



CAR Standard for Performance of Contrast Examinations of the Small Bowel in Adults

Approved: June 1996

These standards were reviewed by the Gastrointestinal Expert Advisory Panel: France Bourdon, MD, Chair, J. Stephen Fache, MD, Vancouver, László A. Fried, MD, Halifax, David Reid, MD, Calgary, Lawrence A. Stein, MD, Montreal, Giles W. Stevenson, MD, Hamilton, Hardy Tao, MD, Ottawa

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

Recently, there has been a significant change in the radiological investigation of small bowel disease. Ultrasonography and CT scan are now considered more useful examinations in some disorders of the small bowel.

However, fluoroscopic contrast study remains an important investigative method. A good contrast study of the small bowel should demonstrate most intraluminal disease and some extraluminal disease, while keeping radiation dose at a minimum.

II. DEFINITIONS

- A.** The small bowel meal or series is a contrast study of the entire small bowel, using overhead films, spot films, and fluoroscopy.
- B.** Enteroclysis or antegrade small bowel enema is a contrast study of the small bowel performed under fluoroscopic control after intubation of the distal duodenum, or, preferably, the proximal jejunum.
- C.** Retrograde small bowel enema through ileostomy, jejunostomy or rectum, refers to retrograde studies of the small bowel performed under fluoroscopic control.
- D.** Small bowel follow-through traditionally has referred to the examination of the small bowel done immediately after a barium meal or upper gastrointestinal series. Since the barium used in the two studies tend to be incompatible, it is recommended that, as much as possible, the two studies not be performed at the same time.

III. INDICATIONS

- 1. diagnosis and follow-up of Crohn's disease;
- 2. intermittent partial small bowel obstruction;
- 3. unexplained GI hemorrhage or iron deficiency anemia;
- 4. unexplained diarrhea;
- 5. unexplained steatorrhea;
- 6. as part of the investigation of a variety of diseases such as lymphoma, peritoneal carcinomatosis, malabsorption etc.

IV. PHYSICIAN QUALIFICATIONS

That Physicians involved in the performance, supervision and interpretation of contrast examinations of the small bowel in adults 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.

V. RADIOLOGIC TECHNOLOGISTS QUALIFICATIONS

The medical radiation technologist must have Canadian Association of Medical Radiation Technologists certification or be certified by an equivalent licensing body recognized by the C.A.M.R.T.

Under the overall supervision of the radiologists, the technologist will have the responsibility for patient comfort and safety, for examination preparation and performance, and for image technical evaluation and quality and applicable quality assurance.

The training of technologists engaged in specialty activities shall meet with applicable and valid national and provincial specialty qualifications.

Continued education of technologists is encouraged by the C.A.M.R.T. and should meet pertinent provincial regulations.

VI. EQUIPMENT AND QUALITY CONTROL

Examinations should be performed with fluoroscopic and radiographic equipment meeting all applicable federal and provincial radiation standards.

Each imaging facility should have documented policies and operations for monitoring and evaluating the effective management, safety and operation of imaging equipment. The quality control program should be designed to minimize patient, personnel and public radiation risks and maximize the quality of the diagnostic information.

At least annually or as required by provincial law, equipment performance should be monitored and a quantitative dose determination should be conducted by a qualified medical radiation physicist or a qualified designated substitute.

VII. EXAMINATION PRELIMINARIES

- A.** A written request from the referring physician, including reason for consultation and appropriate past medical and surgical history, should be available.
- B.** The medical chart of hospitalized patients should accompany the patient to the fluoroscopic unit.
- C.** The sequence of examinations is to be determined by the radiologist, in keeping with the specific problem being investigated. As usual, thought should be given to the fact that barium might interfere with subsequent CT scan and ultrasound examinations.
- D.** The patient should have nothing by mouth on the day of the examination. A bowel preparation is not generally thought to be necessary, but is recommended if oral pneumocolon is performed routinely (Sec. 9A5).

VIII. CHOICE OF RADIOGRAPHIC MODALITY AND CONTRAST MEDIUM

Based on the method of introduction of contrast media, the small bowel study can be divided into four categories:

1. small bowel meal or series;
2. antegrade small bowel enema (enteroclysis);

3. retrograde small bowel enema through ileostomy or jejunostomy; and
4. retrograde small bowel enema through the rectum.

Patient preparation and choice of contrast media are somewhat different in each of the above. In general, for any suspicion of bowel perforation, i.e. trauma, post-surgery, water soluble contrast media should be used. However, water soluble contrast media, because of their high osmolarity, are not appropriate for routine study of small bowel disease. A well mixed barium suspension of moderate density is recommended.

In patients with intermittent small bowel obstruction who are referred for evaluation as outpatients, the best test for finding the cause is probably enteroclysis. Recent literature suggests that, while enteroclysis may be used for acute small bowel obstruction, CT scan is a more helpful examination. Before delivering barium from above, however, it is important to be sure that the patient does not have a colonic obstruction and single contrast barium enema without preparation may be indicated.

IX. EXAMINATION TECHNIQUE

A. Small bowel series

The following techniques may be modified at the discretion of the radiologist, as required by the clinical situation, the condition of the patient and the fluoroscopic findings.

1. Approximately 600 cc of well mixed, low to medium density barium suspension is ingested by mouth.
2. Prone films of the abdomen are taken every 15 to 20 minutes and these should be checked by a radiologist.
3. Fluoroscopic compression spot films should be done whenever necessary, and once the barium enters the right colon, to examine the distal and terminal ileum.
4. Spot films or overhead films should be done with a kilovoltage appropriate to the barium density being used. A small focal spot should be used if possible, and the exposure time should be 1/10 sec. or less.
5. The introduction of air or CO₂ per rectum (oral pneumocolon) will often allow a double contrast examination of the distal small bowel and right colon, and may be performed at the radiologist's discretion.

The quality controls specific to this study are:

- a. The density of the barium and the technical factors should permit sufficient transparency for visualisation of small bowel folds.
- b. All segments of the small bowel should be visualised on overhead or fluoroscopic spot films.
- c. Transit time should be kept below 90 minutes. Various recognized methods such as keeping the stomach full of barium, intravenous propulsive agents, or giving the patient a dry meal at 60 or 90 minutes can be used.

B. ANTEGRADE SMALL BOWEL ENEMA (ENTEROCLYSIS)

1. An appropriate small bowel tube with or without balloon is positioned with the tip in the distal duodenum or, preferably the proximal jejunum. The tube may be passed orally or nasally after appropriate local anesthesia and intravenous sedation. Intravenous metoclopramide may be given just before the tube is passed in order to speed passage of the tube to the jejunum and passage of the contrast to the caecum.
2. Intermittent fluoroscopy, a well coned field of view, and last image hold are all helpful in minimizing radiation exposure during intubation.

3. Contrast medium

a. *Single contrast examination* - A dilute, well mixed barium suspension is introduced at 75 to 100ml/minute until the terminal ileum is reached, and distension is obtained.

b. *Double contrast examination* - A total of 600 ml of a well mixed medium density barium suspension is introduced at 75 ml/minute. Then methyl cellulose 0.5% may be used to follow the barium at 75 to 100ml/minute to obtain distension and a double contrast effect.

Some authors prefer air, carbon dioxide or water as the double contrast agent. These are more difficult to use and require modifications of technique and timing for satisfactory results.

4. Intermittent frequent fluoroscopy is used as the contrast advances, and films are taken, preferably with the patient prone. Spot films are taken to evaluate pathology, and compression fluoroscopy is used at intervals to evaluate all the loops of the small bowel.

The quality controls specific to this study are:

a. The folds of the entire small bowel are well shown in both single and double-contrast phases.

b. All segments are adequately distended.

c. Care must be taken that images of the proximal jejunum or distal duodenum be obtained.

C. RETROGRADE SMALL BOWEL ENEMA THROUGH ILEOSTOMY OR JEJUNOSTOMY

1. It must be recognized that inflation of a Foley style balloon inside a stoma has been associated with complications, and if required, should be performed with great care under fluoroscopic control in a conscious patient.

2. An intravenous antispasmodic agent is advisable.

3. A well-mixed barium suspension is introduced into the small bowel in retrograde fashion. Low to medium density is appropriate for single contrast examination, and medium to high density is suitable for double contrast techniques.

The amount of contrast medium used is based on clinical indications suggesting the expected level of pathology.

4. Compression spot films should be performed whenever necessary.

D. RETROGRADE SMALL BOWEL ENEMA THROUGH THE RECTUM

This is done as a continuation of a single contrast enema with retrograde opacification of the small bowel. Intravenous antispasmodics increase the reflux of contrast into the small bowel and decrease patient discomfort.

X. QUALITY CONTROL

The following controls should be applied to all contrast examinations of the small bowel:

A. Once examinations are completed, the images must be checked by the radiologist before the patient is permitted to leave the department, and the technician must verify that any digital images are technically satisfactory.

B. Poorly exposed, inadequately centered or positioned films and blurred films should be repeated as necessary.

C. An attempt should be made to resolve questionable radiologic findings before the patient leaves.

D. Radiologic findings should be correlated with surgical and pathologic findings where available.

XI. QUALITY IMPROVEMENT

Procedures should be systematically monitored and evaluated as part of the overall quality improvement program of the facility. Monitoring should include the evaluation of the accuracy of radiologic interpretation as well as the appropriateness of the examination.

The incidence of complications and adverse events should be recorded and periodically reviewed in order to identify opportunities to improve patient care.

The data should be collected in a manner which complies with statutory and regulatory peer review procedures in order to protect the confidentiality of the peer review data.

XII. THE REPORT

This should conform with the C.A.R. Standards for communication in diagnostic radiology.