ACR–SPR PRACTICE PARAMETER FOR THE PERFORMANCE OF THE MODIFIED BARIUM SWALLOW

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[1]. 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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1 *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

The modified barium swallow (MBS) or videofluoroscopic swallow study is a proven and useful procedure for evaluating oral and pharyngeal swallowing function and airway protection [1-6]. Although it is used primarily for the evaluation of function, structural abnormalities may also be revealed and may be a primary cause of swallowing dysfunction. A tailored MBS focusing primarily on function may be performed . Because symptoms of dysphagia are often poorly localized, a complete evaluation of these symptoms may require spot film images of the pharynx for structural assessment or an esophagram in addition to an MBS. For the purposes of this practice parameter, MBS focuses on the assessment of the functional swallowing regions including the oral cavity, pharynx, larynx, and pharyngoesophageal junction. For evaluation of the esophagus, see the ACR Practice

Parameter for the Performance of Esophagrams and Upper Gastrointestinal Examinations in Adults [7] and the ACR–SPR Practice Parameter for the Performance of Contrast Esophagrams and Upper Gastrointestinal Examinations in Infants and Children [8].

The MBS may be performed because of known or suspected swallowing dysfunction or because of the presence of conditions that are strongly associated with swallowing dysfunction. The MBS should be performed only for a valid medical reason and with the minimum radiation dose necessary to achieve a study of diagnostic quality [9]. Additional or specialized examinations may be required to complete the patient's assessment.

The primary purposes of the MBS include the following: identify and distinguish the presence, type, and estimated severity of physiologic swallowing impairment; determine the safety of oral intake (airway protection); determine the efficiency of oral intake (clearance); detail the effects of selected frontline interventions (postures, maneuvers, bolus variables) on swallowing physiology, airway protection, and efficiency; identify indications for specific interventions that may be appropriate for the clinical condition of the patient; and develop intake (oral, tube, etc) and diet texture/nutritional management plans in collaboration with the physician and other interdisciplinary team members [10].

Although it is not possible to detect all structural and functional swallowing abnormalities using the MBS, adherence to the following practice parameter will maximize the probability of their detection.

II. INDICATIONS AND CONTRAINDICATIONS

Indications for the MBS include, but are not limited to:

1. Oropharyngeal dysphagia
2. Coughing, choking, or drooling
3. Known or suspected aspiration or aspiration pneumonia
4. Frequent respiratory tract infections
5. Neurologic or neurodegenerative disorders likely to affect swallowing
6. Myoneural junction disorders likely to affect swallowing
7. Pulmonary conditions possibly related to swallowing dysfunction
8. Myopathy or nerve injury involving the pharynx, cervical esophagus, or upper airway
9. Masses of the tongue, pharynx, larynx, or retropharyngeal region that may affect swallowing
10. Preoperative and follow-up posttreatment (operative, radiation, and/or chemotherapy) evaluation of the mouth, pharynx, larynx, retropharyngeal, or pharyngo-esophageal junction area [11-13]
11. Follow-up of known oropharyngeal swallowing dysfunction
12. Follow-up assessment of dietary restrictions and protective maneuvers to limit or prevent aspiration
13. Follow-up assessment of patients recovering from trauma and/or coma
14. Oral feeding safety assessment for ventilator-dependent patients [14]
15. Poor feeding, sucking, swallowing (neonate)
16. Patients with basilar pulmonary fibrosis
17. After prolonged intubation and/or deconditioning
18. Prior abnormal MBS with subsequent modification of swallow technique or improvement in patient conditioning
19. Nasal stuffiness or noisy breathing that worsens with feeding (pediatrics)
20. Laryngotracheal cleft

For the pregnant or potentially pregnant patient, see the ACR–SPR Practice Parameter for Imaging Pregnant or Potentially Pregnant Patients with Ionizing Radiation [15,16].

Potential Contraindications

1. Known or suspected leak from the pharynx or esophagus such as following trauma or surgery. If a leak is suspected, an esophagram using nonionic low osmolar water-soluble contrast material should be performed before MBS.
2. Known or suspected tracheoesophageal fistula. If suspected, an esophagram using low osmolar water-

soluble contrast material should be performed before MBS.

III. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL

A. Physician

Examinations must be performed by or under the supervision of a licensed physician and interpreted by a physician with the following qualifications:

Certification in Radiology, Diagnostic Radiology or Interventional Radiology/Diagnostic Radiology (IR/DR) 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.

or

Completion of a 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 must have documented formal training in the performance and interpretation of gastrointestinal fluoroscopy, including MBS.

and

The physician shall have documented training in and understanding of the physics of diagnostic radiology and the equipment needed to produce the images. This should include radiography, fluoroscopy, and digital image processing. In addition, the physician must be familiar with the principles of radiation protection, the hazards of radiation, and radiation monitoring requirements as they apply to both patients and personnel.

and

The physician shall have documented training in and understanding of the value of MBS examinations and oropharyngeal swallowing function relative to other medical imaging procedures (general radiography, fluoroscopy, CT, ultrasound, MRI, and nuclear medicine) to best evaluate a patient's clinical symptoms.

Continuing Medical Education

The physician's continuing medical education should be in accordance with the ACR Practice Parameter for Continuing Medical Education (CME) [17].

III. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL

B. 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

C. Radiologic Technologist

Qualifications of technologists performing GI radiography should be in accordance with the current ACR policy statement for fluoroscopy[2] and with the operating procedures or manuals at the imaging facility. Fluoroscopy technologists assisting in MBS examinations should be thoroughly trained in GI radiography.Certification by the American Registry of Radiologic Technologists (ARRT) or unrestricted state licensure is required.

[2]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 12-m) *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, 20

III. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL

D. Speech-Language Pathologist

A speech-language pathologist may also be involved in the performance and interpretation of MBS studies, in conjunction with the radiologist. This professional should have specific education and training related to the indications and to the performance and interpretation of the MBS using validated and standardized methods. It is recommended that the individual hold the Certificate of Clinical Competence in Speech-Language Pathology from the American Speech-Language-Hearing Association. The speech-language pathologist should have knowledge of the patient's medical condition and current cognitive and mental status.

IV. SPECIFICATIONS OF THE EXAMINATION

The written or electronic request for modified barium swallow should provide sufficient information to demonstrate the medical necessity of the examination and allow for its proper performance and interpretation.

Documentation that satisfies medical necessity includes 1) signs and symptoms and/or 2) relevant history (including known diagnoses). Additional information regarding the specific reason for the examination or a provisional diagnosis would be helpful and may at times be needed to allow for the proper performance and interpretation of the examination.

The request for the examination must be originated by a physician or other appropriately licensed health care provider. The accompanying clinical information should be provided by a physician or other appropriately licensed health care provider familiar with the patient's clinical problem or question and consistent with the state's scope of practice requirements. (ACR Resolution 35 adopted in 2006 – revised in 2016, Resolution 12-b)

IV. SPECIFICATIONS OF THE EXAMINATION

B. Patient Selection, Preparation, and Positioning

The patient must have sufficient cognitive awareness to cooperate with the study. The swallowing functions are usually evaluated initially in the lateral plane with the patient upright with gravity assistance to mimic the eating and drinking position. The lateral view may be followed by frontal view observations whenever positioning allows to provide evaluation of symmetry of swallowing function. Stable, commercially prepared barium and validated, standard protocols are encouraged to optimize visualization and reproducibility of the MBS and comparison of findings across sites [18-20]. Special chairs are available to assist with patient positioning if the patient is unable to stand or sit upright unsupported, but they are not necessary to perform an adequate study. For infants, the MBS should be performed with the patient upright and sitting supported in a secured chair/seat preferentially designed for oropharyngeal motility studies. For patients who cannot be placed upright, a semi-upright swallowing study can be performed with the patient placed in the lateral decubitus position on the fluoroscopy table and the table tilted as close to upright as the patient can tolerate.

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upright swallowing study can be performed with the patient placed in the lateral decubitus position on the fluoroscopy table and the table tilted as close to upright as the patient can tolerate.

IV. SPECIFICATIONS OF THE EXAMINATION

C. Personnel

The examination may be performed by a physician alone (or an NPRP with physician supervision) for diagnostic evaluation or by a physician (or an NPRP with physician supervision) and a speech-language pathologist for both diagnosis and recommendation regarding therapy.

IV. SPECIFICATIONS OF THE EXAMINATION

D. Method of Recording

For functional assessment, the fluoroscopic portion of the examination should be recorded on high-resolution videofluorographic (VF) and/or rapid digital fluorographic imaging [10,21]. For morphologic assessment, spot images and/or rapid digital fluorographic imaging with double-contrast or single-contrast technique should be used.

IV. SPECIFICATIONS OF THE EXAMINATION

E. MBS Technique

1. Examination

The examination should include evaluation of oral, nasopharyngeal, pharyngeal, laryngeal, and pharyngoesophageal segment function and morphology in the lateral projection. Evaluation in the frontal projection may be useful to view symmetry of function and effects of applied compensatory strategies on swallowing safety and bolus clearance. Observation of the esophagus in the frontal projection to ensure unimpeded pharyngo-esophageal drainage may be helpful. It is important to recognize that the assessment of gravity-assisted pharyngo-esophageal clearance of barium during MBS is a limited assessment and does not imply the esophagus is normal. Depending on patient symptoms and findings (or lack of findings) on MBS, an esophagram may be required to complete the assessment of the patient. [22-25]. The examination may need to be terminated prematurely if the patient demonstrates severe aspiration (such as aspiration below the sternal notch) and does not respond to protective or therapeutic maneuvers.

IV. SPECIFICATIONS OF THE EXAMINATION

E. MBS Technique

2. VF recording medium

It is recommended that VF and/or rapid digital fluorographic recordings are performed while the patient is administered barium consistencies and volumes customized for the MBS and that approximate the consistencies of liquids and food in an oral diet to detect swallowing impairment. Use of a standardized and validated set of commercially prepared barium consistencies and volumes is recommended whenever possible, to ensure the ability to reproduce or compare repeat evaluation results, risks associated with aspiration of these substances, and infection control issues [26]. . If aspiration occurs, the patient's response to aspiration and ability to clear the aspirated materials and response to protective and therapeutic maneuvers should be assessed wherever possible. The literature supports a fluoroscopic acquisition rate of 30 pulses per second or continuous fluoroscopy whenever possible to provide optimal visualization of rapid movements associated with swallowing and aspiration detection. [9,27,28]. However, fluoroscopic acquisition rates should be determined by the supervising radiologist with attention to optimally minimizing the patient's radiation exposure and maximizing adequate swallowing evaluation.

a. Spot radiographs

Spot radiographs are not needed for all patients. When obtained, double-contrast spot radiographs and/or rapid digital fluorographic images of the pharynx may include lateral views during both suspended respiration and phonation and frontal views during both suspended respiration and modified Valsalva maneuver. Single-contrast radiographs and/or rapid digital fluorographic images may be substituted if warranted by the patient's clinical condition. For pediatric patients, spot radiographs and double contrast examinations are seldom necessary.

b. Esophagram

An evaluation of esophageal structure and function is beyond the scope of the MBS, which is focused on assessment of functional swallowing in the areas of the oral cavity, pharynx, larynx, and pharyngo-esophageal junction. For evaluation of the esophagus, see the ACR Practice Parameter for the Performance of Esophagrams and Upper Gastrointestinal Examinations in Adults [7] and the ACR–SPR Practice Parameter for the Performance of Contrast Esophagrams and Upper Gastrointestinal Examinations in Infants and Children [8]. In cases of significant aspiration, the esophagram may be performed with an injection of contrast material directly into the esophagus through a feeding tube, either pre-existing or placed by the radiologist.

IV. SPECIFICATIONS OF THE EXAMINATION

E. MBS Technique

3. Tailored Examination

The method of examination may vary based on the patient's history, the clinical questions to be answered, and the findings during the study; however, standard protocols, assessment, interpretation, and reporting are encouraged [19].

IV. SPECIFICATIONS OF THE EXAMINATION

E. MBS Technique

4. Protective and therapeutic measures

When aspiration does occur, the effect of maneuvers to limit or prevent aspiration may be assessed. These may include changes in neck or body position or other special maneuvers. If swallowing dysfunction is present, additional compensatory strategies may be assessed to improve swallow physiology [14].

IV. SPECIFICATIONS OF THE EXAMINATION

E. MBS Technique

5. Protective measures

When the patient's symptoms are not explained by the standard examination, provocative or helpful maneuvers based on the history may be needed. Changes in head or body position may be used to evoke subtle swallowing dysfunction, including head turn or flexion . Similarly, a change in the position of an infant's head (flexion) may also be useful, once aspiration has been shown, to determine if head position eliminates aspiration.

In the event of aspiration during the study, frontal chest radiography may be helpful at the end of the examination to document or determine the extent of aspiration.

IV. SPECIFICATIONS OF THE EXAMINATION

E. MBS Technique

6. Pediatric considerations

The examination may be tailored for pediatric patients, these considerations include:

1. Pulsed fluoroscopy, preferably at 15 frames per second, is recommended to reduce the radiation dose.
2. Use of barium mixed with home or in-house food products of various consistencies (eg, milk, barium cookie) to ensure palatability and patient cooperation
3. Use of various nipples to meter flow of liquids and bolus size for bottle-fed children
4. Use of unique cups and straws to meter flow of liquids and bolus size for children who drink from a cup
5. Use of pediatric chairs of various sizes to optimize positioning during the examination. Note that neonates who are not able to sit upright may be imaged in a right lateral decubitus position with the table tilted upwards
6. Images should be collimated superiorly to include the nasopharynx but exclude the orbits. This positioning balances the ability to identify nasopharyngeal reflux but excludes the radiation sensitive lens.

IV. SPECIFICATIONS OF THE EXAMINATION

F. Radiographic Quality Control

Proper functioning of the imaging equipment should be assured before beginning the examination. If spot images are obtained, image quality should be checked by a qualified technologist or physician before the patient is dismissed. Images not of diagnostic quality should be repeated as necessary. Provision should be made for recording all available radiation dose data in the patient's medical record. If cumulative air kerma or air kerma-area-product data are not available, the fluoroscopic exposure time and the number of acquired images (radiography or cine) should be recorded in the patient's medical record, according to the ACR–AAPM Technical Standard for Management of the Use of Radiation in Fluoroscopic Procedures [29].

V. DOCUMENTATION

Reporting should be in accordance with the ACR Practice Parameter for Communication of Diagnostic Imaging Findings [30].

When the examination is performed by a radiologist, a supervised resident or fellow, or a qualified supervised NPRP and a speech-language pathologist, the images should be reviewed by the performing team with a discussion of the findings and conclusions agreed upon by them. This should be done out of hearing of the patient. If there are any discordant opinions not resolved by image review, additional imaging should be performed.

Comparison to prior MBS studies should be performed when relevant, particularly when the examination is performed to follow up previously demonstrated abnormalities. Patient identity (using name and/or a unique identifying number) and examination date should be recorded on the VF recording medium. Each institution should develop a policy on retention and reporting results of video images, which are considered part of the medical record consistent with applicable state or federal policies. It is recommended that the radiologist and speech-language pathologist corroborate findings at the conclusion of the examination [10].

VI. EQUIPMENT SPECIFICATIONS

Examinations should be performed with fluoroscopic and radiographic equipment meeting all applicable federal, state, and local regulations. The equipment should be part of a Quality Management (QM)/Quality Control (QC) Program. The QM/QC program should include an annual survey by a medical physicist. The fluoroscopic and recorded images should be of diagnostic quality. In selected cases, patient monitoring may be desirable. However, most patients do not require any additional monitoring other than that which may already be in use.

Equipment performance monitoring should be in accordance with the ACR–AAPM Technical Standard for Diagnostic Medical Physics Performance Monitoring of Radiographic Equipment [18] and the ACR–AAPM Technical Standard for Diagnostic Medical Physics Performance Monitoring of Fluoroscopic Equipment [19].

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

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®, 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®

for children (www.imagegently.org) and Image Wisely® for adults (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 Quality Control & 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).

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