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ACR–SIR–SNIS–SPR PRACTICE PARAMETER FOR INTERVENTIONAL CLINICAL PRACTICE AND MANAGEMENT

PREAMBLE

This document is an educational tool designed to assist practitioners in providing appropriate radiologic care for patients. Practice Parameters and Technical Standards are not inflexible rules or requirements of practice and are not intended, nor should they be used, to establish a legal standard of care¹. For these reasons and those set forth below, the American College of Radiology and our collaborating medical specialty societies caution against the use of these documents 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 practitioner in light of all the circumstances presented. Thus, an approach that differs from the guidance in this document, 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 this document 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 this document. However, a practitioner who employs an approach substantially different from the guidance in this document 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 the guidance in this document 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 this document is to assist practitioners in achieving this objective.

¹ Iowa Medical Society and Iowa Society of Anesthesiologists v. Iowa Board of Nursing, ___ N.W.2d ___ (Iowa 2013) Iowa Supreme Court refuses to find that the ACR *Technical Standard for Management of the Use of Radiation in Fluoroscopic Procedures* (Revised 2008) sets a national standard for who may perform fluoroscopic procedures in light of the standard's stated purpose that ACR standards are educational tools and not intended to establish a legal standard of care. See also, Stanley v. McCarver, 63 P.3d 1076 (Ariz. App. 2003) where in a concurring opinion the Court stated that "published standards or guidelines of specialty medical organizations are useful in determining the duty owed or the standard of care applicable in a given situation" even though ACR standards themselves do not establish the standard of care.

I. INTRODUCTION

This practice parameter has been developed, written, and revised collaboratively by the American College of Radiology (ACR), the Society of Interventional Radiology (SIR), the Society of Neurointerventional Surgery (SNIS), and the Society for Pediatric Radiology (SPR).

Interventional radiology and interventional neuroradiology are clinical subspecialties of radiology focused on minimally invasive, image-guided therapy for numerous diseases.

An interventional radiologist or interventional neuroradiologist interacts directly with patients and counsels them regarding their diseases and therapeutic options. Interventional therapy includes initial consultation, patient assessment image-guided therapeutic interventions when appropriate, and continues through time to eventual resolution of the clinical problem or establishment of an alternative care plan. To achieve these ends, it is necessary for the interventional radiologist or interventional neuroradiologist to see patients in clinical practice settings and often to formulate and execute management plans. Traditional clinical office space and privileges to manage patients in the hospital are essential.

In addition to the mandatory infrastructure requirements, there are benchmarks that define an interventional clinical practice. These benchmarks should be used as goals for developing the practice. Clinical interventional radiologists and interventional neuroradiologists should be able to:

- Accept referrals for therapeutic interventions as the sole or primary consultant for the disease process.
- Perform consultations prior to and following elective, urgent, or emergent interventions, with a system to communicate these consultations back to referrers.
- Submit accurate claims and have the necessary billing support system.
- Inform patients referred for diagnostic services about the spectrum of therapeutic options that might benefit them and provide interventional treatment if the patient desires.
- Establish, document, and implement treatment plans without requiring the participation of another specialist.
- Admit patients who require inpatient care following therapeutic interventions. The interventional physician should have admitting privileges as required. Clinical coverage is required 24 hours a day, 7 days a week.
- Provide longitudinal patient care as appropriate.

The following practice parameters should be used to develop an interventional clinical practice for both inpatient and outpatient clinical services. Recommendations will include requirements concerning processes for handling referrals, physician-patient relationship, scheduling of invasive procedures, staffing, clinic space, time dedicated to clinical duties, equipment needs, clerical services, and continuous quality improvement programs.

II. THE CLINICAL TEAM

A. Interventional Radiologist or Interventional Neuroradiologist

The interventional radiologist or interventional neuroradiologist should be dedicated to the clinical management of patients and the performance of interventional procedures. The number of interventional radiologists and interventional neuroradiologists is based primarily on the volume of procedures performed and clinical care delivered. The interventional radiologist/neuroradiologist has the primary clinical responsibility as head of the team. Nonphysician practitioners can help improve the efficiency of the clinical practice, especially with regard to routine perioperative and follow-up care in the hospital or in the office.

B. Nonphysician Practitioner

Nonphysician practitioners include nurse practitioners (NPs), physician assistants (PAs), and radiologist assistants (RAs). These medical professionals can obtain medical histories, perform physical examinations, and participate with

the interventional radiologist or interventional neuroradiologist in forming a clinical assessment and plan. Their clinical training makes them valuable members of the interventional clinical team [1,2].

A nonphysician practitioner employed by a radiology group may function as a member of the interventional team, delivering clinical care to the patient. Medicare and most other third-party payers allow them to bill under their own identification numbers for the clinical services they provide. The nonphysician practitioner can perform minor interventional procedures, thereby increasing the productivity of the interventional clinical team. They should be trained and credentialed for the procedures they perform and their clinical activities.

Although PAs and NPs can function in a similar if not identical manner, there are clear differences in the way they can practice as viewed or determined by the Centers for Medicare & Medicaid Services (CMS), regulatory agencies, and local hospitals. Interventional radiologists and interventional neuroradiologists are advised to consult with their local regulatory agencies and hospitals regarding the modes of practice that are acceptable in their regions.

C. Nursing

Registered nurses (RNs) play a critical role during interventional procedures and can be used to augment clinical services. RNs are not trained and/or may not be authorized to provide the types of clinical duties that the nonphysician practitioner provides.

The addition of a nurse coordinator to a clinical interventional team should be considered when there is a need to provide care adjunctive to that provided by the practitioner. Examples include, but are not limited to, obtaining portions of the history, gathering laboratory values, and speaking with family members. In the outpatient setting, adjunctive care might include obtaining vital signs, drawing blood, providing patient education, and telephone consultation and follow-up with patients. Nurse coordinators are particularly helpful in assisting in screening or triaging referrals or assisting with research protocols.

D. 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)

E. Radiologic Technologist

A radiologic technologist plays a critical role during interventional procedures. The radiologic technologist should be certified by the American Registry of Radiologic Technologists (ARRT) or have an unrestricted state license with documented training and experience in interventional procedures. It is desirable for the technologist to have special certification in cardiac-interventional (CI) and/or vascular interventional (VI) radiography procedures (eg, RT [R] [CV]).

Radiologic technologists are not trained and are not authorized to perform the clinical duties of the nonphysician practitioner. However, the addition of a technologist to the interventional team is essential for patient care; they are skilled in the operation of equipment and instrumentation, image/data management, and quality assurance.

F. Certified Medical Assistant

The medical assistant plays a valuable role in a robust clinical practice. Within an outpatient clinic setting, the medical assistant facilitates patient flow and operational efficiency. A medical assistant can be tasked to prepare an examination room, chaperone patients throughout a large physical area (moving to and from rooms, blood draw areas, and imaging centers), acquire vital signs, and perform basic charting. The medical assistant contributes to efficient use of resources, performing activities that do not require higher levels of training possessed by nurse, nonphysician practitioner, or medical doctor.

III. ADMINISTRATIVE SERVICES

The required administrative personnel needed to run an office-based clinical practice ideally include a receptionist, an office manager, a scheduler, an individual to perform insurance precertification, personnel with knowledge of coding guidelines with experience and expertise in interventional coding and claims submission, and a compliance officer. In addition, personnel to perform data management and quality improvement are important. Individual staff members may perform more than one function.

The following elements are necessary to implement an effective quality program:

- A computer with a database such as the SIR HI-IQ™ for tracking outcomes (Other databases are available.)
- Resources to track procedures, outcome data, and long-term follow-up
- Regular analysis of the quality of data and implementation of quality improvement actions

The following elements are highly desirable and contribute to quality control/continuous quality improvement:

- Participation in national databases (which may become necessary for reimbursement and facility accreditation for some services)
- Participation in structured reporting for quality assurance purposes

An individual may fulfill the responsibilities of more than 1 position. Many of these administrative services are already available in a clinic and could be expanded or modified to meet the additional needs.

IV. THE OUTPATIENT PRACTICE

The outpatient interventional clinic should be the cornerstone of any interventional clinical practice and serves as the front door through which patients enter the practice. The outpatient clinic is essential in providing longitudinal care, including monitoring and surveillance of disease progression or recurrence. Many patients may require follow-up interventional or diagnostic studies. Longitudinal care is vital to the growth and future success of interventional practices and to the patient's well-being.

In the outpatient clinic setting the interventional radiologist or interventional neuroradiologist and support staff can perform the following duties while providing evaluation and management (E&M) services:

- Determining appropriate diagnostic workup
- Determining the need for and arranging consultation with other physicians
- Scheduling interventional procedures
- Obtaining insurance authorization for care
- Providing follow-up care, including postprocedure testing
- Providing counseling visits

A. Space and Equipment

A successful interventional clinic practice requires quality dedicated clinic space. Although placing the interventional clinic within the radiology department is certainly economical and convenient for the physician, it can be confusing to the outpatient who is expecting to see the interventional radiologist or interventional neuroradiologist in a traditional

physician office setting. The interventional clinic is best designed as a conventional doctor's office, with a waiting room, a receptionist, and a private and confidential setting. This can be achieved using an office-sharing arrangement within a hospital-owned clinic or within another specialty clinic (eg, a surgical or internal medicine clinic).

There are many advantages to establishing an office practice outside the hospital (such as in a medical office building) or in a dedicated outpatient center within the hospital. They include patient comfort and privacy, an increased profile for the clinical practice among other doctors in the building, an increased understanding by referring doctors of the practice's level of commitment to longitudinal patient care, and an improved status with the hospital administration. Specifically, trying to perform routine clinical consultation in a holding/recovery area or in an interventional suite is not appropriate.

The examination room(s) should be large enough to accommodate an examination table, a sink, and chairs and a wheelchair if needed. Equipment requirements for the examination room(s)/clinic should include the following:

- Examination table
- Sphygmomanometer
- Stethoscope
- Educational material
- Desk
- Phone/intercom access for communication
- Emergency access bell/pull/alarm available at floor level

Other office requirements should include the following:

- Equipment and medical record storage space
- Consultation space
- Dictation/transcription capabilities
- Facilities for viewing imaging and clinical information
- Restroom availability

A patient education room is an optional feature.

Additional equipment may be required for the interventional neuroradiology clinic in order to perform a thorough neurological examination.

B. Personnel

Whether in an office-sharing arrangement or in a freestanding interventional clinic, certain personnel may be required:

- Receptionist
- Scheduler
- Clerical support
- Nonphysician practitioner and/or RN
- Practice manager
- Coding and billing personnel
- Interventional physician

A single individual may fulfill the responsibilities of more than 1 position. A receptionist, for example, may provide typing/dictation service and also manage medical records.

C. Time

Interventional clinics should be staffed with doctors dedicated to seeing patients and not scheduled to perform procedures concurrently. The physician time recommended for evaluating new patients and providing adequate

follow-up care for interventional patients is expected to be in the range of 5 to 15 hours per week. The exact time required will vary depending on the size of the practice. Practice parameters for time (including both physician and ancillary personnel time) allotted per clinic patient are 30 to 60 minutes for each new patient and 15 to 30 minutes for each follow-up patient.

D. Communication of Clinical Care

A written consultation report describing the preoperative clinical interaction with the patient must be sent to the referring physician in a timely fashion. It should be in the form of a letter, not an imaging report. The consultation should be filed and electronically signed within the patient's electronic medical record (EMR). In addition, documentation of any postoperative care should be forwarded to the referring physician as well as to any other physician who may have an interest in the ongoing care of the patient.

V. THE INPATIENT PRACTICE

A. Admitting Privileges

Hospital admitting privileges are critical for a successful clinical interventional practice. It demonstrates that the interventional radiologist or interventional neuroradiologist is willing and able to take the lead responsibility while the patient is in the hospital and facilitates direct referrals to the interventional radiologist or interventional neuroradiologist. In circumstances where hospital-based physicians are available, the interventionist or neurointerventionist might choose to work in conjunction with these providers.

The interventional practice is often the best place to address periprocedure management and complications that may arise, as well as the appropriate timing of hospital discharge and outpatient follow-up. Patients are admitted at the discretion of the IR physician. Examples include the following:

- Painful procedures that will require prolonged analgesia (eg, uterine artery embolization)
- Procedures requiring prolonged monitoring (eg, carotid stent)
- Procedures known to have greater than minimal risk (eg, neuroendovascular procedures, new biliary tube, percutaneous nephrostomy, cancer therapy)
- Significant unexpected procedural complications
- Other considerations (eg, advanced age, no home caregiver, home distant from hospital facility)

The number of physicians in the group who provide interventional services and have admitting privileges should be sufficient to provide 24-hour interventional call coverage. This includes managing the clinical problems that fall within the interventional radiologist or interventional neuroradiologist scope of practice as well as consulting other specialties as necessary.

Part of the duties of the inpatient service should be daily clinical rounds. Patients to be seen should include the following:

- Any patient who is admitted by the interventional practice
- Patients with a significant portion of his or her inpatient care managed by the interventional service, including patients with abscess drainage
- Any patient with a clinical problem that is being managed by the interventional practice in consultation

The physician inpatient visit can be performed in concert with the nonphysician practitioner visit. This strategy will ensure the most efficient use of physician time and help reduce costs while maintaining the personal contact provided to the patient by the interventional radiologist or interventional neuroradiologist.

B. Time Allocation

The time allocation for inpatient clinical duties includes the total time spent by the physician, nonphysician practitioner, and any other ancillary staff that the interventional radiologist or interventional neuroradiologist and

hospital deem appropriate. The exact amount of time required for daily rounds and admissions will depend on the size of the practice.

The amount of time required will also depend on case mix. Practices performing large volumes of procedures such as arterial interventions, neurointerventions, chemoembolization, tumor ablation, uterine fibroid embolization, and abscess/drain management require more time for admissions and inpatient care.

C. Scheduling of Interventional Procedures

It may be acceptable to schedule some invasive diagnostic radiology procedures, such as superficial biopsy or arthrography, based on a direct request from a physician's office. Booking of invasive diagnostic procedures entailing therapeutic options or posing some degree of risk to the patient should be referred to the clinic for patient consultation with the interventional radiologist or interventional neuroradiologist prior to the procedure. The interventional radiologist or interventional neuroradiologist will examine the patient, formulate a care plan, determine the appropriateness of a requested procedure (if specifically requested), discuss the risks, benefits, and alternatives to the procedure, obtain informed consent, and arrange for scheduling of the procedure.

VI. IMAGING REQUIREMENTS

Radiology departments must continue to take the lead in providing state-of-the-art imaging. Patients who may benefit from an interventional procedure are often seen first in the radiology department for imaging studies. These patients should be identified and the information promptly conveyed to the referring physician(s). This will help to optimize the use of interventional procedures in clinical practice. If the diagnostic radiologist interpreting the study is not familiar with the indications for a specific interventional procedure, he or she may consult with an interventional radiologist or interventional neuroradiologist.

Quality control mechanisms that track the imaging of potential interventional patients to guarantee that the imaging is performed with high quality and with a high level of service may be helpful in promoting interventional procedures. These goals are best accomplished in most radiology departments using a team approach. The critical points in the program include the following:

- Maintaining high-quality image interpretation. In many departments, this may require involvement of the interventional radiologist or interventional neuroradiologist in either a primary reading role or a support role
- Identifying patients who may benefit from interventional procedures
- Communicating knowledgeably about potential interventions to the referring physician
- Educating potential referring physicians on the role of the interventional radiologist or interventional neuroradiologist in the evaluation and management of those patients who are found to have treatable disease at the time of imaging. At times, this will be best accomplished by having the interventional radiologist or interventional neuroradiologist directly communicate with the referring physician.
- Providing the time necessary for the interventional radiologist or interventional neuroradiologist to participate in such a program

These collaborative measures are in the interest of patient care and in the interest of the future growth of interventional radiology and interventional neuroradiology.

VII. INTERVENTIONAL SUITE REQUIREMENTS

This section summarizes the equipment required to operate a clinical interventional practice. This equipment needs to be located in a setting that provides the electrical service, air conditioning, air exchange, sterile conditions, room and task lighting, telephone, computer, and patient amenities required for these types of procedures. The setting may be within a hospital or in a sophisticated outpatient facility. The interventional suite must be of sufficient size to hold the imaging and nonradiographic equipment, provide easy access to the patient from multiple approaches and

accommodate the necessary life-support equipment. Interventional procedures may be performed in other parts of the Radiology Department such as computed tomography (CT), ultrasound (US), and magnetic resonance imaging (MRI).

A. Radiographic Equipment

Fixed-installation fluoroscopy equipment, designed and specified for interventional procedures, is preferable [3,4]. The equipment parameters should be sufficient to perform interventional procedures. Some of these parameters include the following:

- Appropriately sized image receptor
- Permanent recording modes (eg, DSA, cine)
- Fluoroscopic tube focal spot(s), output, heat load and cooling capacity
- Generator capacity
- Software packages
- Local modality image storage capacity
- DICOM capability – ability to integrate with PACS
- Procedure-appropriate dose-management tools
- Patient table weight limits

Biplane imaging and 3-D angiography are strongly recommended for the interventional neuroradiology practice. Cone-beam CT capability may also be very useful for interventional radiology and interventional neuroradiology procedures. Depending on patient size and user preference large bore CT scanners with CT fluoroscopy may be recommended for CT-guided interventions.

Mobile fluoroscopy equipment may be adequate for some interventional procedures.

B. Patient Preparation Area and Recovery Room

Dedicated space should be allocated to hold inpatients and outpatients while awaiting procedures or transport, to observe patients prior to transfer to the wards, and for recovery of outpatients. The amount of space should be appropriate to the clinical practice and may require up to 4 beds per interventional suite. This could include space in a dedicated recovery area, not necessarily in the radiology department. This space requires oxygen, suction, physiologic monitoring capability, a telephone, computer (or mobile device), and ready access to resuscitation equipment, as well as call button/emergency access/alarm capability at floor level. An efficient preprocedure and recovery area is important for a high-volume practice.

C. Medical/Surgical Supply Inventory

The dedicated interventional suite must have sufficient storage for commonly used equipment, as well as an inventory control system. This space should be located close to the suite.

The following items relevant to inventory should be considered when developing an interventional practice suite:

- Sufficient facility budgetary commitment to sustain the supply and disposable equipment needs of the suite
- Dedicated personnel responsible for inventory management
- An inventory control system, ideally with barcode-reading capability

D. Nonradiographic Equipment

The modern interventional suite often requires other invasive and noninvasive equipment for nonradiographic imaging and interventions. The following list of such essential equipment is intended to serve as a guide:

- Oxygen and suction
- Physiologic monitors
- Resuscitation equipment

- Image-viewing facilities
- Readily accessible secure storage for drugs including those that require refrigerated storage
- Communication equipment (eg, telephone, mobile devices).
- Ceiling-mounted or mobile operating room light

E. Staffing

Nurse staffing levels should be sufficient to provide a dedicated nurse for each procedure room. This nurse provides patient care and monitoring and may perform other departmental activities such as quality assurance. Nurses providing sedation should be appropriately trained and credentialed for sedation needs. In addition, the recovery room should be appropriately staffed with RNs and LPNs/MAs. Intensive care patients or sedated pediatric patients require one-to-one nurse staffing. Facilities with high volumes of intensive care or pediatric patient populations may require a higher nurse-to-bed ratio in the recovery room setting.

Radiologic technologist staffing levels should be sufficient to provide a technologist per procedure room. The technologist will assist with the case, perform imaging functions, inventory, cleanup, room preparation, image or digital image processing, and data entry.

To achieve consistent coverage, the above staffing recommendations should be considered in light of local staffing factors. This will require greater than 1 FTE per procedure room to cover vacations, sick time, and educational leave and can vary from 1.2 to approximately 1.8 FTEs per staff position depending on the benefit levels and numbers of shifts per day.

F. Physiological Monitoring Equipment

The interventional suite must be capable of monitoring critically ill patients and patients under moderate sedation and/or general anesthesia. The ability to monitor blood pressure, heart rate, ECG, and pulse oximetry and to perform invasive pressure measurements must be available at a minimum. Capnography is desirable. A paper printer connected to the physiological monitor device is desirable to produce a permanent hardcopy of any selected physiological parameter.

VIII. PRACTICE DEVELOPMENT

The preservation and development of a radiology-based clinical office practice has unique challenges and requires regular attention with a multifaceted approach. The goal is to inform referring physicians and the public of the services offered and to provide reliable service with a reputation for availability and consistency [5,6].

A. Communications

Written communication is the primary means by which a clinical practice interacts with its referring community. Letters should have a letterhead that reflects the practice's interventional radiology focus. Letters should not resemble imaging reports. Copies of letters should be sent to all doctors important in the care of the patient, and should always include the primary care doctor when he or she is not the referring doctor. In practices that use electronic communications, this correspondence can be provided electronically.

B. Website

The letterhead and any brochure of the interventional practice should ideally provide a website address where referring physicians and the public can find details about the interventional physicians and the services provided by the practice as well as reliable location and contact information. Social media has taken on increasing importance in marketing directly both to patients and referring physicians, and this avenue starts with a robust website. Search engine optimization (SEO) has developed as a useful tool to ensure high visibility of an interventional practice on a

local, regional, and national level. With a visually appealing and highly informative website as a base, interventionists can generate direct outreach to the community.

C. Personal Contact

An analysis of key imaging referrals through the larger radiology practice can lead to identification of physicians or physician groups to whom direct contact should be targeted with personal phone calls, visits, and educational forums. This type of targeted, personal, and repeated attention will not only bring new business but will also build long-term relationships. Other groups such as emergency physicians, nurses, and field crews also have an interest in the treatment and outcomes of their patients who are ultimately cared for by interventional radiologists.

D. Education

Active attendance and participation in multidisciplinary conferences within the hospital are important signals of commitment and availability. Ongoing interaction with potential referring doctors can also be accomplished through grand rounds on topics for which interventional services are available and sponsorship or co-sponsorship of educational symposia or dinners with presentations by local, regional, or national interventionists. Availability should be made of patient-oriented educational brochures covering routinely treated diseases for referring physicians to distribute to their patients. These brochures should be informative and present interventional services in a balanced way and should also be available in the interventional waiting room.

E. Practice Promotion

Public education through radio, television, local newspapers, and magazines with announcements of new physicians, new procedures, and new research is an important supplement to mailing such notification directly to physician and nonphysician practitioners, medical directors of practices, and practice managers. Emphasizing board certifications, specialty training, and other unique achievements is also important. In larger practices, having individual interventional radiologists and interventional neuroradiologists subspecialize along broad disease categories or service lines may enhance promotion. For example, an interventional radiologist that specializes in uterine fibroid embolization can serve as the primary contact person in that practice for the referring gynecologists. Such an interventionist benefits from increased familiarity with referring physicians and individual patient groups. Similarly, scheduling of clinic days around the specific disease entities or service lines will provide continuity for referring physicians.

F. Other Considerations

Whenever possible, a physician presence and connection solidifies relationships with the referring community. In larger hospital settings, this may entail direct contact with a referring physician's office. Best practice outpatient interventional clinics often have physical proximity to a referrer's clinic.

IX. QUALITY IMPROVEMENT AND PRACTICE EVALUATION

Maintaining and improving quality is a cornerstone of all of the practice parameters and technical standards programs of the ACR. This optimizes patient care and is required by the Joint Commission in the hospital setting. Established programs of continual practice evaluation and quality improvement are a requirement of all current interventional practices [7]. Participation in ongoing practice assessment, including ongoing professional practice evaluation (OPPE) and focused ongoing practice evaluation, (FPPE) as warranted, is required by The Joint Commission. Practice Quality Improvement (PQI) has also become a core competency of the American Board of Radiology (ABR) and Maintenance of Certification (MOC) programs. The PQI initiative is a framework to facilitate improvement of medical care and/or its delivery as an individual, group, or institution. Participating in mortality and morbidity conferences, with review of practice complications or adverse outcomes, are also beneficial to continual practice improvement.

Quality parameters should be set according to published data and relevant national societal guidelines. This pertains to both the clinical aspects of an interventional practice, as well as the technical outcomes of the procedures. Areas of concern or improvement should be identified and addressed. If a problem or area of improvement is identified, actions designed to improve quality should be made, and the actions should be monitored and documented to ensure improvement.

Individual physician outcomes data are also necessary for granting and maintaining physician privileges. Outcomes data are an important means to inform referring physicians of the benefits of referring patients to interventional radiology and interventional neuroradiology practices.

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 website (<http://www.acr.org/guidelines>).

Equipment performance monitoring should be in accordance with the ACR Technical Standard for Diagnostic Medical Physics Performance Monitoring of Radiographic and Fluoroscopic Equipment.

X. RADIATION SAFETY IMAGING

Radiologists, medical physicists, registered radiologist assistants, radiologic technologists, and all supervising physicians have a responsibility for safety in the workplace by keeping radiation exposure to staff, and to society as a whole, “as low as reasonably achievable” (ALARA) and to assure that radiation doses to individual patients are appropriate, taking into account the possible risk from radiation exposure and the diagnostic image quality necessary to achieve the clinical objective. All personnel that work with ionizing radiation must understand the key principles of occupational and public radiation protection (justification, optimization of protection and application of dose limits) and the principles of proper management of radiation dose to patients (justification, optimization and the use of dose reference levels) http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1578_web-57265295.pdf.

Facilities and their responsible staff should consult with the radiation safety officer to ensure that there are policies and procedures for the safe handling and administration of radiopharmaceuticals and that they are adhered to in accordance with ALARA. These policies and procedures must comply with all applicable radiation safety regulations and conditions of licensure imposed by the Nuclear Regulatory Commission (NRC) and by state and/or other regulatory agencies. Quantities of radiopharmaceuticals should be tailored to the individual patient by prescription or protocol

Nationally developed guidelines, such as the ACR’s [Appropriateness Criteria](#)[®], should be used to help choose the most appropriate imaging procedures to prevent unwarranted radiation exposure.

Additional information regarding patient radiation safety in imaging is available at the Image Gently[®] for children (www.imagegently.org) and Image Wisely[®] for adults (www.imagewisely.org) websites. These advocacy and awareness campaigns provide free educational materials for all stakeholders involved in imaging (patients, technologists, referring providers, medical physicists, and radiologists).

Radiation exposures or other dose indices should be measured and patient radiation dose estimated for representative examinations and types of patients by a Qualified Medical Physicist in accordance with the applicable ACR Technical Standards. Regular auditing of patient dose indices should be performed by comparing the facility’s dose information with national benchmarks, such as the ACR Dose Index Registry, the NCRP Report No. 172, Reference Levels and Achievable Doses in Medical and Dental Imaging: Recommendations for the United States or the Conference of Radiation Control Program Director’s National Evaluation of X-ray Trends. (ACR Resolution 17 adopted in 2006 – revised in 2009, 2013, Resolution 52).

Two personal dosimeters, one worn under the protective apron and a second worn at neck level, above protective garments, are preferred and should be used in the FGI (fluoroscopically guided-procedure environment). Alternatively, a single personal dosimeter worn at neck level, above protective garments, may be used if it complies with state or local regulations.

These dosimeters should be monitored by the Radiation Safety Officer.

XI. EVALUATION AND MANAGEMENT

An intelligent framework for documenting and reporting evaluation and management (E&M) interactions is a requirement for any successful clinical interventional practice. For all clinical interactions, a robust system of documentation and coding is the first step toward ensuring the clinic is compliant with coding guidelines. Critical aspects of E&M coding include, but are not limited to, the following elements [8]:

- Reimbursement for E&M services require appropriate selection of Current Procedural Terminology® (CPT®) codes that best capture patient type, setting of service, and level of service performed.
- The patient type can be either new or established patients.
- The setting of the E&M service typically falls into the categories of outpatient visits, hospital inpatients, or consultations.
- The level of E&M service is determined by 3 key components: history, physical examination, and medical decision-making.
- Documentation of history and physical examination can be categorized as problem-focused, expanded problem-focused, detailed, or comprehensive services.
- Documentation of medical decision making can be categorized into one of 4 levels of increasing complexity of care.
- New patients require documentation of all 3 components, whereas established patient encounters only require two components.
- Documentation of these components can be waived if greater than 50% of the visit was utilized to provide counseling and coordination of care. The total visit time then needs to be documented.
- Federal and state policies guide E&M reimbursement for nurse practitioners and physician assistants.

A facile comprehension of documentation and coding increases the likelihood of being in compliance with coding guidelines and prompt and accurate payor reimbursement for individual visits. By following proper practice parameters, downstream benefits accrue to an interventional clinical practice with an organized system [9].

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REFERENCES

1. Stecker MS, Armenoff D, Johnson MS. Physician assistants in interventional radiology practice. *J Vasc Interv Radiol.* 2004;15(3):221-227.
2. Taylor K, Sansivero GE, Ray CE, Jr. The role of the nurse practitioner in interventional radiology. *J Vasc Interv Radiol.* 2012;23(3):347-350.
3. Cardella JF, Casarella WJ, DeWeese JA, et al. Optimal resources for the examination and endovascular treatment of the peripheral and visceral vascular systems. AHA Intercouncil Report on Peripheral and Visceral Angiographic and Interventional Laboratories. *J Vasc Interv Radiol.* 2003;14(9 Pt 2):S517-530.
4. Zoetelief J, Faulkner K. Equipment requirements and specification for digital and interventional radiology. *Radiat Prot Dosimetry.* 2001;94(1-2):43-48.
5. Society of Interventional Radiology. *Setting up and running an office-based clinical practice.* 1st ed. Fairfax, Va: JVIR; 2005:1-279.
6. Society of Interventional Radiology. Strategy and business plan development. [*Supplement to setting up and running an office-based clinical practice. JVIR 1st ed 2005;1-279*]. 1st ed. Fairfax, Va: JVIR; 2010:5-50.
7. Steele JR, Wallace MJ, Hovsepian DM, et al. Guidelines for establishing a quality improvement program in interventional radiology. *J Vasc Interv Radiol.* 2010;21(5):617-625.
8. Society of Interventional Radiology. *Interventional Radiology Coding Update.* 19th ed. Fairfax, Va; 2013.
9. American Medical Association. *AMA CPT® Codebook.* Chicago, IL; 2013.

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