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RESOLUTION 3

BE IT RESOLVED,

**that the American College of Radiology adopt the ACR–SPR
Practice Guideline for the Use of Intravascular Contrast Media**

Sponsored By: ACR Council Steering Committee

The American College of Radiology, with more than 30,000 members, is the principal organization of radiologists, radiation oncologists, and clinical medical physicists in the United States. The College is a nonprofit professional society whose primary purposes are to advance the science of radiology, improve radiologic services to the patient, study the socioeconomic aspects of the practice of radiology, and encourage continuing education for radiologists, radiation oncologists, medical physicists, and persons practicing in allied professional fields.

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.

ACR–SPR 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

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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 **and was revised collaboratively by the American College of Radiology (ACR) and the Society for Pediatric Radiology (SPR).**

~~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.~~ **For a complete discussion of the use of intravascular contrast media and of potential adverse events related to contrast media administration (e.g., nephrotoxicity, extravasation, allergic-like reactions pregnancy issues, and other concerns [e.g., drug interactions], see the ACR Manual on Contrast Media [1].**

The goals of radiologists and other personnel administering intravascular contrast media ~~should be to utilize~~ **include using these contrast agents media** appropriately and properly, **optimizing so that imaging studies image study quality, are optimized and minimizing risk to the patient.** ~~to the patient is minimized~~

II. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL

The health care professional performing the injection ~~may~~ **must** be a certified and/or licensed radiologic technologist, **MRI technologist, registered radiologist assistant,** nurse, physician assistant, physician, or other appropriately credentialed health care professional under the direct supervision¹ of a radiologist or his or her physician designee [2-4]. ~~if The practice injection technique must be~~ **is** in compliance with **relevant** institutional, ~~and~~ state, **and federal** regulations. Training and proficiency in

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.

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30 cardiopulmonary resuscitation are recommended for those who attend to patients
31 undergoing contrast-enhanced examinations.

32 33 A. ~~Supervising~~ Physician

- 34
35 1. The ~~supervising~~ physician should be a licensed physician with the following
36 qualifications:

37
38 Certification in Radiology, Diagnostic Radiology, or Radiation Oncology by the
39 American Board of Radiology, the American Osteopathic Board of Radiology, the
40 Royal College of Physicians and Surgeons of Canada, or the Collège des
41 Médecins du Québec.

42 or

43 Completion of a residency program approved by the Accreditation Council for
44 Graduate Medical Education (ACGME), the Royal College of Physicians and
45 Surgeons of Canada (RCPSC), the Collège des Médecins du Québec, or the
46 American Osteopathic Association (AOA) to include ~~radiographic imaging~~
47 training on all body areas. ~~and have documentation of a minimum of 6 months of~~
48 ~~formal dedicated training in the interpretation and formal reporting of general~~
49 ~~radiographs for patients of all ages~~

50 or

51 ~~The A~~ physician whose residency or fellowship training did not include the above
52 may still be considered qualified to ~~administer~~ **protocol** contrast media
53 **administration** provided he or she can demonstrate sufficient knowledge of the
54 pharmacology, indications, and contraindications for the use of contrast media to
55 enable safe administration, and can recognize and initiate treatment for adverse
56 events. ~~reactions~~

57 and

- 58 2. The ~~supervising~~ physician should be familiar with the various contrast media
59 available and the indications and contraindications for each. **The physician**
60 **should be aware of specific relative contraindications and pertinent risk**
61 **factors that might increase the likelihood of adverse events from contrast**
62 **media administration, and should have appropriate knowledge of alternative**
63 **imaging methods (see the ACR Manual on Contrast Media [1]).** The
64 physician should also be familiar with patient preparation for the examination,
65 including any necessary hydration or bowel preparation. He or she should have
66 knowledge of the volume and concentration of the appropriate contrast media
67 required for a given examination.

- 68
69 3. **The physician is responsible for defining the examination protocol, including**
70 **specifying the type, timing, dosage, rate of injection, and route of administration**
71 **of contrast media.**

72 ~~(see the ACR Manual on Contrast Media. Physicians should have sufficient~~
73 ~~patient history to determine the indications for the study. The supervising~~
74 ~~physician or his or her physician designee must be aware of specific relative~~
75 ~~contraindications and pertinent risk factors that might increase the likelihood of~~

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76 ~~adverse effects from contrast administration, and must have appropriate~~
77 ~~knowledge of alternative imaging methods. The physician has the responsibility~~
78 ~~for reviewing indications for the examination and for specifying the physician~~
79 ~~designee must be aware of specific relative contraindications and pertinent risk~~
80 ~~factors that might increase the likelihood of adverse effects from contrast~~
81 ~~administration, and must have appropriate knowledge of alternative imaging~~
82 ~~methods~~

84 **B. Physician Performing Direct Supervision¹**

85
86 The ~~supervising physician~~ **supervising the injection of contrast media** ~~or his or her~~
87 ~~physician designee must~~ **should** be knowledgeable in the recognition and treatment of
88 ~~adverse effects~~ **events related to contrast media administration (see the ACR Manual**
89 **on Contrast Media [1]).** ~~(e.g., idiosyncratic reactions, extravasations) of contrast media~~
90 ~~used for these studies~~

91 ~~Continuing Medical Education~~

92 ~~The physician's continuing medical education should be in accordance with the ACR~~
93 ~~Practice Guideline for Continuing Medical Education (CME)~~

94 **C. Registered Radiologist Assistant [5]**

95
96
97
98 A registered radiologist assistant is an advanced level radiographer who is
99 certified and registered as a radiologist assistant by the American Registry
100 of Radiologic Technologists (ARRT) after having successfully completed
101 an advanced academic program encompassing an ACR/ASRT (American
102 Society of Radiologic Technologists) radiologist assistant curriculum and
103 a radiologist-directed clinical preceptorship. Under radiologist
104 supervision, the radiologist assistant may perform patient assessment,
105 patient management and selected examinations as delineated in the Joint
106 Policy Statement of the ACR and the ASRT titled "Radiologist Assistant:
107 Roles and Responsibilities" and as allowed by state law. The radiologist
108 assistant transmits to the supervising radiologists those observations that
109 have a bearing on diagnosis. Performance of diagnostic interpretations
110 remains outside the scope of practice of the radiologist assistant. (ACR
111 Resolution 34, adopted in 2006)

112 **D. Radiologic Technologist**

113
114
115 ~~The technologist should be responsible for patient comfort as well as for preparing and~~
116 ~~positioning the patient for the examination. Qualifications for Technologists performing~~
117 ~~injections of contrast media should be in compliance with existing operating~~

¹ For 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.

118 policies and procedures at the imaging facility **in which they are working. At a**
119 **minimum, the technologist should understand the general benefits of contrast media**
120 **administration, follow protocols that involve intravascular injection of contrast**
121 **media, understand contraindications to intravascular injection of contrast media,**
122 **and recognize adverse events following contrast media administration.**

123

124 Certification by the American Registry of Radiologic Technologists (ARRT), **the**
125 **American Registry of Magnetic Resonance Imaging Technologists (ARMRIT), or an**
126 **unrestricted state license is required.**

127

128 E. Nurse or Other Healthcare Professional

129

130 The certified and/or licensed nurse or other appropriately credentialed health care
131 professional performing injections of contrast media should be in compliance with the
132 existing operating policies and procedures at the imaging facility **in which he or she is**
133 **working and must be in compliance with state and federal regulations.**

134

135 F. Pharmacist

136

137 **In some settings, a pharmacist may review the contrast medium order for**
138 **appropriateness and/or dispense the contrast media. The reviewing pharmacist**
139 **should be familiar with the various contrast media available and the indications and**
140 **contraindications for each.**

141

142 **However, pharmacist review may not be necessary for some settings that meet the**
143 **Joint Commission Medication Management Standards. The Joint Commission has**
144 **stated that “a hospital’s radiology services (including hospital-associated**
145 **ambulatory radiology) will be allowed to define, through protocol or policy, the role**
146 **of the licensed independent practitioner in the direct supervision of a patient during**
147 **and after IV contrast media is administered. The protocol policy is to be approved**
148 **by the medical staff.” [6]**

149

150 III. WRITTEN REQUEST FOR THE EXAMINATION

151

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

156

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

162

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

169 ~~V. INTRAVASCULAR CONTRAST MEDIA~~

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

172 ~~A. Iodinated Contrast Media~~

173 ~~1. For specific details (e.g., nephrotoxicity and drug interactions) refer to the ACR~~
174 ~~Manual on Contrast Media~~

175 ~~1. Types of iodinated contrast media: Ionic high osmolality contrast media (HOCM)~~
176 ~~and Low osmolality contrast media (LOCM) of both ionic and nonionic types are~~
177 ~~considered safe for IV use by the Food and Drug Administration. Iodinated~~
178 ~~LOCM, most of which are nonionic agents, are associated with less discomfort~~
179 ~~and have a lower incidence of adverse effects~~

180 ~~Iso-osmolality iodinated contrast media (IOCM) are also currently available. At~~
181 ~~this time there are only preliminary data on this agent, so indications for its use~~
182 ~~(instead of LOCM) have not been clearly defined~~

183 ~~2. Patients considered likely to benefit from use of LOCM are those who are at~~
184 ~~increased overall risk for adverse effects. They include~~

185 ~~a. Patients with a history of any previous adverse effect from intravascular~~
186 ~~iodinated contrast media, with the exception of a sensation of heat, flushing,~~
187 ~~or a single episode of nausea or vomiting~~

188 ~~b. Patients with asthma~~

189 ~~c. Patients with previous serious allergic reactions to materials other than~~
190 ~~contrast media~~

191 ~~d. Patients with known cardiac dysfunction, including patients with risks for or~~
192 ~~recent acute congestive heart failure, dysrhythmia, unstable angina pectoris,~~
193 ~~recent myocardial infarction, or pulmonary hypertension~~

194 ~~e. Patients with renal insufficiency (particularly those with diabetes)~~

195 ~~f. Patients with generalized severe debilitation, as determined by a physician~~

196 ~~g. Patients at high risk for contrast extravasation~~

197 ~~h. Patients receiving contrast by power injector~~

198 ~~i. Any other circumstances in which, after due consideration, the radiologist~~
199 ~~believes there is a specific indication for the use of LOCM. Examples include,~~
200 ~~but are not restricted to~~

201 ~~i. Patients with sickle cell disease~~

202 ~~ii. Patients at increased risk for aspiration~~

203 ~~iii. Patients with suspected or known pheochromocytoma~~

204 ~~iv. Patients with suspected or known myasthenia gravis disease~~

205 ~~v. Patients who are very anxious about the contrast procedure or who~~
206 ~~request or demand the use of LOC.~~

207 ~~vi. Patients in whom the risk factors cannot be satisfactorily established~~
208

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209 ~~B. MR Contrast Media~~

210 For specific details refer to the ACR Manual on Contrast Media

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

223

224 IV. PROCEDURE

225

226 Each facility or **imaging** department should have written policies, **protocols**, and
227 **procedures regarding administration of intravascular contrast media.**

228

229 **Appropriate history and preprocedural screening should be performed by personnel**
230 **familiar with the various risk factors for adverse events, contraindications to contrast**
231 **media administration, examination preparation, and any necessary premedication**
232 **strategies. ~~should perform appropriate history and preprocedural screening~~ Relevant**
233 **history and laboratory results should be brought to the attention of reviewed by the**
234 **supervising physician (see section II A) prior to contrast material media injection.**

235

236 All imaging facilities should have policies and procedures to identify pregnant patients
237 prior to imaging. ~~and to consider any possible risks to the fetus of any planned~~
238 ~~administration of contrast material taking into consideration the potential clinical benefits~~
239 ~~of the examination~~ **Prior to contrast media administration, possible risks to the fetus**
240 **and benefits of the procedure should be evaluated by a radiologist and discussed**
241 **with the patient and referring clinician. See the section on administration of**
242 **contrast medium to pregnant or potentially pregnant patients in the ACR Manual**
243 **on Contrast Media [1].**

244

245 Vascular access should be established **or confirmed** using the facility's protocol.
246 Adequate ~~flow~~ **access** should be ascertained prior to **contrast media** injection (e.g.,
247 **verifying that the catheter is appropriate for the injection, assessing the access for**
248 **backflow of blood, saline flush, and/or test injection with a power injector).**

249

250 The health care professional performing the injection ~~must~~ **should** be aware of the signs
251 and symptoms of an adverse ~~reaction~~ **event** and ~~must~~ **should** monitor the patient for the
252 development of these signs and symptoms. ~~during the examination~~ Patients should be
253 ~~monitored~~ **assessed** during and **for some time** after contrast ~~material~~ **media** injection, **in**
254 **ways that are reasonably able to detect adverse events.**

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255 ~~The supervising physician, or his or her physician designee~~ **A physician** must be
256 immediately available to respond promptly to an adverse ~~effect~~ **event** (see section II B).
257 Protocols should be in place for treating patients with adverse ~~contrast effects~~ **events**.

258

259 **A clinically significant event and its treatment should be documented in the**
260 **radiology report and/or the patient's medical record in compliance with the**
261 **operating policies and procedures of the imaging facility (see the ACR Practice**
262 **Guideline for Communication of Diagnostic Imaging Findings [7]).** ~~After a reaction~~
263 ~~there must be documentation of the effect and treatment reporting to the appropriate~~
264 ~~healthcare personnel, counseling about future contrast administration, and flagging of the~~
265 ~~patient's medical and/or radiological record~~ **Counseling about future contrast media**
266 **administration and the possible need for future premedication should be directly**
267 **communicated to the patient as well as the patient's referring physician, if possible.**

268

269 **V. DOCUMENTATION**

270

271 Reporting should be in accordance with the ACR Practice Guideline for Communication
272 of Diagnostic Imaging Findings. The use of contrast media for radiation therapy planning
273 should be documented in an appropriate record.

274

275 **VI. EQUIPMENT SPECIFICATIONS**

276

277 Appropriate emergency equipment and medications must be immediately available to
278 treat adverse ~~reactions~~ **events related to contrast media administration (see the ACR**
279 **Manual on Contrast Media [1]).** ~~associated with administered contrast media~~ The
280 equipment and medications should be monitored for inventory and drug expiration dates
281 on a regular basis. The equipment, medications, and other emergency support must ~~also~~
282 be appropriate for the range of ages and/or sizes in the patient population.

283

284 **VII. QUALITY CONTROL AND IMPROVEMENT, SAFETY, INFECTION** 285 **CONTROL, AND PATIENT EDUCATION**

286

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

292

293 **ACKNOWLEDGEMENTS**

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295 This guideline was revised according to the process described under the heading *The*
296 *Process for Developing ACR Practice Guidelines and Technical Standards* on the ACR
297 web site (<http://www.acr.org/guidelines>) by the Committee on Drugs and Contrast Media
298 of the Commission on General, Small, and Rural Practice, **and the Committee on**
299 **Pediatric Radiology of the Commission on Pediatric Radiology, in collaboration**
300 **with the SPR.**

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302 revision of this guideline

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400
 401

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

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