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The American College of Radiology will periodically define new practice guidelines and technical standards for radiologic practice to help advance the science of radiology and to improve the quality of service to patients throughout the United States. Existing practice guidelines and technical standards will be reviewed for revision or renewal, as appropriate, on their fifth anniversary or sooner, if indicated.

Each practice guideline and technical standard, representing a policy statement by the College, has undergone a thorough consensus process in which it has been subjected to extensive review, requiring the approval of the Commission on Quality and Safety as well as the ACR Board of Chancellors, the ACR Council Steering Committee, and the ACR Council. The practice guidelines and technical standards recognize that the safe and effective use of diagnostic and therapeutic radiology requires specific training, skills, and techniques, as described in each document. Reproduction or modification of the published practice guideline and technical standard by those entities not providing these services is not authorized.

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ACR PRACTICE GUIDELINE FOR THE USE OF INTRAVASCULAR CONTRAST MEDIA

PREAMBLE

These guidelines are an educational tool designed to assist practitioners in providing appropriate radiologic care for patients. They are not inflexible rules or requirements of practice and are not intended, nor should they be used, to establish a legal standard of care. For these reasons and those set forth below, the American College of Radiology cautions against the use of these guidelines in litigation in which the clinical decisions of a practitioner are called into question.

The ultimate judgment regarding the propriety of any specific procedure or course of action must be made by the physician or medical physicist in light of all the circumstances presented. Thus, an approach that differs from the guidelines, standing alone, does not necessarily imply that the approach was below the standard of care. To the contrary, a conscientious practitioner may responsibly adopt a course of action different from that set forth in the guidelines when, in the reasonable judgment of the practitioner, such course of action is indicated by the condition of the patient, limitations of available resources, or advances in knowledge or technology subsequent to publication of the guidelines. However, a practitioner who employs an approach substantially different from these guidelines is advised to document in the patient record information sufficient to explain the approach taken.

The practice of medicine involves not only the science, but also the art of dealing with the prevention, diagnosis, alleviation, and treatment of disease. The variety and complexity of human conditions make it impossible to always reach the most appropriate diagnosis or to predict with certainty a particular response to treatment.

Therefore, it should be recognized that adherence to these guidelines will not assure an accurate diagnosis or a successful outcome. All that should be expected is that the practitioner will follow a reasonable course of action based on current knowledge, available resources, and the needs of the patient to deliver effective and safe medical care. The sole purpose of these guidelines is to assist practitioners in achieving this objective.

I. INTRODUCTION

This guideline has been developed to promote the safe and effective administration of intravascular contrast media used for imaging studies.

Intravascular contrast media are used for a wide variety of imaging studies. The majority of intravascular contrast-enhanced imaging examinations involve iodinated contrast media, but other contrast media may be used for magnetic resonance imaging (MRI), ultrasonic imaging, and angiography.

II. GOAL

The goal of radiologists and other personnel administering intravascular contrast media should be to utilize these agents appropriately and properly so that imaging studies are optimized and risk to the patient is minimized.

III. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL

The healthcare professional performing the injection may be a certified and/or licensed radiologic technologist, nurse, physician assistant, physician, or other

appropriately credentialed healthcare professional under the direct supervision¹ of a radiologist or his or her physician designee if the practice is in compliance with institutional and state regulations. Training and proficiency in cardiopulmonary resuscitation are recommended for those who attend to patients undergoing contrast-enhanced examinations.

A. Supervising Physician

The supervising physician should be a licensed physician with the following qualifications:

1. Certification in Radiology, Diagnostic Radiology, or Radiation Oncology by the American Board of Radiology, the American Osteopathic Board of Radiology, the Royal College of Physicians and Surgeons of Canada, or the Collège des Médecins du Québec.
or
2. Completion of a residency program approved by the Accreditation Council for Graduate Medical Education (ACGME), the Royal College of Physicians and Surgeons of Canada (RCPSC), the Collège des Médecins du Québec, or the American Osteopathic Association (AOA) to include radiographic training on all body areas, and have documentation of a minimum of 6 months of formal dedicated training in the interpretation and formal reporting of general radiographs for patients of all ages.
or
3. The physician whose residency or fellowship training did not include the above may still be considered qualified to administer contrast media provided he or she can demonstrate sufficient knowledge of the pharmacology, indications, and contraindications for the use of contrast media to enable safe administration and can recognize and initiate treatment for adverse reactions.
and
4. The supervising physician should be familiar with the various contrast media available and the indications and contraindications for each. The physician should also be familiar with patient preparation for the examination, including any necessary hydration or bowel preparation. He or she should have knowledge of the volume and concentration of the appropriate contrast media required for a given examination (see the [ACR Manual on Contrast Media](#)).

5. Physicians should have sufficient patient history to determine the indications for the study. The supervising physician or his or her physician designee must be aware of specific relative contraindications and pertinent risk factors that might increase the likelihood of adverse effects from contrast administration, and must have appropriate knowledge of alternative imaging methods. The physician has the responsibility for reviewing indications for the examination and for specifying the type, timing, dosage, rate, and route of administration of contrast media (see the [ACR Manual on Contrast Media](#)).
6. The supervising physician, or his or her physician designee, must be knowledgeable in the recognition and treatment of adverse effects (e.g., idiosyncratic reactions, extravasations) of contrast media used for these studies.

Continuing Medical Education

The physician's continuing medical education should be in accordance with the [ACR Practice Guideline for Continuing Medical Education \(CME\)](#).

B. Registered Radiologist Assistant

A registered radiologist assistant is an advanced level radiographer who is certified and registered as a radiologist assistant by the American Registry of Radiologic Technologists (ARRT) after having successfully completed an advanced academic program encompassing an ACR/ASRT (American Society of Radiologic Technologists) radiologist assistant curriculum and a radiologist-directed clinical preceptorship. Under radiologist supervision, the radiologist assistant may perform patient assessment, patient management and selected examinations as delineated in the Joint Policy Statement of the ACR and the ASRT titled "Radiologist Assistant: Roles and Responsibilities" and as allowed by state law. The radiologist assistant transmits to the supervising radiologists those observations that have a bearing on diagnosis. Performance of diagnostic interpretations remains outside the scope of practice of the radiologist assistant. (ACR Resolution 34, adopted in 2006)

C. Radiologic Technologist

The technologist should be responsible for patient comfort as well as for preparing and positioning the patient for the examination. Qualifications for technologists performing injections of contrast media should be in compliance with existing operating policies and procedures at the imaging facility.

¹For the purpose of this guideline, direct supervision means that the physician must be present and immediately available to furnish assistance and direction throughout the performance of the procedure. It does not mean that the physician must be present in the room where the procedure is performed.

Certification by the American Registry of Radiologic Technologists (ARRT) or an unrestricted state license is required.

D. Nurse or Other Healthcare Professional

The certified and/or licensed nurse or other appropriately credentialed healthcare professional performing injections of contrast media should be in compliance with the existing operating policies and procedures at the imaging facility.

IV. WRITTEN REQUEST FOR THE EXAMINATION

The written or electronic request for an examination using IV contrast media should provide sufficient information to demonstrate the medical necessity of the examination and allow for its proper performance and interpretation.

Documentation that satisfies medical necessity includes 1) signs and symptoms and/or 2) relevant history (including known diagnoses). Additional information regarding the specific reason for the examination or a provisional diagnosis would be helpful and may at times be needed to allow for the proper performance and interpretation of the examination.

The request for the examination must be originated by a physician or other appropriately licensed health care provider. The accompanying clinical information should be provided by a physician or other appropriately licensed health care provider familiar with the patient's clinical problem or question and consistent with the state scope of practice requirements. (ACR Resolution 35, adopted in 2006)

V. INTRAVASCULAR CONTRAST MEDIA

A. Iodinated Contrast Media

1. For specific details (e.g., nephrotoxicity and drug interactions) refer to the [ACR Manual on Contrast Media](#).
2. Types of iodinated contrast media: Ionic high-osmolality contrast media (HOICM) and low-osmolality contrast media (LOICM) of both ionic and nonionic types are considered safe for intravascular use by the Food and Drug Administration. Iodinated LOICM, most of which are nonionic agents, are associated with less discomfort and have a lower incidence of adverse effects. Iso-osmolar iodinated contrast media (IOICM) are also currently available. At this time there are only preliminary data on this

agent, so indications for its use (instead of LOICM) have not been clearly defined.

3. Patients considered likely to benefit from use of LOICM are those who are at increased overall risk for adverse effects. They include:

- a. Patients with a history of any previous adverse effect from intravascular iodinated contrast media, with the exception of a sensation of heat, flushing, or a single episode of nausea or vomiting.
- b. Patients with asthma.
- c. Patients with previous serious allergic reactions to materials other than contrast media.
- d. Patients with known cardiac dysfunction, including patients with risks for or recent acute congestive heart failure, dysrhythmia, unstable angina pectoris, recent myocardial infarction, or pulmonary hypertension.
- e. Patients with renal insufficiency (particularly those with diabetes).
- f. Patients with generalized severe debilitation, as determined by a physician.
- g. Patients at high risk for contrast extravasation.
- h. Patients receiving contrast by power injector.
- i. Any other circumstances in which, after due consideration, the radiologist believes there is a specific indication for the use of LOICM. Examples include, but are not restricted to:
 - i. Patients with sickle cell disease.
 - ii. Patients at increased risk for aspiration.
 - iii. Patients with suspected or known pheochromocytoma.
 - iv. Patients with suspected or known myasthenia gravis disease.
 - v. Patients who are very anxious about the contrast procedure or who request or demand the use of LOICM.
 - vi. Patients in whom the risk factors cannot be satisfactorily established.

B. MR Contrast Media

1. For specific details refer to the [ACR Manual on Contrast Media](#).

2. Extracellular gadolinium chelate agents are extremely well tolerated by the vast majority of patients. Adverse reactions are encountered with a much lower frequency than is observed after administration of iodinated contrast media, but severe reactions can occur. Physicians and other healthcare professionals should be aware that certain gadolinium based contrast agents used in MRI examinations have been associated with nephrogenic systemic fibrosis (NSF) in patients with advanced or moderate kidney failure.
3. Adverse events, including some that are severe, have also been noted with other types of intravascular MR contrast media.
4. The same qualifications for injecting, monitoring and/or supervising iodinated contrast media pertain to physicians, nurses, radiologist assistants, radiologic technologists, and other healthcare professionals administering intravascular MR contrast media, as stated in section III.

C. The ACR recognizes the appropriateness of the use of any FDA-approved contrast media in accordance with the supervising physician's best judgment.

VI. PROCEDURE

Each facility or department should have written policies and procedures.

Personnel familiar with the various risk factors, preparation, and any necessary premedication strategies should perform appropriate history and preprocedural screening. Relevant history should be brought to the attention of the supervising physician prior to contrast injection.

All imaging facilities should have policies and procedures to identify pregnant patients prior to imaging, and to consider any possible risks to the fetus of any planned administration of contrast material, taking into consideration the potential clinical benefits of the examination. See the [ACR Manual on Contrast Media](#).

Vascular access should be established using the facility's protocol. Adequate flow should be ascertained prior to injection.

The health care professional performing the injection must be aware of the signs and symptoms of an adverse reaction and must monitor the patient for the development of these signs and symptoms during the examination. Patients should be monitored during and after contrast injection.

The supervising physician, or his or her physician designee, must be immediately available to respond promptly to an adverse effect.

Protocols should be in place for treating patients with adverse contrast effects. After a reaction there must be documentation of the effect and treatment, reporting to the appropriate healthcare personnel, counseling about future contrast administration, and flagging of the patient's medical and/or radiological record.

VII. DOCUMENTATION

Reporting should be in accordance with the [ACR Practice Guideline for Communication of Diagnostic Imaging Findings](#). The use of contrast media for radiation therapy planning should be documented in an appropriate record.

VIII. EQUIPMENT SPECIFICATIONS

Appropriate emergency equipment and medications must be immediately available to treat adverse reactions associated with administered contrast media. The equipment and medications should be monitored for inventory and drug expiration dates on a regular basis. The equipment, medications, and other emergency support must also be appropriate for the range of ages and/or sizes in the patient population.

IX. QUALITY CONTROL AND IMPROVEMENT, SAFETY, INFECTION CONTROL, AND PATIENT EDUCATION

Policies and procedures related to quality, patient education, infection control, and safety should be developed and implemented in accordance with the ACR Policy on Quality Control and Improvement, Safety, Infection Control, and Patient Education appearing under the heading *Position Statement on QC & Improvement, Safety, Infection Control, and Patient Education* on the ACR web page (<http://www.acr.org/guidelines>).

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Suggested Reading (Additional articles that are not cited in the document but that the committee recommends for further reading on this topic)

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*Guidelines and standards are published annually with an effective date of October 1 in the year in which amended, revised or approved by the ACR Council. For guidelines and standards published before 1999, the effective date was January 1 following the year in which the guideline or standard was amended, revised, or approved by the ACR Council.

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