

Quality Improvement Guidelines for Percutaneous Drainage/Aspiration of Abscess and Fluid Collections



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Abbreviation: ACR = American College of Radiology

PREAMBLE

THE membership of the Society of Interventional Radiology (SIR) Standards of Practice Committee represents experts in a broad spectrum of interventional procedures from both the private and academic sectors of medicine. Generally Standards of Practice Committee members dedicate the vast majority of their professional time to performing interventional procedures; as such they represent a valid broad expert constituency of the subject matter under consideration for standards production.

Technical documents specifying the exact consensus and literature review

methodologies as well as the institutional affiliations and professional credentials of the authors of this document are available upon request from SIR, 3975 Fair Ridge Dr, Ste 400 North, Fairfax, VA 22033.

METHODOLOGY

SIR produces its Standards of Practice documents using the following process. Standards documents of relevance and timeliness are conceptualized by the Standards of Practice Committee members. A recognized expert is identified to serve as the principal author for

the standard. Additional authors may be assigned dependent upon the magnitude of the project.

An in-depth literature search is performed using electronic medical literature databases. Then a critical review of peer-reviewed articles is performed with regards to the study methodology, results, and conclusions. The qualitative weight of these articles is assembled into an evidence table, which is used to write the document such that it contains evidence-based data with respect to content, rates, and thresholds.

Reported complication-specific rates in some cases reflect the aggregate of major and minor complications. Thresholds are derived from critical evaluation of the literature and evaluation of empirical data from Standards of Practice Committee members' practices. When the evidence of literature is weak, conflicting, or contradictory, consensus for the parameter is reached by a minimum of 12 Standards of Practice Committee members using a Modified Delphi Consensus Method (Appendix A). For purposes of these documents, consensus is defined as 80% Delphi participant agreement on a value or parameter.

The draft document is critically reviewed by the Revisions Subcommittee members of the Standards of Practice Committee, either by telephone conference calling or face-to-face meeting. The finalized draft from the Committee is sent to the SIR membership for further input/criticism during a 30-day com-

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ment period. These comments are discussed by the Subcommittee, and appropriate revisions made to create the finished standards document. Prior to its publication the document is endorsed by the SIR Executive Council.

INTRODUCTION

This guideline was revised by the American College of Radiology (ACR) in collaboration with SIR.

Image-guided percutaneous drainage or aspiration of abscesses and abnormal fluid collections (percutaneous drainage) has become the diagnostic and therapeutic treatment of choice for a wide variety of fluid collections. The procedures have resulted in reduced morbidity and mortality and have helped to reduce length of hospital stay and hospital costs (1–13).

For information on breast interventional procedures, see the ACR Practice Guideline for the Performance of Stereotactically Guided Breast Interventional Procedures or the ACR Practice Guideline for the Performance of Ultrasound-guided Percutaneous Breast Interventional Procedures (14).

The procedures may be performed with ionizing radiation for image guidance, including fluoroscopy or computed tomography, or with nonionizing radiation modalities, including ultrasound and magnetic resonance imaging. Optimal performance of percutaneous drainage procedures requires knowledge of anatomy and pathophysiology, familiarity with percutaneous techniques (eg, needle, guide wire, drainage catheter use), and knowledge of the advantages and disadvantages of one imaging modality versus another for any particular drainage procedure. 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 guideline outlines the specifications and principles for performing high-quality percutaneous drainage procedures.

These guidelines are written to be used in quality improvement programs to assess percutaneous drainage procedures. The most important processes of care are (i) patient selection, (ii) performing the procedure, and (iii) monitoring the patient. The outcome measures or indicators for these processes are indications, success rates, and com-

plication rates. Outcome measures are assigned threshold levels.

DEFINITIONS

Image-guided percutaneous drainage is defined as the placement of a catheter with the use of image guidance to provide continuous drainage of a fluid collection, using access pathways that may be either transorificial (eg, transrectal, transvaginal, peroral) or transcuteaneous. It includes localization of the collection and placement and maintenance of the drainage catheter or catheters. It may be performed during a single session or as a staged procedure during multiple sessions.

Image-guided percutaneous aspiration is defined as evacuation or diagnostic sampling of a fluid collection with the use of a catheter or a needle during a single imaging session, with removal of the catheter or needle immediately after the aspiration.

Complications can be stratified on the basis of outcome. Major complications (see [Appendix A](#)) result in admission to a hospital for therapy (for outpatient procedures), an unplanned increase in the level of care, prolonged hospitalization, permanent adverse sequelae, or death. Minor complications (see [Appendix A](#)) result in no sequelae; they may require nominal therapy or a short hospital stay for observation (generally overnight). The complication rates and thresholds below refer to major complications unless otherwise specified.

INDICATIONS AND CONTRAINDICATIONS

Because of variability in the presentation of abscesses and fluid collections, the indications for percutaneous drainage/aspiration of abscesses and fluid collections must be stated in general terms. The prerequisites for percutaneous drainage procedures are an abnormal fluid collection and one of the following:

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 sufficient to warrant drainage.

4. Temporizing maneuver to stabilize the patient's condition before definitive surgery (eg, drainage of diverticular abscess to allow primary reanastomosis).
5. As an adjunctive procedure to facilitate the improved outcome of a subsequent intervention (eg, paracentesis before and potentially after gastrostomy to reduce the risk of gastropexy breakdown and peritonitis).

The collection may be detected by physical examination but typically is discovered by an imaging study. Additional studies may be required to confirm the presence or nature of the fluid collection and to evaluate the feasibility of percutaneous aspiration or drainage.

Diagnostic aspiration may be the only means of determining that a fluid collection is infected. For instance, although fever, leukocytosis, malaise, anorexia, or other systemic symptoms point to an infection, these signs and symptoms may be absent in elderly, very ill, or immunocompromised patients. If material that appears infected is obtained or if the operator suspects the presence of infection, a drainage catheter may then be placed.

Percutaneous drainage or aspiration may be performed in essentially every organ system. The contraindications are relative and depend on the suitability of surgical alternatives. Common relative contraindications include coagulopathy and necrotic tissue requiring surgical debridement. There is a spectrum of disease complexity. Examples of more complex situations include multiple or multiloculated abscesses, abscess resulting from Crohn disease, pancreatic abscesses, drainage route that traverses bowel or pleura, infected clot, and infected tumor (15–22). Articles have documented curative or partially successful percutaneous drainage in patients with these complex situations. However, one should expect that percutaneous drainage in such cases will have a lower chance of success, be more technically difficult, require longer periods of time for drainage, and have a higher rate of complications. In addition, abscesses in such cases may be more likely to recur. Decisions regarding percutaneous versus surgical drainage of complex collections should be made in concert with other physicians involved in the patient's care. Some have advocated the

possibility of draining abscesses with the use of needles alone (23–25). However, catheter drainage may still be needed in selected cases, and the overall utility of needle drainage of abscesses awaits further study.

Patient follow-up and catheter management are integral to the success of the procedure. The radiologist performing the drainage should ensure that appropriate follow-up is performed and maintained until the catheter is removed.

The threshold for appropriateness criteria for performing percutaneous drainage procedure based on these indications should be met in 98% of cases.

There are no absolute contraindications. However, there are relative contraindications and, as for all patients considered for this procedure, the relative benefits and risks of the procedure should be weighed carefully. These relative contraindications should be addressed and corrected or controlled before the procedure when feasible. The relative contraindications for percutaneous drainage include:

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

All imaging facilities should have policies and procedures to reasonably attempt to identify pregnant patients before the performance of any examination involving ionizing radiation. In accordance with ACR Resolution 1a (adopted in 1995, revised in 2005), if the patient is known to be pregnant, the potential radiation risk to the fetus and clinical benefits of the procedure should be considered before proceeding with the study (26).

QUALITY IMPROVEMENT

Although practicing physicians should strive to achieve perfect outcomes (eg, 100% success, 0% complications), in practice all physicians will fall short of this ideal to a variable extent. Thus, indicator thresholds may be used to assess the efficacy of ongoing quality improvement programs. For the pur-

Table 1
Success Rates and Thresholds

Outcome	Suggested Threshold (%)
Successful diagnostic fluid aspiration	
Aspiration of adequate fluid for diagnostic characterization	95
Successful drainage	
Curative and partial success	85

poses of these guidelines, a threshold is a specific level of an indicator that should prompt a review. "Procedure thresholds" or "overall thresholds" reference a group of indicators for a procedure (eg, major complications). Individual complications may also be associated with complication-specific thresholds. When measures such as indications or success rates fall below a minimum threshold or when complication rates exceed a maximum threshold, a review should be performed to determine causes and to implement changes if necessary. For example, if the incidence of bleeding is one measure of the quality of percutaneous drainage procedures, then values in excess of the defined threshold should trigger a review of policies and procedures within the department to determine the causes and to implement changes to lower the incidence for the complication. Thresholds may vary from those listed here; for example, patient referral patterns and selection factors may dictate a different threshold value for a particular indicator at a particular institution. Thus, setting universal thresholds is very difficult, and each department is urged to alter the thresholds as needed to higher or lower values to meet its own quality improvement program needs.

Participation by the radiologist in patient follow-up is an integral part of percutaneous drainage procedures and will increase the success rate of the procedure. Close follow-up with monitoring and management of patients who have undergone percutaneous drainage is appropriate for the radiologist.

Success Rates and Thresholds

Successful diagnostic fluid aspiration is defined as the aspiration of material sufficient for diagnosis. The suggested threshold for aspiration of adequate fluid for diagnostic characterization is

95%. Success rates and thresholds are summarized in **Table 1**.

Curative drainage is defined as complete resolution of infection requiring no further operative intervention. Curative drainage has been achieved in more than 80% of patients. 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's condition before surgery. Partial success occurs in 5%–10% of patients. Failure occurs in 5%–10% and recurrence in 5%–10%. These results are similar for both abdominal and chest drainage procedures. These success rates will depend on the proportion of collections drained in patients with relative contraindications, on the complexity of the collection, and on the severity of the underlying medical problems. The suggested threshold for curative and partial success is 85% (**Table 1**).

Drainage of infected collections.—Because of the variability of the types of infected collections, the success rate of drainage will be highly variable, and it is not believed that a specific threshold for success in drainage of infected collections can be set.

Complication Rates and Thresholds

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

Published rates for individual types of complications are highly dependent on patient selection and are based on series comprising several hundred patients, which is a larger volume than most individual practitioners are likely to treat. Generally the complication-specific thresholds should be set higher than the complication-specific reported rates listed here. It is also recognized

Table 2
Published Complication Rates and Suggested Thresholds

Specific Major Complication	Reported Rate (%)	Suggested Threshold (%)
Septic shock	1–2	4
Bacteremia requiring significant new intervention	2–5	10
Hemorrhage requiring transfusion	1	2
Superinfection (includes infection of sterile fluid collection)	1	2
Bowel transgression requiring intervention	1	2
Pleural transgression requiring intervention (abdominal interventions)	1	2

Table 3
Overall Complication Rate

Overall Procedure	Suggested Threshold
All major complications resulting from adult percutaneous drainage procedures	10%

that a single complication can cause a rate to cross above a complication-specific threshold when the complication occurs within a small patient series (eg, early in a quality improvement program). In this situation, an overall procedural threshold is more appropriate for use in a quality improvement program (Table 3). In Table 2, all values are supported by the weight of literature evidence and panel consensus. The suggested threshold for all major complication resulting from percutaneous drainage procedures in adults is 10% (Table 1).

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APPENDIX A: CONSENSUS METHODOLOGY

Reported complication-specific rates in some cases reflect the aggregate of major and minor complications. Thresholds are derived from critical evaluation of the literature, evaluation of empirical data from Standards of Practice Committee members' practices, and, when available, the SIR HI-IQ System national database.

Consensus on statements in this document was obtained utilizing a modified Delphi technique (1,2).

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APPENDIX B: SIR STANDARDS OF PRACTICE COMMITTEE CLASSIFICATION OF COMPLICATIONS BY OUTCOME

Minor Complications

- A. No therapy, no consequence.

- B. Nominal therapy, no consequence; includes overnight admission for observation only.

Major Complications

- C. Require therapy, minor hospitalization (<48 h).
- D. Require major therapy, unplanned increase in level of care, prolonged hospitalization (>48 h).
- E. Permanent adverse sequelae.
- F. Death.

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SIR DISCLAIMER

The clinical practice guidelines of the Society of Interventional Radiology attempt to define practice principles that generally should assist in producing high quality medical care. These guidelines are voluntary and are not rules. A physician may deviate from these guidelines, as necessitated by the individual patient and available resources. These practice guidelines should not be deemed inclusive of all proper methods of care or exclusive of other methods of care that are reasonably directed towards the same result. Other sources of information may be used in conjunction with these principles to produce a process leading to high quality medical care. The ultimate judgment regarding the conduct of any specific procedure or course of management must be made by the physician, who should consider all circumstances relevant to the individual clinical situation. Adherence to the SIR Quality Improvement Program will not assure a successful outcome in every situation. It is prudent to document the rationale for any deviation from the suggested practice guidelines in the department policies and procedure manual or in the patient's medical record.