

# ACR–SIR–SPR PRACTICE PARAMETER FOR SPECIFICATIONS AND PERFORMANCE OF IMAGE-GUIDED DRAINAGE / ASPIRATION OF ABSCESSES AND FLUID COLLECTIONS

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Each practice parameter 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 and approval. The practice parameters 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 parameter and technical standard by those entities not providing these services is not authorized.

## 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 care<sup>1</sup>. 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 considering 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 variables such as the condition of the patient, limitations of available resources, or advances in knowledge or technology after publication of this document. However, a practitioner who employs an approach substantially different from the guidance in this document may consider documenting in the patient record information sufficient to explain the approach taken.

The practice of medicine involves the science, and 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 purpose of this document is to assist practitioners in achieving this objective.

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<sup>1</sup> *Iowa Medical Society and Iowa Society of Anesthesiologists v. Iowa Board of Nursing*, 831 N.W.2d 826 (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 was revised collaboratively by the American College of Radiology (ACR), the Society of Interventional Radiology (SIR), and the Society for Pediatric Radiology (SPR).

Image-guided drainage or aspiration of abscesses and fluid collections (DAFC) has become the diagnostic and therapeutic treatment of choice for a wide variety of fluid collections [1,2]. DAFC is a safe and effective alternative or adjunct to surgery, reducing morbidity and mortality, length of hospital stay, and costs [1-38].

Image-guided drainage involves the placement of a catheter into a fluid collection using imaging guidance to provide continuous drainage, using access pathways that may be either percutaneous or transorificial (eg, transrectal, transvaginal, transgastric, peroral) [1,2]. The target fluid collection is localized by imaging; the procedure may involve placement of one or more catheters and may be performed during a single session or as a staged procedure in multiple sessions. Care may include catheter maintenance and eventual removal of the catheter(s). Image-guided aspiration is defined as therapeutic evacuation or diagnostic sampling of a fluid collection using either a catheter or a needle during a single imaging session, with removal of the catheter or needle immediately after the aspiration [1,2].

These image guided procedures may be performed with ionizing radiation [eg, fluoroscopy or computed tomography (CT)], or with nonionizing radiation [eg, ultrasound or magnetic resonance imaging (MRI)]. Optimal performance of DAFC, and choice of imaging modality, requires knowledge of anatomy and pathophysiology, familiarity with percutaneous techniques (eg, needle, guidewire, and drainage catheter use), and knowledge of the advantages and disadvantages of one imaging modality versus another for any particular drainage procedure, including the as-low-as-reasonably-achievable (ALARA) principle. As with any invasive therapy, the patient is most likely to benefit when the procedure is performed in an appropriate environment and by qualified physicians.

This practice parameter outlines the specifications and principles for performing a quality DAFC and is intended to be used in quality improvement programs to assess drainage procedures. The most important processes of care are 1) patient selection, 2) performing the procedure, and 3) monitoring the patient [1,2]. The outcome measures or indicators for these processes are indications, success rates, and complication rates and are assigned threshold levels [1,2].

For information on breast interventional procedures, see the [ACR Practice Parameter for the Performance of Stereotactic/Tomosynthesis-Guided Breast Interventional Procedures](#) or the [ACR Practice Parameter for the Performance of Ultrasound-Guided Percutaneous Breast Interventional Procedures](#) [39,40].

## **II. INDICATIONS AND CONTRAINDICATIONS**

### **A. Indications**

The indications for DAFC include, but are not limited to, the presence of fluid collection with [1]:

1. Suspicion that the fluid is infected or the result of an abnormal fistulous communication.
2. Need for fluid characterization.
3. Suspicion that the collection is producing symptoms or adverse physiologic effects such as sepsis, respiratory compromise, gastrointestinal or urinary obstruction, vascular compression, compartment syndrome, etc.
4. Need as an adjunctive procedure to facilitate improved outcome of a subsequent intervention (eg, paracentesis prior to liver intervention) or additional therapy following access (eg, sclerotherapy, pleurodesis).

Threshold: DAFC should be done for 1 of the above 4 indications in 98% of cases [2].

Diagnostic aspiration may be the only means of determining whether a fluid collection is infected. If infected material is obtained or if the operator suspects the presence of infection, a drainage catheter may then be placed.

Curative or partially successful drainage in patients with more complex situations including multiple or multiloculated abscesses, abscess due to Crohn's disease, pancreatic abscesses, drainage routes traversing bowel or pleura, infected hematoma, and tumor abscess has been reported [1,2,41-54]. Decisions regarding image-guided versus surgical drainage of complex collections should be made in concert with other physicians involved in the patient's care [1,2]. For complex fluid collections or abscesses that are incompletely drained after DAFC, some have reported success with adjunctive intracavitary fibrinolysis and/or subsequent procedures such as upsizing to a larger catheter or one with additional side holes [55,56]. Some have advocated the possibility of draining abscesses using needles alone [50,57,58]. However, a majority of abscesses need catheter placement to prevent reaccumulation of fluid, and the overall utility of needle drainage of abscesses awaits further study [1,2].

Drainage or aspiration may be performed in essentially any organ system in either the adult or the pediatric patients [1-34]. In addition to fluid, the feasibility and safety of addressing abnormal postoperative air collections related to infection has also been described [59].

## **II. INDICATIONS AND CONTRAINDICATIONS**

### **B. Contraindications**

For all patients considered for DAFC, the relative benefits and risks of the procedure should be weighed carefully [1]. There are no absolute contraindications for DAFC. Relative contraindications for DAFC include [1]:

1. Significant coagulopathy that cannot be adequately corrected.
2. Severely compromised cardiopulmonary function or hemodynamic instability.
3. Lack of a safe pathway to access the abscess or fluid collection.
4. Inability of the patient to cooperate with, or to be positioned for, the procedure.

These relative contraindications should be addressed and corrected or optimized before the procedure, whenever feasible.

For the pregnant or potentially pregnant patient, see the [ACR–SPR Practice Parameter for Imaging Pregnant or Potentially Pregnant Patients with Ionizing Radiation](#) [60].

### **III. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL**

#### **A. Physician**

Core Privileging: This procedure is considered part of or amendable to image-guided core privileging.

#### Initial Qualifications

Image-based diagnosis and treatment planning require integrating the preprocedural imaging findings within the context of the patient's history and physical findings. Therefore, the physician must be clinically informed and understand the specific questions to be answered and goals to be accomplished by DAFC prior to the procedure to plan and perform it safely and effectively.

The physician performing DAFC must have knowledge of the benefits, alternatives, and risks of the procedures. The physician must have a thorough understanding of imaging anatomy (including congenital and developmental variants), the imaging equipment to be used during the procedures, radiation safety considerations, and physiologic monitoring equipment. The physician must also have access to adequate supplies and personnel to perform the procedure safely.

DAFC procedures must be performed by a physician who has the following qualifications. The physician's experience in DAFC is best documented by use of a formal case log submitted by the applicant.

1. Certification in Radiology, Diagnostic Radiology or Interventional Radiology/Diagnostic Radiology 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 and has performed (with supervision) a sufficient number of DAFC procedures to demonstrate competency as attested by the supervising physician(s).

or

2. Completion of radiology or interventional radiology residency program approved by the Accreditation Council for Graduate Medical Education the Royal College of Physicians and Surgeons of Canada, the Collège des Médecins du Québec, or the American Osteopathic Association and has performed (with supervision) a sufficient number of DAFC procedures to demonstrate competency as attested by the supervising physician(s).

or

3. Physicians whose residency or fellowship training did not include the above may still be considered qualified to perform DAFC provided that the following can be demonstrated:

The physician must have image-guided procedural experience during which the physician performed (with supervision) a sufficient number of DAFC procedures to demonstrate competency as attested by the supervising physician(s).

and

4. Physicians meeting any of the qualifications in 1, 2, and 3 above also must have written substantiation that they are familiar with all of the following:
- a. Indications and contraindications for the procedure.
  - b. Periprocedural and intraprocedural assessment, monitoring, and management of the patient and potential complications.
  - c. Where applicable, pharmacology of moderate sedation medications and recognition and treatment of adverse reactions and complications.
  - d. Imaging systems that may be used for guidance during percutaneous procedures and determining which imaging modality would be optimal for a specific DAFC procedure in terms of both safety and effectiveness.
  - e. Where applicable, principles of radiation protection, ALARA, the hazards of radiation, and radiation monitoring requirements.
  - f. Where applicable, pharmacology of contrast agents and recognition and treatment of potential adverse reactions.
  - g. Percutaneous and transorificial needle and catheter introduction techniques.
  - h. Technical aspects of performing the procedure, including the use of various catheter and guide-wire systems.
  - i. Anatomy, physiology, and pathophysiology of the structures being considered for

The written substantiation should come from the chief of interventional radiology, the director or chief of body imaging or ultrasound, or the chair of the radiology department of the institution in which the physician will be providing these services. Substantiation could also come from a prior institution in which the physician provided the services, but only at the discretion of the current interventional director or chair who solicits the additional input.

### Maintenance of Competence

Physicians must perform a sufficient number of overall procedures applicable to the spectrum of core privileges to maintain their skills, with acceptable success and complication rates as laid out in this parameter. Continued competence should depend on participation in a quality improvement program that monitors these rates. Consideration should be given to the physician's lifetime practice experience.

### Continuing Medical Education

The physician's continuing education should be in accordance with the [ACR Practice Parameter for Continuing Medical Education \(CME\)](#) [61].

## III. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL

### B. Qualified Medical Physicist

A Qualified Medical Physicist should have the responsibility for overseeing the equipment quality control program and for monitoring fluoroscopy and other cross-sectional imaging modalities both upon installation and routinely on an annual basis. Medical physicists assuming these responsibilities should meet the following qualifications:

A Qualified Medical Physicist is an individual who is competent to practice independently in one or more of the subfields in medical physics. The American College of Radiology (ACR) considers certification and continuing education and experience in the appropriate subfield(s) to demonstrate that an individual is competent to practice one or more of the subfields in medical physics and to be a Qualified Medical Physicist. The ACR strongly recommends that the individual be certified in the appropriate subfield(s) by the American Board of Radiology (ABR), the Canadian College of Physics in Medicine, the American Board of Science in Nuclear Medicine (ABSNM), or the American Board of Medical Physics (ABMP).

A Qualified Medical Physicist should meet the [ACR Practice Parameter for Continuing Medical Education \(CME\)](#) [62].

The appropriate subfield of medical physics for this practice parameter is Diagnostic Medical Physics (including medical physics certification categories of Radiological Physics, Diagnostic Radiological Physics, or Diagnostic Imaging Physics). (ACR Resolution 17, adopted in 1996 – revised in 2008, 2012, 2022, Resolution 41f)

### **III. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL**

#### **C. Non-Physician Radiology Provider (NPRP)**

NPRPs are all Non-Physician Providers (e.g., RRA, RPA, RA, PA, NP, ...) who assist with or participate in portions of the practice of a radiologist-led team (Radiologists = diagnostic, interventional, neurointerventional radiologists, radiation oncologists, and nuclear medicine physicians). The term "NPRP" does not include radiology, CT, US, NM MRI technologists, or radiation therapists who have specific training for radiology related tasks (e.g., acquisition of images, operation of imaging and therapeutic equipment) that are not typically performed by radiologists.

The term 'radiologist-led team' is defined as a team supervised by a radiologist (i.e., diagnostic, interventional, neurointerventional radiologist, radiation oncologist, and nuclear medicine physician) and consists of additional healthcare providers including RRAs, PAs, NPs, and other personnel critical to the provision of the highest quality of healthcare to patients. (ACR Resolution 8, adopted 2020).

### **III. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL**

#### **D. Radiologic Technologist**

The technologist, together with the physician and nursing personnel, should have responsibility for patient comfort and safety. The technologist should be able to prepare and position<sup>[2]</sup> the patient for the image-guided percutaneous procedure and, together with the nurse, monitor the patient during the procedure. The technologist should provide assistance to the physician as required, which may include operating the imaging equipment and obtaining images prescribed by the supervising physician. If intravenous contrast material is to be

administered, qualifications for technologists performing intravenous injection should be in compliance with the current ACR policy<sup>[3]</sup> and the operating procedures or manuals at the facility. The technologist should also perform regular quality control testing of the equipment under supervision of the medical physicist.

Technologists should be certified by the American Registry of Radiologic Technologists (ARRT) or have an unrestricted state license with documented training and experience in the imaging modality used for the image guided procedure.

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<sup>2</sup> The American College of Radiology approves of the practice of certified and/or licensed radiologic technologists performing fluoroscopy in a facility or department as a positioning or localizing procedure only, and then only if monitored by a supervising physician who is personally and immediately available\*. There must be a written policy or process for the positioning or localizing procedure that is approved by the medical director of the facility or department/service and that includes written authority or policies and processes for designating radiologic technologists who may perform such procedures. (ACR Resolution 26, 1987 – revised in 2007, Resolution 12m)

\*For the purposes of this parameter, "personally and immediately available" is defined in manner of the "personal supervision" provision of CMS—a physician must be in attendance in the room during the performance of the procedure. Program Memorandum Carriers, DHHS, HCFA, Transmittal B-01-28, April 19, 2001

<sup>3</sup> See the [ACR–SPR Practice Parameter for the Use of Intravascular Contrast Media](#).

### **III. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL**

#### **E. Diagnostic Medical Sonographer**

For cases performed with the assistance of a sonographer, the sonographer, together with the physician and nursing personnel, should have responsibility for patient comfort and safety. The sonographer should be able to prepare and position the patient for the image-guided procedure and, together with the nurse, monitor the patient during the procedure. The sonographer should provide assistance to the physician as required, which may include operating the imaging equipment and obtaining images prescribed by the supervising physician. The sonographer should also perform regular quality control testing of the equipment under supervision of the physicist.

Diagnostic medical sonographers involved in DAFC should have documented training and experience in assisting with these procedures. When possible, they should be certified by the ARRT or by the American Registry for Diagnostic Medical Sonography. When applicable, they should have an unrestricted state license.

### **III. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL**

#### **F. CT or MR Technologist**

See the [ACR Practice Parameter for Performing and Interpreting Diagnostic Computed Tomography \(CT\)](#) and the [ACR Practice Parameter for Performing and Interpreting Magnetic Resonance Imaging \(MRI\)](#) for the qualifications of CT and MR technologists [63,64].

CT or MR technologists should be certified by the ARRT or have an unrestricted state license with documented training and experience in CT and/or MR as appropriate to the modality being used.

### **III. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL**

#### **G. Other Ancillary Personnel**

Other ancillary personnel who are qualified and duly licensed or certified under applicable state law may, under supervision by a radiologist or other qualified physician, perform specific interventional fluoroscopic or other image-guided procedures. Supervision by a radiologist or other qualified physician must be direct or personal and must comply with local, state, and federal regulations. Individuals should be credentialed for specific fluoroscopic and other image-guided interventional procedures and should have received formal training in radiation management and/or application of other imaging modalities as appropriate. See the [ACR–AAPM Technical Standard for Management of the Use of Radiation in Fluoroscopic Procedures](#) [65].

### **III. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL**

#### **H. Nursing Services**

Nursing services, when deemed appropriate by the performing physician, are an integral part of the team for preprocedural, intra-procedural, and postprocedural patient management and education and are recommended in monitoring the patient during the procedure.

### **IV. SPECIFICATIONS OF THE PROCEDURE**

#### **A. Imaging Equipment and Facilities**

The choice of modality for imaging guidance will depend on the site and characteristics of the collection, the skill and preference of the intervening physician, and the availability of appropriate imaging devices for guidance.

1. The minimum requirements for facilities in which DAFC is performed include the following:
  - a. When fluoroscopic guidance is used, a high-resolution unit with adequate shielding and collimation is desirable. The ability to perform complex angle (eg, anteroposterior, lateral, or oblique) fluoroscopy views is often necessary to ensure proper needle or catheter placement. Image and written documentation of needle or drainage catheter location is essential. The patient should be oriented so the staff who are performing the procedure are on the beam-exit side, reducing the exposure to scattered radiation.
  - b. When ultrasound guidance is used, proper transducer frequency is required to direct and monitor needle placement to avoid damage to surrounding structures.



- c. CT, CT fluoroscopy, flat-panel cone-beam CT, or MRI equipment may better visualize the anatomy, particularly in:
  - i. Patients with fluid collections that are difficult to visualize or access with other imaging modalities or are in unusual or precarious locations.
  - ii. Planning the optimal access route to avoid, when possible, transgression of vital structures.
  - iii. Patients with unusual anatomy or who are of large size.
  - iv. When MR guidance is used, MR-compatible equipment must be used.
- d. The facility should provide an area within the institution appropriate for patient preparation and for postprocedure observation . This might be within the radiology department, in a short-stay unit, or in a routine nursing unit as outlined in the Patient Care section below. There should be immediate access to emergency resuscitation
- e. For patients undergoing thoracic procedures, appropriate equipment for decompression of a clinically significant pneumothorax should be available.
- f. Access to a laboratory with expertise in cytopathology, microbiology, and chemistry should be available. (These resources need not be located in the facility.)

## 2. Performance guidelines

When using fluoroscopy, CT, or MRI guidance for DAFC, a facility should meet or exceed the following imaging practices:

- a. Radiation doses for both fluoroscopy and CT guidance should be kept to a minimum. The operator will use only as much fluoroscopy or CT imaging as is necessary to achieve a successful procedure, consistent with the ALARA radiation safety guidelines. One method to minimize fluoroscopic time is to use units with "last image hold" capability. See the [ACR–AAPM Technical Standard for Management of the Use of Radiation in Fluoroscopic Procedures](#) [65].
- b. The radiation beam should be restricted to the area of interest to reduce the volume of tissue irradiated.
- c. All personnel in the room should wear protective garments (eg, aprons, thyroid collars, eyeglasses) or stand behind protective barriers.
- d. For CT-guided drainages, appropriately lowering the milliamperere-seconds (mAs) and kilovoltage peak (kVp), and/or using an appropriate slice thickness can substantially reduce radiation dose without compromising the procedure for larger fluid collections.

## IV. SPECIFICATIONS OF THE PROCEDURE

### B. Physiologic Monitoring and Resuscitation Equipment

- 1. Appropriate equipment should be present to allow for monitoring the patient's heart rate, cardiac rhythm, and blood pressure. In cases using moderate sedation, a pulse oximeter and capnography should be used. (See the [ACR–SIR Practice Parameter for Minimal and/or Moderate Sedation/Analgesia](#) [66].)
- 2. Any procedure performed using MRI guidance must have MRI safety compatible emergency resuscitation equipment available.
- 3. Appropriate emergency equipment and medications must be immediately available to treat procedural complications or adverse reactions associated with administered medications. The equipment should be monitored and the medications inventoried for 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.

## IV. SPECIFICATIONS OF THE PROCEDURE

### C. Acute Care Support

Although complications of DAFC only rarely require urgent surgery, high-risk procedures should be performed in an environment in which surgical intervention can be instituted promptly. Ideally, this would be a facility with adequate surgical, anesthesia, and ancillary support. When these procedures are performed in a freestanding center, detailed protocols for the rapid transport or admission of patients to an acute-care hospital should be formalized in writing.

#### IV. SPECIFICATIONS OF THE PROCEDURE

##### D. Patient Care

###### 1. Preprocedural care

- a. The physician performing the procedure must have knowledge of the following:
  - i. Clinically significant history, including indications for the procedure and any related preprocedure imaging.
  - ii. Screening results for significant bleeding risks, relevant medications (eg, anticoagulants), and allergies [67].
  - iii. Clinically significant physical examination findings, to include an awareness of clinical or medical conditions or comorbidities that may necessitate specific care, such as preprocedure antibiotics [68] or other measures.
  - iv. Possible alternative methods, such as surgery, to obtain the desired diagnostic information or therapeutic result.
- b. Informed consent must be in compliance with state laws and should comply with the [ACR–SIR–SPR Practice Parameter on Informed Consent for Image-Guided Procedures](#) [69].

###### 2. Procedural care

- a. Adherence to the Joint Commission's current Universal Protocol for Preventing Wrong Site, Wrong Procedure, Wrong Person Surgery™ is required for procedures in nonoperating room settings, including bedside procedures.  
The organization should have processes and systems in place for reconciling differences in staff responses during the "time out."
- b. Nursing personnel, technologists, and those directly involved in patient care during DAFC should have protocols for use in standardizing care. These should include, but are not limited to:
  - i. Equipment needed for the procedure
  - ii. Patient monitoring
- c. Protocols should be reviewed and updated periodically.

###### 3. Postprocedural care

- a. Orders for postprocedure patient care should include the frequency of monitoring vital signs, drainage catheter care, and discharge instructions. Discharge instructions should include instructions for following catheter output, appointments for physician catheter evaluation and follow-up imaging, and postprocedure instructions regarding any modifications to the patient's medications, including resumption of anticoagulants, when applicable.
- b. Specific anatomic and management considerations
  - i. Thoracic cavity: pulmonary assessment for the presence of procedure-related pneumothorax and to confirm adequate catheter placement.
    - a. If guidance was by fluoroscopy or ultrasound, an upright chest radiograph should be obtained when appropriate.
    - b. If guidance was by CT, a tailored postprocedure CT scan should be obtained.
  - ii. Peritoneal and other cavities: confirmation of appropriate tube placement.
  - iii. Postprocedure imaging and follow-up may involve injection of contrast material to confirm catheter placement within the abscess or symptomatic fluid collection cavity, catheter

patency, assess fistulae to bowel or other structures, or documentation of the reduction in cavity size.

- iv. Appropriate adjunct drainage maneuvers may often include irrigation of the abscess cavity, drainage tube repositioning, drainage tube upsizing or downsizing, antibiotic therapy, fibrinolytics, etc.

c. Clinical and imaging follow-up

- i. The patient should be informed of who the patient should contact for questions about or issues with the drain.
- ii. Periodic imaging follow-up may be appropriate to evaluate for resolution or persistence of an abscess or symptomatic fluid collection and for development of new abscesses.
- iii. A facility or practice in concert with the clinical team should have a set protocol to address monitoring of catheter outputs and arrangements for follow-up imaging to ensure timely and consistent patient care.

#### **IV. SPECIFICATIONS OF THE PROCEDURE**

##### **E. Specifics of the Procedure**

1. All image-guided percutaneous procedures involving aspiration of fluid collections with or without percutaneous catheter drainage are performed for specific indications, and the examination or procedure should therefore be tailored accordingly.
2. In the setting of image-guided percutaneous aspiration of fluid collections for diagnostic purposes, initial placement of a small needle (ie, 18-22 gauge) or centesis catheter is advised when appropriate.
3. Diagnostic percutaneous fluid aspiration may lead to therapeutic placement of a percutaneous drainage catheter using modified Seldinger (needle/guide-wire/catheter) or trocar techniques, for definitive drainage.

#### **V. DOCUMENTATION**

Reporting should be in accordance with the [ACR–SIR–SPR Practice Parameter for the Reporting and Archiving of Interventional Radiology Procedures](#) [70].

#### **VI. EQUIPMENT SPECIFICATIONS**

Equipment performance monitoring should be in accordance with the [ACR–AAPM Technical Standard for Diagnostic Medical Physics Performance Monitoring of Fluoroscopic Equipment](#) [71], [ACR–AAPM Technical Standard for Diagnostic Medical Physics Performance Monitoring of Computed Tomography \(CT\) Equipment](#) [72], and [ACR–AAPM Technical Standard for Diagnostic Medical Physics Performance Monitoring of Magnetic Resonance \(MR\) Imaging Equipment](#) [73].

#### **VII. RADIATION SAFETY IN IMAGING**

Radiologists, medical physicists, non-physician radiology providers, 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 who work

with ionizing radiation must understand the key principles of occupational and public radiation protection (justification, optimization of protection, application of dose constraints and limits) and the principles of proper management of radiation dose to patients (justification, optimization including the use of dose reference levels). [https://www-pub.iaea.org/MTCD/Publications/PDF/PUB1775\\_web.pdf](https://www-pub.iaea.org/MTCD/Publications/PDF/PUB1775_web.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 in accordance with ALARA principles. 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 applicable state, local, or other relevant regulatory agencies and accrediting bodies, as appropriate. Quantities of radiopharmaceuticals should be tailored to the individual patient by prescription or protocol, using body habitus or other customized method when such guidance is available.

Nationally developed guidelines, such as the [ACR's Appropriateness Criteria](#)<sup>®</sup>, should be used to help choose the most appropriate imaging procedures to prevent unnecessary radiation exposure.

Additional information regarding patient radiation safety in imaging is available from the following websites – Image Gently<sup>®</sup> for children ([www.imagegently.org](http://www.imagegently.org)) and Image Wisely<sup>®</sup> for adults ([www.imagewisely.org](http://www.imagewisely.org)). 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 periodically measured by a Qualified Medical Physicist in accordance with the applicable ACR Technical Standards. Monitoring or regular review of dose indices from patient imaging should be performed by comparing the facility's dose information with national benchmarks, such as the ACR Dose Index Registry and relevant publications relying on its data, applicable ACR Practice Parameters, 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; 2006, 2009, amended 2013, revised 2023 (Res. 2d).

## **VIII.**

### **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 website (<https://www.acr.org/Advocacy-and-Economics/ACR-Position-Statements/Quality-Control-and-Improvement>).

## **IX.**

### **QUALITY IMPROVEMENT**

Although practicing physicians should strive to achieve perfect outcomes (eg, 100% success, 0% adverse events), in practice all physicians will fall short of this ideal to a variable extent. A Medical Outcome Audit may be performed to assess and monitor the outcomes of procedures. A comparison of the audit results against indicator thresholds may be used to assess the efficacy of ongoing quality-improvement programs. Procedure thresholds or overall thresholds refer to a group of indicators for a procedure (eg, major complications). Individual complications may also be associated with complication-specific thresholds.

Deviation from the recommended success rates and adverse event threshold (Tables 1-3 below) should prompt a review of policies and procedures within the department to determine the causes and to implement changes to lower the incidence of the complication [1]. Because patient referral patterns and selection factors may dictate a different threshold value for a metric at a particular institution, each department should alter the thresholds as appropriate to meet its own quality-improvement program needs [1].

**IX.**  
**QUALITY IMPROVEMENT**

**A.**  
**Success Rates and Thresholds**

*(Pending: Permission request to use table with modifications)*

Table 1: Success Rates and Thresholds [1]

Outcome	Suggested Threshold (%)
Successful diagnostic fluid aspiration Aspiration of adequate fluid for diagnostic characterization	89
Successful drainage Curative and partial success	76

*From Dariushnia SR, Mitchell JW, Chaudry G, Hogan MJ. Society of Interventional Radiology Quality Improvement Standards for Image-Guided Percutaneous Drainage and Aspiration of Abscess and Fluid Collections. J Vasc Interv Radiol 2020;31:662-666.*

Curative drainage is defined as complete resolution of infection requiring no further operative intervention. Partial success is defined as either adequate drainage of the abscess with surgery subsequently performed to repair an underlying problem or as temporizing drainage performed to stabilize the patient prior to surgery.

**IX.**  
**QUALITY IMPROVEMENT**

**B.**  
**Complication Rates and Thresholds**

Complications for DAFC are reported to occur in approximately 10% of patients. Published major complication rates and suggested thresholds are summarized in Table 2.

*(Pending: Permission request to use table with modifications)*

Table 2: Published Adverse Event Rates and Suggested Thresholds [1]

Specific Major Complication	Reported Rate (%)	Suggested Threshold (%)
Septic shock	0-2	4
Bacteremia requiring significant new intervention	0-3	5
Hemorrhage requiring transfusion*	0-13	8
Superinfection (includes infection of sterile fluid collection)	0-5	7
Bowel transgression requiring intervention	0-2	2
Pleural transgression requiring intervention (abdominal interventions)	0-1	2
Pneumothorax/hemothorax/pleural effusion requiring further intervention (chest procedures)	0-12	14

*\*Includes data in which adjunctive intracavitary fibrinolytic therapy is used.*

*From Dariushnia SR, Mitchell JW, Chaudry G, Hogan MJ. Society of Interventional Radiology Quality Improvement Standards for Image-Guided Percutaneous Drainage and Aspiration of Abscess and Fluid Collections. J Vasc Interv Radiol 2020;31:662-666*

In the above table, all values were supported by the weight of literature evidence and panel consensus.

Generally, the complication-specific thresholds should be set higher than the complication-specific reported rates listed above, because the published rates for individual types of complications are highly dependent on patient selection and are based on a series comprising several hundred patients, which is a volume larger than most individual practitioners are likely to treat [1]. When the complication occurs within a small patient volume (eg, early in a quality improvement program), the overall procedure threshold (Table 3) is more appropriate for use in a quality-improvement program.

*(Pending: Permission request to use table with modifications)*

Table 3: Overall Adverse Events Rate [1]

Overall Procedure	Suggested Threshold (%)
All major adverse events resulting from adult and pediatric percutaneous drainage procedures	15

*From Dariushnia SR, Mitchell JW, Chaudry G, Hogan MJ. Society of Interventional Radiology Quality Improvement Standards for Image-Guided Percutaneous Drainage and Aspiration of Abscess and Fluid Collections. J Vasc Interv Radiol 2020;31:662-666*

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