	☑	
5. Cranium	☑	☑	
H. Image evaluation	☑	☑	
IV. Contrast Media			
A. Rationale for use	☑		
B. Agents	☑		
C. Contrast preparations	☑		
D. Media in Use	☑		
V. Definitions/Terminology			
A. Pathology	☑	☑	
B. Disease	☑	☑	
C. Etiology	☑	☑	
D. Diagnosis	☑	☑	
E. Prognosis	☑	☑	
VI. Relevance to Radiographic Procedures			
A. Purpose of the procedure	☑	☑	
B. Manifestations of pathology	☑	☑	
C. Technical considerations	☑	☑	
D. Radiographic appearance	☑	☑	
VII. Imaging for Investigative Procedures			
A. Basal skull			☑
B. Burned remains			☑
C. Decomposed body			☑

Check marks indicate elements of forensic radiography in existing curricula or existing educational programs of the designated specialty. Unchecked elements for a given specialty are intended to guide in developing educational pathways. R.T., radiologic technologist; LXMO, limited x-ray machine operator; F.A., forensic assistant.

	R.T.	LXMO	F.A.
D. Gunshot wounds			☑
E. Intraoral investigation			☑
F. Missile identification			☑
G. Motor vehicle accidents			☑
H. Removal of artifacts			☑
I. Skeletal remains			☑
J. Unidentified corpse			☑
Scope of Forensic Radiology			
I. Service			☑
II. Education			☑
III. Concerns of Public Health and Safety			☑
IV. Mass Casualty			☑
V. Child Abuse			☑
VI. Research			☑
VII. Domestic Abuse			☑
VIII. Abuse of the Elderly			☑
IX. Human Rights Abuse, Torture, Terrorism			☑

Check marks indicate elements of forensic radiography in existing curricula or existing educational programs of the designated specialty. Unchecked elements for a given specialty are intended to guide in developing educational pathways. R.T., radiologic technologist; LXMO, limited x-ray machine operator; F.A., forensic assistant.

Descriptions

Digital Image Acquisition and Display
Content is designed to impart an understanding of the components, principles and operation of cassette-based and cassette-less imaging systems found in radiology. Factors that affect image acquisition, display, archiving and retrieval are discussed.

Proposed minimum hours of instruction: 40

Film-screen Image Production and Evaluation
Content is designed to establish a knowledge base in factors that govern and influence the production and recording of radiologic images. Film-screen imaging with related accessories will be emphasized. Radiographic image analysis methods will be introduced using actual images. Included are the importance of minimum imaging standards, discussion of a problem-solving technique for image evaluation and the factors that can affect image quality.

Proposed minimum hours of instruction: 50

Fluoroscopic Unit Operation and Safety
Content promotes the conscientious operation of 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 operator and ancillary personnel are included.

Proposed minimum hours of instruction: 10

Fundamentals, Ethics and Law of Health Care
Content is designed to provide an overview of the foundations in radiologic science. The elements of ethical behavior will be discussed, as well as a variety of ethical issues and dilemmas found in clinical practice. An introduction to legal terminology, concepts and principles also will be presented. Topics include misconduct, malpractice, legal and professional standards. The importance of proper documentation and consent is emphasized.

Proposed minimum hours of instruction: 8

Human Structure and Function
Content is designed to establish a knowledge base in anatomy and physiology. Components of the cells, tissues, organs and systems will be described and discussed.

Proposed minimum hours of instruction: 25

Imaging Equipment and Radiation Production
Content is designed to establish a knowledge base in radiographic equipment and x-ray production. Topics include atomic structure, the nature and characteristics of radiation and the fundamentals of photon interactions with matter.

Proposed minimum hours of instruction: 40

Medical Terminology
Content is designed to provide an introduction to the origins of medical terminology. A word-building system will be introduced, and abbreviations and symbols will be discussed. Also introduced will be an orientation to the understanding of radiographic orders and interpretation of diagnostic reports. Related terminology is addressed.

Proposed minimum hours of instruction: 10

Patient Care in Forensic Science
Content is designed to provide the basic concepts of patient care, including consideration for the physical and psychological needs of the patient and family. Routine patient care procedures will be described, as well as infection control procedures using standard precautions. Content also will include the study of factors that influence relationships with patients and professional peers.

Proposed minimum hours of instruction: 30

Principles of Computed Tomography (CT)
Content is designed to provide students with an exposure to principles related to computed tomography (CT) imaging.

Proposed minimum hours of instruction: 15

Radiation Biology
Content is designed to provide an overview of the principles of the interaction of radiation with living systems. Radiation effects on molecules, cells, tissues and the body as a whole are presented. Factors affecting biological response are presented, including acute and chronic effects of radiation.

Proposed minimum hours of instruction: 20

Radiation Protection
Content is designed to present an overview of the principles of radiation protection, including the responsibilities of the radiographer for patients, personnel and the public. Radiation health and safety requirements of federal and state regulatory agencies, accreditation agencies and health care organizations are incorporated.

Proposed minimum hours of instruction: 20

Radiographic Procedures of the Forensic Assistant
Content is designed to provide a knowledge base necessary to perform standard radiographic procedures. Consideration will be given to the production of images of optimal quality. Students will be introduced to clinical manifestations of pathologic processes, their radiographic appearance and relevance to radiographic procedures.

Proposed minimum hours of instruction: 15

Resources

Textbooks

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