The ASRT Practice Standards for Medical Imaging and Radiation Therapy

Medical Dosimetry

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Preface

A profession's practice standards serve as a guide for appropriate practice. The practice standards define the practice and establish general criteria to determine compliance. Practice standards are authoritative statements established by the profession for evaluating the quality of practice, service and education provided by individuals within the profession.

Practice standards can be used by individual facilities to develop job descriptions and practice parameters. Those outside the profession can use the standards as an overview of the role and responsibilities of individuals within the profession.

The medical imaging and radiation therapy professional and any individual who is legally authorized to perform medical imaging must be educationally prepared and clinically competent as a prerequisite to professional practice. The individual should, consistent with all applicable legal requirements and restrictions, exercise individual thought, judgment and discretion in the performance of the procedure. Federal and state statutes, regulations, accreditation standards and institutional policies could dictate practice parameters and may supersede these standards.

Format

The ASRT Practice Standards for Medical Imaging and Radiation Therapy are divided into five sections:

- *Introduction* – defines the practice and the minimum qualifications for the education and certification of individuals in addition to an overview of the specific practice.
- *Medical Imaging and Radiation Therapy Scope of Practice* – delineates the parameters of the specific practice.
- *Standards* – incorporate patient assessment and management with procedural analysis, performance and evaluation. The standards define the activities of the individual responsible for the care of patients and delivery of medical imaging and radiation therapy procedures; in the technical areas of performance, such as equipment and material assessment safety standards and total quality management; and in the areas of education, interpersonal relationships, self-assessment and ethical behavior.
- *Glossary* – defines terms used in the practice standards document.
- *Advisory Opinion Statements* – provide interpretations of the standards intended for the clarification and guidance of specific practice issues.

The standards are numbered and followed by a term or set of terms that describes the standards. The next statement is the expected performance of the individual when performing the procedure or treatment. A rationale follows and explains why an individual should adhere to the particular standard of performance.

- *Criteria* – used to evaluate an individual's performance. Each standard is divided into two parts: the general criteria and the specific criteria. Both should be used when evaluating performance.
- *General Criteria* – written in a style that applies to medical imaging and radiation therapy professionals and should be used for the appropriate area of practice.
- *Specific Criteria* – meet the needs of the individuals in the various areas of professional performance. Although many areas of performance within medical imaging and radiation

therapy are similar, others are not. The specific criteria were developed with these differences in mind.

Within this document, all organizations are referenced by their abbreviation and spelled out within the glossary.

Introduction

Definition

The medical imaging and radiation therapy profession comprises health care professionals identified as a bone density technologist, cardiac-interventional and vascular-interventional technologist, computed tomography technologist, magnetic resonance technologist, mammographer, medical dosimetrist, nuclear medicine technologist, quality management technologist, radiation therapist, radiographer, radiologist assistant or sonographer who are educationally prepared and clinically competent as identified by these standards.

Furthermore, these standards apply to health care employees who are legally authorized to perform medical imaging and radiation therapy and who are educationally prepared and clinically competent as identified by these standards.

The complex nature of disease processes involves multiple imaging modalities. Medical imaging and radiation therapy professionals are vital members of a multidisciplinary team that forms a core of highly trained health care professionals, who each bring expertise to the area of patient care. They play a critical role in the delivery of health services as new modalities emerge and the need for medical imaging and radiation therapy procedures increases.

Medical imaging and radiation therapy integrates scientific knowledge, technical competence and patient interaction skills to provide safe and accurate procedures with the highest regard to all aspects of patient care. A medical imaging and radiation therapy professional recognizes elements unique to each patient, which is essential for the successful completion of the procedure.

Medical imaging and radiation therapy professionals are the primary liaison between patients, licensed practitioners and other members of the support team. These professionals must remain sensitive to the needs of the patient through good communication, patient assessment, patient monitoring and patient care skills. As members of the health care team, medical imaging and radiation therapy professionals participate in quality improvement processes and continually assess their professional performance.

Medical imaging and radiation therapy professionals think critically and use independent, professional and ethical judgment in all aspects of their work. They engage in continuing education to include their area of practice to enhance patient care, safety, public education, knowledge and technical competence.

Medical Dosimetry

The practice of medical dosimetry is performed by health care professionals responsible for designing a treatment plan for use in the administration of ionizing radiation for the purpose of treating diseases, primarily cancer. Medical dosimetrists perform duties and complete responsibilities under the supervision of qualified medical physicists and radiation oncologists. It is typically the medical dosimetrist who generates an optimal treatment plan and ensures the appropriate transfer of data that the radiation therapist will use to treat the patient. The medical dosimetrist maintains a commitment to a high degree of accuracy, thoroughness and safety.

Medical dosimetrists must demonstrate an understanding of human anatomy, physiology, pathology and medical terminology. In addition, extensive knowledge of characteristics and clinical relevance of radiation oncology treatment machine and equipment, radiobiology, radiation physics, radiation safety and psychosocial aspects of cancer is required.

Medical dosimetrists must maintain a high degree of accuracy in treatment planning optimization, treatment techniques and positioning. Medical dosimetrists assist the radiation oncologist in localizing the treatment area, generate a treatment plan and actively communicate with the radiation oncology team to enable and ensure the appropriate transfer of information.

Medical dosimetrists are the primary liaison between the radiation therapist, medical physicist and radiation oncologist. Medical dosimetrists must remain sensitive to the physical and emotional needs of the patient through good communication and patient assessment. Radiation therapy often involves daily treatments extending over several weeks using highly sophisticated equipment. It requires thorough initial planning as well as constant patient care and monitoring.

Education and Certification

The individual must be educationally prepared and clinically competent as a prerequisite to professional practice.

Medical imaging and radiation therapy professionals performing multiple modality hybrid imaging should be registered by certification agencies recognized by the ASRT and be educationally prepared and clinically competent in the specific modality(ies) they are responsible to perform. Medical imaging and radiation therapy professionals performing diagnostic procedures in more than one imaging modality will adhere to the general and specific criteria for each area of practice.

To maintain certification(s), medical imaging and radiation therapy professionals must complete appropriate continuing education requirements to sustain their expertise and awareness of changes and advances in practice.

Medical Dosimetry

Only medical imaging and radiation therapy professionals who have completed the appropriate education and obtained certification(s) as outlined in these standards should perform medical dosimetry procedures.

Medical dosimetrists prepare for their roles on the interdisciplinary team by meeting the examination eligibility criteria established by the MDCB. Those passing the medical dosimetry examination use the credential CMD.

Medical Imaging and Radiation Therapy Scope of Practice

Scopes of practice delineate the parameters of practice and identify the boundaries for practice. A comprehensive procedure list for the medical imaging and radiation therapy professional is impractical because clinical activities vary by the practice needs and expertise of the individual. As medical imaging and radiation therapy professionals gain more experience, knowledge and clinical competence, the clinical activities may evolve.

The medical imaging and radiation therapy professional and any individual who is legally authorized to perform medical imaging must be educationally prepared and clinically competent as a prerequisite to professional practice. The individual should, consistent with all applicable legal requirements and restrictions, exercise individual thought, judgment and discretion in the performance of the procedure. Federal and state statutes, regulations, accreditation standards and institutional policies could dictate practice parameters and may supersede these standards.

The scope of practice of the medical imaging and radiation therapy professional includes:

- Administering medications parenterally through new or existing vascular access, enterally or through other appropriate routes as prescribed by a licensed practitioner.*†
- Administering medications with an infusion pump or power injector as prescribed by a licensed practitioner.*†
- Applying principles of ALARA to minimize exposure to patient, self and others.
- Applying principles of patient safety during all aspects of patient care.
- Assisting in maintaining medical records, respecting confidentiality and established policy.
- Corroborating a patient's clinical history with procedure and ensuring information is documented and available for use by a licensed practitioner.
- Educating and monitoring students and other health care providers.*
- Evaluating images for proper positioning and determining if additional images will improve the procedure or treatment outcome.
- Evaluating images for technical quality and ensuring proper identification is recorded.
- Identifying and responding to emergency situations.
- Identifying, preparing and/or administering medications as prescribed by a licensed practitioner.*†
- Performing ongoing quality assurance activities.
- Performing venipuncture as prescribed by a licensed practitioner.*†
- Postprocessing data.
- Preparing patients for procedures.
- Providing education.
- Providing optimal patient care.
- Receiving, relaying and documenting verbal, written and electronic orders in the patient's medical record.*
- Selecting the appropriate protocol and optimizing technical factors while maximizing patient safety.
- Starting, maintaining and/or removing intravenous access as prescribed by a licensed practitioner.*†

* Excludes limited x-ray machine operator
† Excludes medical dosimetry

- Verifying archival storage of data.
- Verifying informed consent for applicable procedures.*

Medical Dosimetry

- Developing optimal treatment plans under the direction of a radiation oncologist.
- Evaluating treatment plans for accuracy.
- Monitoring, under the supervision of a radiation oncologist, doses to normal tissues within the irradiated volume to ensure tolerance levels are not exceeded.
- Obtaining and incorporating patient data from medical imaging procedures or manual methods to be used in simulation, treatment planning, treatment delivery and quality assurance.
- Participating in brachytherapy treatment planning and delivery.
- Participating in simulation under the supervision of a radiation oncologist.
- Performing dosimetric calculations.
- Performing or assisting with the fabrication of patient immobilization and other treatment devices.
- Transferring and documenting treatment planning data according to departmental policy.

* Excludes limited x-ray machine operator

Standards

Standard One – Assessment

The medical imaging and radiation therapy professional collects pertinent data about the patient, procedure, equipment and work environment.

Rationale
Information about the patient's health status is essential in providing appropriate imaging and therapeutic services. The planning and provision of safe and effective medical services relies on the collection of pertinent information about equipment, procedures and the work environment.

The medical imaging and radiation therapy professional:

General Criteria

- Assesses and maintains the integrity of medical supplies.
- Assesses factors that may affect the procedure, such as medications, patient history, patient preparation or artifact-producing objects.
- Assesses patient lab values, medication list and risk for allergic reaction(s) prior to procedure and administration of medication.*†
- Confirms that equipment performance, maintenance and operation comply with the manufacturer's specifications.
- Determines that services are performed in a safe environment, minimizing potential hazards.
- Maintains restricted access to controlled areas.
- Obtains and reviews relevant previous procedures and information from all available resources and the release of information as needed.
- Participates in ALARA, patient and personnel safety, risk management and quality management activities.
- Recognizes signs and symptoms of an emergency.
- Verifies patient identification and appropriateness of the procedure requested or prescribed.
- Verifies that the patient has consented to the procedure.
- Verifies that protocol and procedure manuals include recommended criteria and are reviewed and revised.
- Verifies the patient's pregnancy status.

Specific Criteria

Medical Dosimetry

- Assesses the environment for any potential radiation hazards.
- Assesses the patient's need for information and reassurance.
- Reviews patient history for previous therapeutic treatments.

* Excludes limited x-ray machine operator
† Excludes medical dosimetry

Standard Two – Analysis/Determination

The medical imaging and radiation therapy professional analyzes the information obtained during the assessment phase and develops an action plan for completing the procedure.

Rationale
Determining the most appropriate action plan enhances patient safety and comfort, optimizes diagnostic and therapeutic quality and improves efficiency.

The medical imaging and radiation therapy professional:

General Criteria

- Consults appropriate medical personnel to determine a modified action plan.
- Determines that all procedural requirements are in place to achieve a quality diagnostic or therapeutic procedure.
- Determines the appropriate type and dose of contrast media to be administered based on established protocols.*†
- Determines the course of action for an emergent situation.
- Determines the need for and selects supplies, accessory equipment, shielding, positioning and immobilization devices.
- Employs professional judgment to adapt imaging or therapeutic procedures to improve diagnostic quality or therapeutic outcomes.
- Evaluates and monitors services, procedures, equipment and the environment to determine if they meet or exceed established guidelines, and revises the action plan.
- Selects the most appropriate and efficient action plan after reviewing all pertinent data and assessing the patient's abilities and condition.

Specific Criteria

Medical Dosimetry

- Gathers and analyzes pertinent data relevant to the treatment planning and delivery process.
- Participates in reviewing patient treatment parameters and dose records to ensure treatment does not exceed the prescribed dose or normal tissue tolerances.
- Recommends the appropriate immobilization devices and positioning aids for simulation and treatment.
- Recommends when to hold treatment until a radiation oncologist is notified.
- Reviews the treatment record and verifies calculations before and/or after treatment delivery.
- Verifies the treatment summary and the mathematical accuracy of the prescription.

* Excludes limited x-ray machine operator
† Excludes medical dosimetry

Standard Three – Education

The medical imaging and radiation therapy professional provides information about the procedure and related health issues according to protocol; informs the patient, public and other health care providers about procedures, equipment and facilities; and acquires and maintains current knowledge in practice.

Rationale
Education and communication are necessary to establish a positive relationship and promote safe practices. Advancements in the profession and optimal patient care require additional knowledge and skills through education.

The medical imaging and radiation therapy professional:

General Criteria

- Advocates for and participates in continuing education related to area of practice, to maintain and enhance clinical competency.
- Advocates for and participates in vendor specific applications training to maintain clinical competency.
- Educates the patient, public and other health care providers about procedures and the associated biological effects.
- Elicits confidence and cooperation from the patient, the public and other health care providers by providing timely communication and effective instruction.
- Explains effects and potential side effects of medications.*†
- Maintains credentials and certification related to practice.
- Provides an accurate explanation and instructions at an appropriate time and at a level the patient and their care providers can understand; addresses questions and concerns regarding the procedure.
- Provides information on certification or accreditation to the patient, other health care providers and the public.
- Provides information to patients, health care providers, students and the public concerning the role and responsibilities of individuals in the profession.
- Provides pre-, peri- and post-procedure education.
- Refers questions about diagnosis, treatment or prognosis to a licensed practitioner.

Specific Criteria

Medical Dosimetry

- Addresses concerns from the patient and significant others about appropriate and essential uses of radiation in treatment of diseases.
- Explains the role and function of the medical dosimetrist in the overall treatment course.
- Reviews the treatment plan with the patient as requested by a radiation oncologist.

* Excludes limited x-ray machine operator
† Excludes medical dosimetry

Standard Four – Performance

The medical imaging and radiation therapy professional performs the action plan and quality assurance activities.

Rationale
Quality patient services are provided through the safe and accurate performance of a deliberate plan of action. Quality assurance activities provide valid and reliable information regarding the performance of equipment, materials and processes.

The medical imaging and radiation therapy professional:

General Criteria

- Adheres to radiation safety rules and standards.
- Administers first aid or provides life support.†
- Applies principles of aseptic technique.†
- Assesses and monitors the patient's physical, emotional and mental status.
- Consults with medical physicist or engineer in performing and documenting quality assurance tests.
- Explains to the patient each step of the action plan as it occurs and elicits the cooperation of the patient.
- Immobilizes patient for procedure.
- Implements an action plan.
- Maintains current information on equipment, materials and processes.
- Modifies the action plan according to changes in the clinical situation.
- Monitors the patient for reactions to medications. *†
- Participates in safety and risk management activities.
- Performs ongoing quality assurance activities and quality control testing.
- Performs procedural timeout.
- Positions patient for anatomic area of interest, respecting patient ability and comfort.
- Uses accessory equipment.
- Uses an integrated team approach.
- When appropriate, wears one or more personal radiation monitoring devices at the location indicated on the personal radiation monitoring device or as indicated by the radiation safety officer or designee.

Specific Criteria

Medical Dosimetry

- Adheres to established best practice protocols, guidelines and radiation oncologist directives.
- Calculates treatment unit parameters and doses to treatment volumes and points of interest.

* Excludes limited x-ray machine operator
† Excludes medical dosimetry

- Collaborates with the radiation therapist and medical physicist to fabricate individualized immobilization, custom blocks and other beam-modifying devices.
- Collaborates with the radiation therapist, medical physicist and radiation oncologist regarding the simulation process and procedures.
- Demonstrates safe handling, storing and disposal of brachytherapy sources.
- Develops a manual or computer-generated brachytherapy treatment plan as prescribed by a radiation oncologist.
- Develops a treatment plan as directed and prescribed by the radiation oncologist.
- Ensures an independent machine-setting check is completed before treatment is delivered.
- Makes the recommendation to discontinue patient treatment until equipment is operating properly.
- Prepares and positions the patient for simulation and treatment using appropriate positioning aids and immobilization devices.
- Prepares or assists in preparing brachytherapy sources and equipment.
- Reviews simulation images with the radiation therapist, medical physicist and radiation oncologist.
- Reviews treatment planning data for accuracy and appropriateness prior to input into the patient's treatment record and initial treatment.

Standard Five – Evaluation

The medical imaging and radiation therapy professional determines whether the goals of the action plan have been achieved, evaluates quality assurance results and establishes an appropriate action plan.

Rationale
Careful examination of the procedure is important to determine that expected outcomes have been met. Equipment, materials and processes depend on ongoing quality assurance activities that evaluate performance based on established guidelines.

The medical imaging and radiation therapy professional:

General Criteria

- Communicates the revised action plan to appropriate team members.
- Completes the evaluation process in a timely, accurate and comprehensive manner.
- Develops a revised action plan to achieve the intended outcome.
- Evaluates quality assurance results.
- Evaluates the patient, equipment and procedure to identify variances that might affect the expected outcome.
- Identifies exceptions to the expected outcome.
- Measures the procedure against established policies, protocols and benchmarks.
- Validates quality assurance testing conditions and results.

Specific Criteria

Medical Dosimetry

- Acquires data necessary to perform accurate patient protocol plans and participates in implementation of the plan.
- Ensures treatment parameters have been transferred correctly to the oncology information system.
- Reviews treatment calculations and ensures the validity of the treatment plan.
- Reviews treatment variances and assists in determining possible causes and solutions.

Standard Six – Implementation

The medical imaging and radiation therapy professional implements the revised action plan based on quality assurance results.

Rationale
It may be necessary to make changes to the action plan based on quality assurance results to promote safe and effective services.

The medical imaging and radiation therapy professional:

General Criteria

- Adjusts imaging parameters, patient procedure or additional factors to improve the outcome.
- Bases the revised plan on the patient's condition and the most appropriate means of achieving the expected outcome.
- Implements the revised action plan.
- Notifies the appropriate health care provider when immediate clinical response is necessary, based on procedural findings and patient condition.
- Obtains assistance to support the quality assurance action plan.
- Takes action based on patient and procedural variances.

Specific Criteria

Medical Dosimetry

- Assists in supporting the quality assurance action plan.
- Develops additional treatment plans to achieve an optimal dose distribution.
- Ensures accuracy in the transfer and documentation of treatment parameters, according to departmental policies.
- Reviews and implements treatment field changes indicated on simulation or verification images as directed by a radiation oncologist.

Standard Seven – Outcomes Measurement

The medical imaging and radiation therapy professional reviews and evaluates the outcome of the procedure according to quality assurance standards.

Rationale
To evaluate the quality of care, the medical imaging and radiation therapy professional compares the actual outcome with the expected outcome. Outcomes assessment is an integral part of the ongoing quality management action plan to enhance services.

The medical imaging and radiation therapy professional:

General Criteria

- Assesses the patient's physical, emotional and mental status prior to discharge.
- Determines that actual outcomes are within established criteria.
- Evaluates the process and recognizes opportunities for future changes.
- Measures and evaluates the results of the revised action plan.
- Reviews all data for completeness and accuracy.
- Reviews and evaluates quality assurance processes and tools for effectiveness.
- Reviews the implementation process for accuracy and validity.
- Uses evidence-based practice to determine whether the actual outcome is within established criteria.

Specific Criteria

Medical Dosimetry

Refer to general criteria.

Standard Eight – Documentation

The medical imaging and radiation therapy professional documents information about patient care, procedures and outcomes.

Rationale
Clear and precise documentation is essential for continuity of care, accuracy of care and quality assurance.

The medical imaging and radiation therapy professional:

General Criteria

- Archives images or data.
- Documents diagnostic, treatment and patient data in the medical record in a timely, accurate and comprehensive manner.
- Documents procedural timeout.
- Documents unintended outcomes or exceptions from the established criteria.
- Maintains documentation of quality assurance activities, procedures and results.
- Provides pertinent information to authorized individual(s) involved in the patient's care.
- Records information used for billing and coding procedures.
- Reports any out-of-tolerance deviations to the appropriate personnel.
- Verifies patient consent is documented.

Specific Criteria

Medical Dosimetry

- Reports any treatment variances in accordance with departmental, institutional and national quality assurance guidelines.

Standard Nine – Quality

The medical imaging and radiation therapy professional strives to provide optimal care.

Rationale
Patients expect and deserve optimal care during diagnosis and treatment.

The medical imaging and radiation therapy professional:

General Criteria

- Adheres to standards, policies and established guidelines.
- Anticipates, considers and responds to the needs of a diverse patient population.
- Applies professional judgment and discretion while performing the procedure.
- Collaborates with others to elevate the quality of care.
- Participates in ongoing quality assurance programs.

Specific Criteria

Medical Dosimetry

Refer to general criteria.

Standard Ten – Self-Assessment

The medical imaging and radiation therapy professional evaluates personal performance.

Rationale
Self-assessment is necessary for personal growth and professional development.

The medical imaging and radiation therapy professional:

General Criteria

- Assesses personal work ethics, behaviors and attitudes.
- Evaluates performance, applies personal strengths and recognizes opportunities for educational growth and improvement.

Specific Criteria

Medical Dosimetry

Refer to general criteria.

Standard Eleven – Collaboration and Collegiality

The medical imaging and radiation therapy professional promotes a positive and collaborative practice atmosphere with other members of the health care team.

Rationale
To provide quality patient care, all members of the health care team must communicate effectively and work together efficiently.

The medical imaging and radiation therapy professional:

General Criteria

- Develops and maintains collaborative partnerships to enhance quality and efficiency.
- Informs and instructs others about radiation safety.
- Promotes understanding of the profession.
- Shares knowledge and expertise with others.

Specific Criteria

Medical Dosimetry

Refer to general criteria.

Standard Twelve – Ethics

The medical imaging and radiation therapy professional adheres to the profession's accepted ethical standards.

Rationale
Decisions made and actions taken on behalf of the patient are based on a sound ethical foundation.

The medical imaging and radiation therapy professional:

General Criteria

- Accepts accountability for decisions made and actions taken.
- Acts as a patient advocate.
- Adheres to the established ethical standards of recognized certifying agencies.
- Adheres to the established practice standards of the profession.
- Delivers patient care and service free from bias or discrimination.
- Provides health care services with consideration for a diverse patient population.
- Respects the patient's right to privacy and confidentiality.

Specific Criteria

Medical Dosimetry

Refer to general criteria.

Standard Thirteen – Research, Innovation and Professional Advocacy

The medical imaging and radiation therapy professional participates in the acquisition and dissemination of knowledge and the advancement of the profession.

Rationale
Participation in professional organizations and scholarly activities such as research, scientific investigation, presentation and publication advance the profession.

The medical imaging and radiation therapy professional:

General Criteria

- Adopts new best practices.
- Investigates innovative methods for application in practice.
- Monitors changes to federal and state law, regulations and accreditation standards affecting area(s) of practice.
- Participates in data collection.
- Participates in professional advocacy efforts.
- Participates in professional societies and organizations.
- Pursues lifelong learning.
- Reads and evaluates research relevant to the profession.
- Shares information through publication, presentation and collaboration.

Specific Criteria

Medical Dosimetry

Refer to general criteria.

Glossary

The glossary is an alphabetical list of defined terms or words specifically found in the ASRT Practice Standards for Medical Imaging and Radiation Therapy. The terms or words have meaning that might not be general knowledge. The definitions are formulated using evidentiary documentation and put into place following extensive review and subsequent approval. The glossary is not all-inclusive. New terms and new usage of existing terms will emerge with time and advances in technology.

AAPM – American Association of Physicists in Medicine

ACR – American College of Radiology

advanced-practice radiographer – A registered technologist who has gained additional knowledge and skills through the successful completion of an organized program or radiologic technology education that prepares radiologic technologists for advanced-practice roles and has been recognized by the national certification organization to engage in advanced-practice radiologic technology.

adverse event – Any undesirable experience associated with the use of a medical product in a patient.

ALARA – Acronym for "as low as (is) reasonably achievable," which means making every reasonable effort to maintain exposures to radiation as far below the dose limits as practical, consistent with the purpose for which the licensed activity is undertaken, while taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety and other societal and socioeconomic considerations, and in relation to the use of nuclear energy and licensed materials in the public interest. The ASRT recognizes the concept of ALARA to include energies used for magnetic resonance and sonographic imaging.

anatomic (anatomical) landmarks – Bones or other identifiable points that are visible or palpable and indicate the position of internal anatomy.

archive (archival) –The storage of data in either hard (film) or soft (digital) form.

ARDMS – American Registry for Diagnostic Medical Sonography

ARRT – American Registry of Radiologic Technologists

artifact – Extraneous information on the image that interferes with or distracts from image quality.

ASRT – American Society of Radiologic Technologists

authorized user – A physician, dentist or podiatrist who meets the requirements as defined by the United States Nuclear Regulatory Commission.

beam-modification devices – Devices that change the shape of the treatment field or distribution of the radiation at (tissue) depth.

brachytherapy – A type of radiation therapy in which radioactive material sealed in needles, seeds, wires or catheters is placed directly into or near a tumor. Also called implant radiation therapy, internal radiation therapy and radiation brachytherapy.

CCI – Cardiovascular Credentialing International

change management – Systematic approach to preparing for, implementing and sustaining a change in process.

clinical – Pertaining to or founded on actual observations and treatments of patients.

clinically competent – The ability to perform a clinical procedure in a manner that satisfies the demands of a situation, as assessed and documented by a qualified individual.

contrast media – A substance administered during a medical imaging procedure for the purpose of enhancing the contrast between an internal structure or fluid and the surrounding tissue.

cropping – The process of selecting and removing a portion of the image.

custom blocks – Devices designed to shape the radiation field.

DICOM – Acronym for "Digital Imaging and Communications in Medicine." The DICOM standards are a complex set of instructions to exchange and present medical image information.

dose distribution – Spatial representation of the magnitude of the dose produced by a source of radiation. It describes the variation of dose with position within an irradiated volume.

dosimetric calculations – Computation of treatment unit settings, monitor units, treatment times and radiation doses to anatomical areas of interest.

educationally prepared – The successful completion of didactic and clinical education necessary to properly perform a procedure in accordance with accepted practice standards.

electronic masking – Electronic collimation or cropping of the digital radiographic image that occurs during postprocessing of the acquired image and does not alter the size of the irradiated field.

fiducial markers – Fixed reference points against which other objects can be measured. They may be placed internally, at skin surface or fixed externally to the patient.

GRADE – Grading of Recommendations Assessment, Development and Evaluation

hybrid imaging – The combination of imaging technologies that allows information from different modalities to be presented as a single set of images.

image-guided radiation therapy – A process of using various imaging techniques to localize the target and critical tissues and, if needed, reposition the patient just before or during the delivery of radiotherapy.

immobilization device – Device that assists in maintaining or reproducing the position while restricting patient movement.

initial observation – Assessment of technical image quality with pathophysiology correlation communicated to a radiologist.

interpretation – The process of examining and analyzing all images within a given procedure and integration of the imaging data with appropriate clinical data in order to render an impression or conclusion set forth in a formal written report composed and signed by a licensed practitioner.

interventional procedures – Invasive medical imaging guidance methods used to diagnose

and/or treat certain conditions.

ISCD – International Society for Clinical Densitometry

JRC-DMS – Joint Review Committee on Education in Diagnostic Medical Sonography

least significant change – The least amount of bone mineral densitometry change that can be considered statistically significant.

licensed practitioner – A medical or osteopathic physician, chiropractor, podiatrist or dentist who has education and specialist training in the medical or dental use of radiation and is deemed competent to perform independently or supervise medical imaging or radiation therapy procedures by the respective state licensure board.

MDCB – Medical Dosimetrist Certification Board

medical physicist – An individual who is competent to practice independently in the safe use of x-rays, gamma rays, electron and other charged particle beams, neutrons, radionuclides, sealed radionuclide sources, ultrasonic radiation, radiofrequency radiation and magnetic fields for diagnostic and therapeutic purposes. An individual is considered competent to practice in the field of medical physics if he or she is certified by the appropriate recognized certification organization.

medication – Any chemical substance intended for use in the medical diagnosis, cure, treatment or prevention of disease.

minimal sedation (anxiolysis) – A drug-induced state during which patients respond normally to verbal commands. Although cognitive function and coordination may be impaired, ventilatory and cardiovascular functions are unaffected.

moderate sedation – A drug-induced depression of consciousness during which patients respond purposefully to verbal commands, either alone or accompanied by light tactile stimulation. No interventions are required to maintain a patent airway, and spontaneous ventilation is adequate. Cardiovascular function is usually maintained.

molecular imaging – A biomedical discipline enabling the visualization, characterization and quantification of biologic processes taking place at the cellular and subcellular levels within intact living subjects.

monitor units – Unit of output measure used for linear accelerators, sometimes indicated with the abbreviation MU. Accelerators are calibrated so that 1 MU delivers 1 cGy for a standard reference field size at a standard reference depth at a standard source to calibration point.

NECS – National Education Curriculum for Sonography

NMTCB – Nuclear Medicine Technology Certification Board

noninterpretive fluoroscopic procedures – Use of fluoroscopic imaging under the direction of a licensed practitioner for purposes other than interpretation.

normal tissue tolerance – Radiation tolerance levels of healthy organs near or within the radiation treatment fields.

NRC – U.S. Nuclear Regulatory Commission

panning – Movement of the imaging equipment during image acquisition to maintain visualization of an anatomic region of interest.

personal radiation monitoring devices – Devices designed to be worn or carried by an individual for the purpose of measuring the dose of radiation received.

physics survey – Performing equipment testing, evaluating the testing results and completing a formal written report of results. The written survey report, validated by a medical physicist, contains sufficient information to document that each test was conducted according to local, federal or state requirements and includes an assessment of corrective actions and recommendations for improvements.

postprocessing – Computerized processing of data sets after acquisition to create a diagnostic or therapeutic image.

procedure – Specific course of action intended to result in an imaging study, treatment or other outcome.

protocol – The plan for carrying out a procedure, scientific study or a patient's treatment regimen.

quality assurance – Activities and programs designed to achieve a desired degree or grade of care in a defined medical, nursing or health care setting or program. Sometimes indicated with the abbreviation QA.

quality control – The routine performance of techniques used in monitoring or testing and maintenance of components of medical imaging and radiation therapy equipment. This includes the interpretation of data regarding equipment function and confirmation that corrective actions are/were taken. Sometimes indicated with the abbreviation QC.

radiation oncologist – A physician who specializes in using radiation to treat cancer.

radiation protection – Prophylaxis against injury from ionizing radiation. The only effective preventive measures are shielding the operator, handlers and patients from the radiation source; maintaining appropriate distance from the source; and limiting the time and amount of exposure.

radioactive material – A substance composed of unstable atoms that decay with the spontaneous emission of radioactivity. Includes radiopharmaceuticals, unsealed sources (open, frequently in liquid or gaseous form) and sealed sources (permanently encapsulated, frequently in solid form).

radiobiology – The study of the effects of radiation on living organisms.

radiography – The process of obtaining an image for diagnostic examination using x-rays.

sentinel event – An unexpected occurrence involving death or serious physical or psychological injury, or the risk thereof. Serious injury specifically includes loss of limb or function. The phrase "or the risk thereof" includes any process variation for which a recurrence would carry a significant chance of a serious adverse outcome.

setup – Arrangement of treatment parameters used in preparation for delivering radiation therapy; includes patient positioning data, field alignment information and equipment configurations.

shuttering – A postprocessing technique that may be used to eliminate ambient light around an image for the sole purpose of improving the quality of the displayed image. It should not be used as a substitute for insufficient collimation of the irradiated field.

simulation – A process using imaging technologies to plan radiation therapy so that the target area is precisely located and marked; the mockup procedure of a patient treatment with medical imaging documentation of the treatment portals.

SNMMI – Society of Nuclear Medicine and Molecular Imaging

static – Any medical image that is fixed or frozen in time.

supervising radiologist – A board-certified radiologist who oversees duties of the radiologist assistant and has appropriate clinical privileges for the procedure performed by the radiologist assistant.

timeout – Preprocedural pause to conduct a final assessment that the correct patient, site and procedure are identified.

tolerance levels (doses) – The maximum radiation dose that may be delivered to a given biological tissue at a specified dose rate and throughout a specified volume without producing an unacceptable change in the tissue.

treatment calculations – *See dosimetric calculations*.

treatment field (portal) – Volume of tissue exposed to radiation from a single radiation beam.

treatment planning – The process by which dose delivery is optimized for a given patient and clinical situation. It encompasses procedures involved in planning a course of radiation treatment, including simulation through completion of the treatment summary.

treatment record – Documents the delivery of treatments, recording of fractional and cumulative doses, machine settings, verification imaging and the ordering and implementation of prescribed changes.

T-score – Number of standard deviations the individual's bone mineral density is from the average bone mineral density for gender-matched young normal peak bone mass.

vascular access device – Apparatus inserted into the peripheral or central vasculature for diagnostic or therapeutic purposes.

vascular closure device – Active or passive medical devices used to achieve hemostasis after a cardiovascular or endovascular procedure that requires catheterization.

venipuncture – The transcutaneous puncture of a vein by a sharp rigid stylet or cannula carrying a flexible plastic catheter or by a steel needle attached to a syringe or catheter.

verification images – Images produced to confirm accurate treatment positioning and accurate treatment portals.

Z-score – Number of standard deviations the individual's bone mineral density is from the average bone mineral density for age- and gender-matched reference group.

Advisory Opinion Statements

Advisory opinion statements are interpretations of the practice standards. They are intended for clarification and guidance for specific practice issues.

The ASRT issues advisory opinions as to what constitutes appropriate practice. As such, an opinion is not a regulation or statute and does not have the force and effect of law. It is issued as a guidepost to medical imaging and radiation therapy professionals who wish to engage in safe practice. Federal and state laws, accreditation standards necessary to participate in government programs and institutional policies and procedures supersede these standards. The individual must be educationally prepared and clinically competent as a prerequisite to professional practice.

The profession holds medical imaging and radiation therapy professionals responsible and accountable for rendering safe, effective clinical services to patients and for judgments exercised and actions taken in the course of providing those services.

Acts that are within the recognized scope of practice for a given license or certification may be performed only by those individuals who possess the education and clinical proficiency to perform those acts in a safe and effective manner.

The medical imaging and radiation therapy professional's performance should be evidence-based and consistent with federal and state laws, regulations, established standards of practice, facility policies and procedures. Links to external websites may change without notice.

Each medical imaging and radiation therapy professional must exercise professional and prudent judgment when determining whether the performance of a given act is within the scope of practice for which the individual is licensed, if applicable within the jurisdiction in which the person is employed, educationally prepared and clinically competent to perform.

The ASRT's position is to determine the practice standards and scopes of practice for medical imaging and radiation therapy professionals. The practice standards emphasize the importance of an individual being educationally prepared and clinically competent to practice in the profession of medical imaging and radiation therapy.

Guidance for the Communication of Clinical and Imaging Observations and Procedure Details by Radiologist Assistants to Supervising Radiologists

After research of evidentiary documentation such as current literature, curricula, position statements, scopes of practice, laws, federal and state regulations and inquiries received by the ASRT, the ASRT issued opinions contained herein.

Advisory Opinion

It is the opinion of the ASRT that based upon current literature, curricula set forth by the ASRT, entry-level clinical activities by the ARRT, regulatory requirements and where federal or state law and/or institutional policy permits that:

1. Communication of clinical and imaging observations and procedure details by the radiologist assistant to the supervising radiologist is an integral part of radiologist assistant practice. Without clear, consistent, appropriate and ascribed communication between members of the radiology team, there is a possibility of inadequate patient care, incomplete reports and diminished departmental productivity. To create a safe and productive radiology environment, communication between the radiologist assistant and supervising radiologist must be free-flowing, consistent and relevant to the patient examination or procedure. This communication can take many forms, including verbal, written and electronic correspondence. These communications may be included and taken into consideration by the radiologist in creating a final report. However, initial clinical and imaging observations and procedure details communicated from the radiologist assistant to the radiologist are only intended for the radiologist's use and do not substitute for the final report created by the radiologist. These communications should be considered and documented as "initial clinical and imaging observations or procedure details."
2. While assisting radiologists in the performance of imaging procedures or during the performance of procedures under radiologist supervision, the radiologist assistant must be able to communicate and document procedure notes, observations, patient responses and other types of information relevant to the radiologist's interpretation and creation of the final report. Radiologist assistants do not independently "report findings" or "interpret" by dictation or by any other means; and to avoid any confusion, these terms should not be used to refer to the activities of the radiologist assistant. However, radiologist assistants may add to the patient record (following the policies and procedures of the facility) in a manner similar to any other dependent nonphysician practitioner. Radiologist assistants who are authorized to communicate initial observations to the supervising radiologist using a voice recognition dictation system or other electronic means must adhere to institutional protocols ensuring that initial observations can be viewed or accessed only by the supervising radiologist. Initial clinical or imaging observations or procedure details created by the radiologist assistant resulting from the radiologist assistant's involvement in the performance of the procedure that are included in the final report should be carefully reviewed by the supervising radiologist and should be incorporated at the supervising radiologist's discretion.

With proper education and proven competence, the communication of clinical and imaging observations and procedure details by radiologist assistants to supervising radiologists provides

quality patient services in a safe environment.
GRADE: Strong

Definitions

The following definitions can be found in the glossary to the ASRT Practice Standards for Medical Imaging and Radiation Therapy:

- clinically competent
- educationally prepared

Evidentiary Documentation

Current Literature
Not applicable

Curricula

- Radiologist Assistant Curriculum (ASRT, 2015)

Communication of Findings and Validation of Clinical Practice

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

Objectives

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

Content

I. Clinical Reporting

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

II. Evaluation of Diagnostic Accuracy

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

III. Clinical Audit

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

QUALITY OF EVIDENCE: High

Certification Agency Entry-Level Clinical Activities

- Registered Radiologist Assistant Entry-Level Clinical Activities (ARRT, 2018)

  The document states that radiologist assistants may "Review imaging procedures, make initial observations, and communicate observations **ONLY** *[emphasis added]* to the radiologist; record initial observations of imaging procedures following radiologist approval; communicate radiologist's report to appropriate health care provider consistent with the ACR Practice Parameter for Communication of Diagnostic Imaging Findings."

QUALITY OF EVIDENCE: High

Scopes of Practice and Practice Standards Reference

- Scope of Practice
    - Communicating the supervising radiologist's report to the appropriate health care provider consistent with the American College of Radiology Practice Guidelines for Communication of Diagnostic Imaging Findings.
    - Evaluating images for completeness and diagnostic quality and recommending additional images.
    - Obtaining images necessary for diagnosis and communicating initial observations to the supervising radiologist. The radiologist assistant does not provide image interpretation as defined by the American College of Radiology.

- Providing follow-up patient evaluation.

- The ASRT Practice Standards for Medical Imaging and Radiation Therapy
  - Performs follow-up patient evaluation and communicates findings to the supervising radiologist. (Standard Seven, radiologist assistant only)
  - Reports clinical and imaging observations and procedure details to the supervising radiologist. (Standard Eight, radiologist assistant only)
  - Maintains documentation of quality assurance activities, procedures and results. (Standard Eight)
  - Documents in a timely, accurate and comprehensive manner. (Standard Eight)
  - Documents and assists radiologist in quality reporting measures for the purpose of improved patient care. (Standard Eight, radiologist assistant only)

QUALITY OF EVIDENCE: High

Federal and State Statute References
Not applicable

Other
Not applicable

Approved: June 19, 2011
Amended, Main Motion, C-13.21 & C13.23, 2013
Amended, Main Motion, C-16.11, 2016
Amended, Main Motion, C-18.07, 2018
ASRT House of Delegates

Medication Administration by Medical Imaging and Radiation Therapy Professionals

After research of evidentiary documentation such as current literature, curricula, position statements, scopes of practice, laws, federal and state regulations and inquiries received by the ASRT, the ASRT issued opinions contained herein.

Advisory Opinion

It is the opinion of the ASRT that based upon current literature; curricula set forth by the ASRT, SNMMI and the NECS; certification examination specifications by the ARRT, NMTCB and CCI; recommendations by the ACR and Centers for Medicare & Medicaid Services; and where federal or state law and/or institutional policy permits that:

1. It is within the scope of practice for medical imaging and radiation therapy professionals to perform the parenteral administration of contrast media and other medications.
2. The parenteral administration of contrast media and other medications by medical imaging and radiation therapy professionals shall be performed only when a licensed practitioner is immediately available to ensure proper diagnosis and treatment of adverse events.

With proper education and proven competence, the parenteral administration of contrast media and other medications by medical imaging and radiation therapy professionals provides quality patient services in a safe environment when a licensed practitioner is immediately available to ensure proper diagnoses and treatment of possible adverse events.

GRADE: Strong

Definitions

The following definitions can be found in the glossary to the ASRT Practice Standards for Medical Imaging and Radiation Therapy:

- adverse event
- clinically competent
- educationally prepared
- licensed practitioner
- medication

Evidentiary Documentation

Current Literature

- ACR Committee on Contrast Media. *ACR Manual on Contrast Media.* Version 10.3. Reston, VA: American College of Radiology; 2017. Accessed November 29, 2018.
- American College of Radiology. ACR accreditation facility toolkit for validation site surveys. Revised April 9, 2018. Accessed November 29, 2018.
- American College of Radiology. ACR practice parameter for performing and interpreting magnetic resonance imaging (MRI). Revised 2017. Accessed November 29, 2018.

- American College of Radiology. ACR-SAR practice parameter for the performance of excretory urography. Revised 2014. Accessed November 29, 2018.
- American College of Radiology. ACR-SPR practice parameter for the use of intravascular contrast media. Revised 2017. Accessed November 29, 2018.
- American College of Radiology. ACR-SPR technical standard for therapeutic procedures using radiopharmaceuticals. Revised 2016. Accessed November 29, 2018.
- Covered medical and other health services. In: *Medicare Benefit Policy Manual*. Baltimore, MD: Centers for Medicare & Medicaid Services; 2017. Accessed November 29, 2018.

QUALITY OF EVIDENCE: High

Curricula
The ASRT curricula for all practice areas were reviewed.
- Cardiac-Interventional and Vascular-Interventional Curriculum (ASRT, 2014)
- Computed Tomography Curriculum (ASRT, 2018)
- Magnetic Resonance Curriculum (ASRT, 2015)
- Mammography Curriculum (ASRT, 2018)
- National Education Curriculum for Sonography (JRC-DMS, 2016)
- NEC Common Curricula (JRC-DMS, 2016)
- Nuclear Medicine Technology Competency-Based Curriculum Guide (SNMMI, 2013)
- Radiation Therapy Professional Curriculum (ASRT, 2014)
- Radiography Curriculum (ASRT, 2017)
- Radiologist Assistant Curriculum (ASRT, 2015)

QUALITY OF EVIDENCE: High

Certification Agency Examination Content Specifications
- Cardiac Interventional Radiography (ARRT, 2017)
- Computed Tomography (ARRT, 2017)
- Magnetic Resonance Imaging (ARRT, 2017)
- Nuclear Medicine Technology (ARRT, 2017)
- Radiation Therapy (ARRT, 2017)
- Radiography (ARRT, 2017)
- Registered Radiologist Assistant (ARRT, 2018)
- Vascular Interventional Radiography (ARRT, 2017)

Other Certification Agency Content Specifications
- Components of Preparedness (NMTCB, 2017)
- Examination Overview: Registered Cardiovascular Invasive Specialist (CCI, 2018)

QUALITY OF EVIDENCE: High

Scopes of Practice and Practice Standards Reference

- Scope of Practice*†
  - Identifying, preparing and/or administering medications as prescribed by a licensed practitioner.

QUALITY OF EVIDENCE: High

Federal and State Statute References
Not applicable

Other
Not applicable

Approved: July 1, 2012
Amended, Main Motion, C-13.21 and C13.23, 2013
Amended, Main Motion, C-16.13, 2016
Amended, Main Motion, C-17.09, 2017
Amended, Main Motion, C-18.11, 2018
ASRT House of Delegates

* Excludes limited x-ray machine operator
† Excludes medical dosimetry

Medication Administration in Peripherally Inserted Central Catheter Lines or Ports With a Power Injector

After research of evidentiary documentation such as current literature, curricula, position statements, scopes of practice, laws, federal and state regulations and inquiries received by the ASRT, the ASRT issued the opinions contained herein.

Advisory Opinion

It is the opinion of the ASRT that based upon current literature; curricula set forth by the ASRT, ASRT Practice Standards for Medical Imaging and Radiation Therapy and SNMMI; certification examination specifications by the ARRT and NMTCB; and where federal or state law and/or institutional policy permits that:

1. It is within the scope of practice for medical imaging and radiation therapy professionals to access and use a Food and Drug Administration–approved peripherally inserted central catheter (PICC) line or port designated for use with power injectors, when manufacturer guidelines regarding infusion rate and pressure are followed and where federal or state law and/or institutional policy permits.

With proper education and proven competence, the use of power injectors with PICC lines or ports provides quality patient services in a safe environment.

GRADE: Strong

Definitions

access – The process of inserting the designated needle through the access point of an existing vascular access device to deliver intravenous (IV) fluids or medication.

The following definitions can be found in the glossary to the ASRT Practice Standards for Medical Imaging and Radiation Therapy:

- educationally prepared
- clinically competent

Evidentiary Documentation

Current Literature
Not applicable

Curricula

- Computed Tomography Curriculum (ASRT, 2018)
- Magnetic Resonance Curriculum (ASRT, 2015)
- Nuclear Medicine Technology Competency-Based Curriculum Guide (SNMMI, 2013)
- Radiography Curriculum (ASRT, 2017)
- Radiologist Assistant Curriculum (ASRT, 2015)

QUALITY OF EVIDENCE: High

Certification Agency Examination Content Specifications

- Components of Preparedness (NMTCB, 2017)
- Computed Tomography (ARRT, 2017)
- Vascular Interventional Radiography (ARRT, 2017)

Other Certification Agency Content Specifications

- Components of Preparedness (NMTCB, 2017)
- Positron Emission Tomography (PET) Specialty Examination Content Outline (NMTCB, 2016)

QUALITY OF EVIDENCE: High

Scopes of Practice and Practice Standards Reference

- Scope of Practice*†
  - Administering medications parenterally through new or existing vascular access, enterally or through other appropriate routes as prescribed by a licensed practitioner.
  - Administering medications with an infusion pump or power injector as prescribed by a licensed practitioner.
  - Identifying, preparing and/or administering medications as prescribed by a licensed practitioner.

- The ASRT Practice Standards for Medical Imaging and Radiation Therapy*†
  - Uses accessory equipment. (Standard Four)

QUALITY OF EVIDENCE: High

Federal and State Statute Reference(s)
Not Applicable

Other

Approved: June 19, 2011
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Amended, Main Motion, C-16.12, 2016
Amended, Main Motion, C-17.08, 2017
Amended, Main Motion, C-18.08, 2018
ASRT House of Delegates

*Excludes limited x-ray machine operator
† Excludes medical dosimetry

Medication Administration Through Existing Vascular Access

After research of evidentiary documentation such as current literature, curricula, position statements, scopes of practice, laws, federal and state regulations and inquiries received by the ASRT, the ASRT issued opinions contained herein.

Advisory Opinion

It is the opinion of the ASRT that based upon current literature; curricula set forth by the ASRT, SNMMI and the NECS; certification examination specifications by the ARRT, NMTCB and CCI; recommendations by the ACR; and where federal or state law and/or institutional policy permits that:

1. It is within the scope of practice for medical imaging and radiation therapy professionals to access and administer medications through existing vascular access.

With proper education and proven competence, accessing and administering medications through existing vascular access provides quality patient services in a safe environment.

GRADE: Strong

Definitions

access – The process of inserting the designated needle through the access point of an existing vascular access device to deliver IV fluids or medication.

existing vascular access – Peripheral or central vascular implanted devices or external access lines that include, but are not limited to, peripherally inserted central catheter lines, intravenous lines, central lines and ports.

The following definitions can be found in the glossary to the ASRT Practice Standards for Medical Imaging and Radiation Therapy:

- clinically competent
- educationally prepared
- medication

Evidentiary Documentation

Current Literature

- ACR Committee on Contrast Media. *ACR Manual on Contrast Media.* Version 10.3. Reston, VA: American College of Radiology; 2017. Accessed November 29, 2018.
- American College of Radiology. ACR practice parameter for performing and interpreting diagnostic computed tomography (CT). Revised 2017. Accessed November 30, 2018.
- American College of Radiology. ACR practice parameter for performing and interpreting magnetic resonance imaging (MRI). Revised 2017. Accessed November 30, 2018.
- American College of Radiology. ACR-SPR practice parameter for the use of intravascular contrast media. Revised 2017. Accessed November 30, 2018.
- Rockwell D. A competency for central line use in radiology. *J Radiol Nurs*. 2008;27(2):84. doi:10.1016/j.jradnu.2008.04.016

QUALITY OF EVIDENCE: High

Curricula

- Cardiac-Interventional and Vascular-Interventional Curriculum (ASRT, 2014)
- Computed Tomography Curriculum (ASRT, 2018)
- Magnetic Resonance Curriculum (ASRT, 2015)
- Mammography Curriculum (ASRT, 2018)
- National Education Curriculum for Sonography (JRC-DMS, 2016)
- NEC Common Curricula (JRC-DMS, 2016)
- Nuclear Medicine Technology Competency-Based Curriculum Guide (SNMMI, 2013)
- Radiation Therapy Professional Curriculum (ASRT, 2014)
- Radiography Curriculum (ASRT, 2017)
- Radiologist Assistant Curriculum (ASRT, 2015)

QUALITY OF EVIDENCE: High

Certification Agency Examination Content Specifications

- Computed Tomography (ARRT, 2017)
- Magnetic Resonance Imaging (ARRT, 2017)
- Nuclear Medicine Technology (ARRT, 2017)
- Radiography (ARRT, 2017)
- Registered Radiologist Assistant (ARRT, 2018)
- Vascular Interventional Radiography (ARRT, 2017)

Other Certification Agency Content Specifications

- Components of Preparedness (NMTCB, 2017)
- Examination Overview: Registered Cardiovascular Invasive Specialist (CCI, 2018)

QUALITY OF EVIDENCE: High

Scopes of Practice and Practice Standards Reference

- Scope of Practice*†
    - Administering medications parenterally through new or existing vascular access, enterally or through other appropriate routes as prescribed by a licensed practitioner.
    - Identifying, preparing and/or administering medications as prescribed by a licensed practitioner.
    - Performing venipuncture as prescribed by a licensed practitioner.
    - Starting, maintaining and/or removing intravenous access as prescribed by a licensed practitioner.

QUALITY OF EVIDENCE: High

Federal and State Statute References
Not applicable

* Excludes limited x-ray machine operator
† Excludes medical dosimetry

Other
Not applicable

Approved: July 1, 2012
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Amended, Main Motion, C-16.14, 2016
Amended, Main Motion, C-17.10, 2017
Amended, Main Motion, C-18.12, 2018
ASRT House of Delegates

Placement of Personal Radiation Monitoring Devices

After research of evidentiary documentation such as current literature, curricula, position statements, scopes of practice, laws, federal and state regulations and inquiries received by the ASRT, the ASRT issued opinions contained herein.

Advisory Opinion

It is the opinion of the ASRT that based upon current literature; curricula set forth by the ASRT and SNMMI; certification examination specifications by the ARRT and NMTCB; regulatory requirements; AAPM recommendations; and where federal or state law and/or institutional policy permits that:

1. Radiation workers wear a personal radiation monitoring device outside of protective apparel with the label facing the radiation source at the level of the thyroid to approximate the maximum dose to the head and neck.
2. In specific cases, a whole-body monitor may be indicated. This monitor should be worn at the waist under a protective lead apron.
3. In some cases, a ring monitor may be indicated. This monitor should be worn on the dominant hand with the label facing the radiation source.

With proper education and proven competence, the determination of proper use of personal monitoring devices provides quality patient services in a safe environment.

GRADE: Strong

Definitions

The following definition can be found in the glossary to the ASRT Practice Standards for Medical Imaging and Radiation Therapy:

- personal radiation monitoring device

Evidentiary Documentation

Current Literature

- Bushong S. Occupational radiation dose management. In: *Radiologic Science for Technologists: Physics, Biology, and Protection.* 11th ed. St Louis, MO: Elsevier; 2017:581-598.
- By standards number: 1910.1096(d)(3)(i) – ionizing radiation. Occupational Safety and Health Administration website. Accessed November 30, 2018.
- Statkiewicz-Sherer MA, Visconti PJ, Ritenour ER, Welch-Haynes K. Radiation monitoring. In: *Radiation Protection in Medical Radiography.* 8th ed. St Louis, MO: Elsevier; 2018:75-92.

QUALITY OF EVIDENCE: High

Curricula

- Bone Densitometry Curriculum (ASRT, 2014)
- Limited X-ray Machine Operator Curriculum (ASRT, 2015)

- Positron Emission Tomography (PET)-Computed Tomography (CT) Curriculum (ASRT, 2004)
- Nuclear Medicine Technology Competency-Based Curriculum Guide (SNMMI, 2013)
- Radiation Therapy Professional Curriculum (ASRT, 2014)
- Radiography Curriculum (ASRT, 2017)
- Radiologist Assistant Curriculum (ASRT, 2015)

QUALITY OF EVIDENCE: High

Certification Agency Examination Content Specifications
- Cardiac Interventional Radiography (ARRT, 2017)
- Limited Scope of Practice in Radiography (ARRT, 2018)
- Nuclear Medicine Technology (ARRT, 2017)
- Radiation Therapy (ARRT, 2017)
- Radiography (ARRT, 2017)
- Registered Radiologist Assistant (ARRT, 2018)
- Vascular Interventional Radiography (ARRT, 2017)

Other Certification Agency Content Specifications
- Components of Preparedness (NMTCB, 2017)

QUALITY OF EVIDENCE: High

Scopes of Practice and Practice Standards Reference
Not applicable

Federal and State Statute References
- § 19.12 Instruction to Workers (NRC, 2018)
- § 20.1208 Dose Equivalent to an Embryo/Fetus (NRC, 2018)
- § 20.1502 Conditions Requiring Individual Monitoring of External and Internal Occupational Dose (NRC, 2018)
- Regulatory Guide 8.34: Monitoring Criteria and Methods to Calculate Occupational Radiation Doses (NRC, 1992)
- Regulatory Guide 8.36: Radiation Dose to the Embryo/Fetus (NRC, 2018)
- Regulatory Guide 8.7: Instructions for Recording and Reporting Occupational Radiation Exposure Data (NRC, 2016)

QUALITY OF EVIDENCE: High

Other
AAPM Report No. 58: Managing the Use of Fluoroscopy in Medical Institutions. Appendix A: Radiation Safety/Quality Assurance Program

QUALITY OF EVIDENCE: High

pproved: July 1, 2012
Amended, Main Motion, C-13.21 & C13.23, 2013
Amended, Main Motion, C-16.15, 2016
Amended, Main Motion, C-18.09, 2018
ASRT House of Delegates

Use of Postexposure Shuttering, Cropping and Electronic Masking in Radiography

After research of evidentiary documentation such as current literature, curricula, position statements, scopes of practice, laws, federal and state regulations, and inquiries received by the ASRT, the ASRT issued opinions contained herein.

Advisory Opinion

It is the opinion of the ASRT that based upon current literature, curricula set forth by the ASRT, certification examination specifications by the ARRT, and recommendations by the ACR that:

1. It is within the scope of practice of a radiologic technologist to determine and apply appropriate pre-exposure collimation to individual projections of examinations to comply with the principle of ALARA. Postexposure shuttering, cropping, electronic collimation or electronic masking to eliminate the visibility of large regions of brightness are acceptable, where automatic processing fails to do so.
2. It is outside of the scope of practice of a radiologic technologist to use postexposure shuttering, cropping, electronic collimation or electronic masking to eliminate any anatomical information. This information is a part of the patient's permanent medical record and should therefore be presented to the licensed practitioner to determine whether the exposed anatomy obtained on any image is significant or of diagnostic value.
3. It is outside the scope of practice of a radiologic technologist to use postexposure shuttering, cropping, electronic collimation or electronic masking to duplicate and use any acquired image for more than one prescribed view or projection on any exam. Facilities acquiring digital images are legally required to retain information in the DICOM information of each image that identifies the selected view or projection at the time of image acquisition. Using the same acquired image to represent two different prescribed views or projections is a falsification of the information in the patient medical record and imaging study made available to the licensed practitioner.

With proper education and proven competence, the elimination of improper use of postexposure shuttering, cropping and electronic masking provides quality patient services in a safe environment.

GRADE: Strong

Definitions

- processing: Manipulation of the raw data just after acquisition.

The following definitions can be found in the glossary to the ASRT Practice Standards for Medical Imaging and Radiation Therapy:

- cropping
- DICOM
- electronic masking
- shuttering

Evidentiary Documentation

Current Literature

- American College of Radiology. ACR-AAPM-SIIM-SPR practice parameter for digital radiography. Revised 2017.
- Bomer J, Wiersma-Deijl L, Holscher HC. Electronic collimation and radiation protection in paediatric digital radiography: revival of the silver lining. *Insights Imaging.* 2013;4(5):723-727. doi:10.1007/s13244-013-0281-5
- Carroll QB. *Radiography in the Digital Age*. 2nd ed. Springfield, IL: Charles C Thomas; 2014.
- Carter C, Vealé B. *Digital Radiography and PACS*. 2nd ed. Maryland Heights, MO: Elsevier; 2014.
- Chalazonitis AN, Koumarianos D, Tzovara J, Chronopoulos P. How to optimize radiological images captured from digital cameras, using the Adobe Photoshop 6.0 program. *J Digit Imaging.* 2003;16(2):216-229.
- Don S, Macdougall R, Strauss K, et al. Image Gently campaign back to basics initiative: ten steps to help manage radiation dose in pediatric digital radiography. *AJR Am J Roentgenol.* 2013;200(5):W431-W436. doi:10.2214/AJR.12.9895
- Fauber TL, Dempsey MC. X-ray field size and patient dosimetry. *Radiol Technol.* 2013;85(2):155-161.
- Fauber TL. *Radiographic Imaging and Exposure*. 5th ed. St Louis, MO: Elsevier; 2016.
- Goske MJ, Charkot E, Herrmann T, et al. Image Gently: challenges for radiologic technologists when performing digital radiography in children. *Pediatr Radiol.* 2011;41(5):611-619. doi:10.1007/s00247-010-1957-3
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- Lo WY, Puchalski SM. Digital image processing. *Vet Radiol Ultrasound*. 2008;49(1 suppl 1):S42-S47. doi:10.1111/j.1740-8261.2007.00333.x
- Russell J, Burbridge BE, Duncan MD, Tynan J. Adult fingers visualized on neonatal intensive care unit chest radiographs: what you don't see. *Can Assoc Radiol J.* 2013;64(3):236-239. doi:10.1016/j.carj.2012.04.004
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- Uffmann M, Schaefer-Prokop C. Digital radiography: the balance between image quality and required radiation dose. *Eur J Radiol*. 2009;72(2):202-208. doi:10.1016/j.ejrad.2009.05.060
- Willis CE. Optimizing digital radiography of children. *Eur J Radiol*. 2009;72(2):266-273. doi:10.1016/j.ejrad.2009.03.003
- Zetterberg LG, Espeland A. Lumbar spine radiography—poor collimation practices after implementation of digital technology. *Br J Radiol*. 2011;84(1002):566-9. doi:10.1259/bjr/74571469

QUALITY OF EVIDENCE: High

Curricula
Not applicable

Certification Agency Content Specifications
Not applicable

Scopes of Practice and Practice Standards Reference

- Scope of Practice
  - Applying principles of ALARA to minimize exposure to patient, self and others.
- The ASRT Practice Standards for Medical Imaging and Radiation Therapy
  - Analyzes digital images to determine the use of appropriate imaging parameters. (Standard Two)
  - Optimizing technical factors in accordance with the principles of ALARA. (Standard Two)
  - Verifies that exposure indicator data for digital radiographic systems has not been altered or modified and is included in the DICOM header and on images exported to media. (Standard Two)
  - Employs proper radiation safety practices. (Standard Four)
  - Optimizes technical factors according to equipment specifications to meet the ALARA principle. (Standard Four)
  - Positions patient for anatomic area of interest, respecting patient ability and comfort. (Standard Four)
  - Uses pre-exposure collimation and proper field-of-view selection. (Standard Four)
  - Adheres to the established practice standards of the profession. (Standard Five)
  - Evaluates images for overall image quality of a specific area of anatomical interest based on limited education, training and licensure/certification within the scope of practice. (Standard Five, limited x-ray machine operator only)
  - Evaluates images for optimal technical exposure factors. (Standard Five, radiography only)
  - Evaluates images for positioning to demonstrate the anatomy of interest. (Standard Five, radiography only)
  - Recognizes the need to adjust patient position or technical exposure factors to improve the quality of the procedure. (Standard Five, limited x-ray machine operator only)
  - Reviews images to determine if additional images will enhance the diagnostic value of the procedure. (Standard Five, radiography only)
  - Performs additional images that will produce the expected outcomes based upon patient condition and procedural variances. (Standard Six, radiography only)
  - Performs additional images that will produce the expected outcome based on patient's condition and procedural variance under the direction of a licensed practitioner or radiographer. (Standard Six, limited x-ray machine operator only)

QUALITY OF EVIDENCE: High

Federal and State Statute References
Not applicable

Other
Not applicable

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ASRT House of Delegates