



## **CAR Standards for the Performance of Percutaneous Nephrostomy**

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*The standards of the Canadian Association of Radiologists (CAR) are not rules, but are guidelines that attempt to define principles of practice that should generally produce radiological care. The physician and medical high-quality physicist may modify an existing standard as determined by the individual patient and available resources. Adherence to CAR standards will not assure a successful outcome in every situation. The standards should not be deemed inclusive of all proper methods of care or exclusive of other methods of care reasonably directed to obtaining the same results. The standards are not intended to establish a legal standard of care or conduct, and deviation from a standard does not, in and of itself, indicate or imply that such medical practice is below an acceptable level of care. The ultimate judgment regarding the propriety of any specific procedure or course of conduct must be made by the physician and medical physicist in light of all circumstances presented by the individual situation.*

### **I. INTRODUCTION AND DEFINITION**

Percutaneous nephrostomy is a well established technique allowing imaging of and effective therapy in selected patients with urinary tract obstruction and/or urinary tract calculi. Percutaneous nephrostomy is an invasive procedure with recognized risk of complication. Many radiologists, with various levels of training, perform this procedure with obvious variation in success and complication rates. For purposes of these standards, percutaneous nephrostomy is defined as the percutaneous placement of a catheter into the renal collecting system with ultrasound, computed tomography, and/or fluoroscopic guidance.

Percutaneous nephrostomy has three main functions:

- 1) relief of urinary tract obstruction;
- 2) assessment of anatomy;
- 3) evaluation of renal function.

### **II. RADIOLOGIST QUALIFICATIONS**

That Physicians involved in the performance, supervision and interpretation of percutaneous nephrostomy should be Diagnostic Radiologists and must have a Fellowship or Certification in Diagnostic Radiology with the Royal College of Physicians and Surgeons of Canada and/or the Collège des médecins du Québec. Also acceptable are foreign Specialist qualifications if the Radiologist so qualified holds an appointment in Radiology with a Canadian University.

As new imaging modalities and interventional techniques are developed additional clinical training, under supervision and with proper documentation, should be obtained before radiologists interpret or perform such examinations or procedures independently. Such additional training must meet with pertinent provincial/regional regulations. Continuing professional development must meet with the requirements of the Maintenance of Certification Program of the Royal College of Physicians and Surgeons of Canada.

#### **1. Requisite Knowledge and Skills**

For PCN to be performed safely and appropriately, certain fundamental knowledge and skills are required. These include:

- a. In addition to a basic understanding of urologic anatomy, physiology, and pathophysiology, the physician should have sufficient knowledge of the clinical and imaging evaluation of urologic patients to determine those for whom PCN is indicated.
- b. The physician is required to be competent in the use of CT, ultrasound, fluoroscopy, and other imaging methods to guide PCN procedures.

c. The physician should have the ability to evaluate a patient's clinical status to anticipate those patients who might be at increased risk, who require additional pre- or post- procedure care, and who have relative contraindications to the procedure.

d. The physician should be capable of the initial management of complications of PCN, including basic life support and the treatment of renovascular trauma and sepsis.

e. The physician should be well versed in care and be able to provide long- post-procedure term nephrostomy tube care and management as necessary.

f. The physician should have documented training in the principles of radiation protection, the hazards of radiation exposure to both patients and radiologic personnel, and the monitoring requirements of the imaging methods listed above.

In general, the requirements listed above may be met by adhering to the recommendations below.

## 2. Minimum Training Recommendations

a. Completion of an accredited residency/fellowship program that includes 6 months of training in cross- sectional imaging including diagnostic ultrasound and CT scanning. Documented successful completion of didactic course lectures and laboratory instruction in radiation physics, radiobiology, and radiation protection. Certification in Radiology or Diagnostic Radiology by the American Board of Radiology, the American Osteopathic Board of Radiology, or the Royal College of Physicians and Surgeons of Canada.

and

b. Training that includes at least 3 months of interventional techniques including percutaneous organ drainage procedures and catheter manipulation. This should include performance (with supervision) of at least 15 percutaneous organ drainage procedures, including PCN, documented by a log of cases performed.

or

Physicians whose residency did not include the above may still be considered as satisfying the qualifications in PCN if they have performed 15 PCNs or similar percutaneous organ drainage procedures with documented acceptable success and complication rates.

or

## 3. Maintenance of Competence

Maintenance of competence requires continuing clinical activity including:

a. Regular performance of percutaneous organ drainage procedures including sufficient numbers of PCNs to maintain success and complication rates in accordance with accepted standards.

b. Continuing education should be in accordance with the ACR Standard for Continuing Medical Education (CME).

## III. TECHNOLOGIST CREDENTIALS CRITERIA

The Medical Radiation Technologist must have Canadian Association Medical Radiation Technologist certification or be certified by an equivalent licensing body recognized by the CAMRT.

Under the overall supervision of the Radiologist the Technologist will have the responsibility for patient comfort and safety, for examination preparation and performance, for image technical evaluation and quality, and applicable quality assurance. The training of Technologists specifically engaged in CT shall meet with applicable and valid National and Provincial Specialty qualifications.

#### IV. INDICATIONS AND CONTRAINDICATIONS

The referring physician should document the indication for nephrostomy in the patient's chart. Table I lists indications for percutaneous nephrostomy.

##### TABLE I : INDICATIONS FOR PERCUTANEOUS NEPHROSTOMY DIAGNOSTIC

- define anatomy
- function assessment
- brush biopsy
- Whitaker test
- Nephroscopy
- abscess drainage

##### THERAPEUTIC

- decompression
- stricture dilatation and/or stenting
- fistula diversion
- calculus extraction and dissolution
- foreign body retrieval(i.e. stents)

##### B. CONTRAINDICATIONS

###### Relative

1. Bleeding diathesis
2. Single functioning kidney

Correction of bleeding diathesis can usually be achieved with blood products prior to the procedure.

The physician performing the procedure should have a practical understanding of coagulopathies and how to correct them prior to performance of percutaneous nephrostomy.

#### V. EXAMINATION TECHNIQUE(S), PERFORMANCE AND RELATED MATTERS

Percutaneous nephrostomy can be accomplished in a number of ways and the guidance system used to direct needle puncture of the pelvicaliceal system varies from institution to institution.

Ultrasound can be used effectively to puncture dilated system with ease. Its usefulness is obvious in pregnancy, renal failure, and patients with poor renal function (i.e. diabetes). It allows for fewer needle punctures, thereby reducing morbidity.

Computed tomography can be used if sonographic visualization is suboptimal (i.e. large patient). In general, this approach is expensive and time-consuming and offers no advantage over ultrasound.

Fluoroscopic guided puncture with antegrade opacification of the collecting system can be used if ultrasound is not available. Following opacification, an appropriate posterior calyx is chosen for final puncture.

Ultrasound is the preferred method of guidance in an obstructed system. Puncture following intravenous or retrograde contrast administration (in a patient with normal renal function) may be the preferred method of guidance in a nondilated system. Guidance should be individualized to each patient with the ultimate choice made to achieve a safe, successful procedure.

##### A. The minimum requirements for facilities in any hospital in which PCN is to be performed are:

1. A high- resolution image intensifier and television with adequate shielding are essential. Overhead fluoroscopic tube suites are not recommended because of increased radiation exposure to personnel during this procedure. Permanent image documentation is desirable.
2. Real- time ultrasound capability to plan and monitor needle placement is recommended.
3. Computed tomography capability is desirable to better demonstrate anatomy, particularly in unusual cases, i. e., solitary kidney, congenital anomalies of kidneys, postoperative state, and lesions close to major vessels.
4. The facility should provide adequate resources for observation of patients during and after PCN. The facility should maintain monitoring devices appropriate to the patient's needs, including blood pressure monitoring, oximetry, EKG, and equipment for cardiopulmonary resuscitation.

##### B. Surgical and Emergency Support

Although serious complications of PCN are infrequent, there should be prompt access to surgical and interventional management of complications.

#### POTENTIAL COMPLICATIONS OF PERCUTANEOUS NEPHROSTOMY

##### Minor

- transient gross haematuria
- common: 50%
- small perinephric hematoma: 8%
- urinoma: 1-2%
- tube occlusion
- displaced catheter

##### Major

- sepsis
- haemorrhage
- AV fistula
- track through major organ: colon, duodenum, spleen, gall bladder
- pneumothorax

Serious complications of percutaneous nephrostomy are infrequent; however, there should be prompt access to surgical/medical or interventional management of complications, including selective and subselective angiography and embolization.

#### VI. REFERENCES

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