Guidelines and Resources to Consider for:

1. MBS and barium aspiration
2. AP view
3. Esophageal sweep
4. Radiation exposure (frame rate and fluoroscopy time)

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ASHA Guidelines (**aspiration considerations**)

"The purpose of the instrumental examination is to enable the SLP to...determine the cause(s) for laryngeal penetration and/or aspiration..." (ASHA, 2017)

"At minimum, the VFSS includes the following protocols….Assessing the presence and effectiveness of the patient's response to laryngeal penetration, aspiration, and/or residue as part of an assessment of the airway integrity (ASHA, 2017)

"A **complete VFSS** requires a **sufficient number of swallowing attempts** to (a) make a clinically informed decision about **route of intake**, **consistency** of oral diet (if appropriate), **exercises** to improve swallowing function, and **compensatory techniques** to maintain patient safety while consuming an oral diet and (b) determine the need for additional assessments/interventions through **interprofessional team referral(s)**" (ASHA, 2017)

American College of Radiology MBS practice guidelines (**aspiration considarations**)

“Videofluorographic recording medium

Videofluorographic and/or rapid digital fluorographic recording is performed while the patient swallows a variety of consistencies of barium or barium-impregnated food with varying bolus volumes. Assessment includes all phases of swallowing from the preparatory oral phase through the oral transfer phase and pharyngeal phase. The esophageal phase may be assessed on other swallows. The viscosity and volume of each bolus may be varied by the clinical judgment of the speech-language pathologist or the radiologist based on the patient’s presenting symptoms. **If aspiration occurs, the patient’s response to aspiration and ability to clear the aspirated materials and his or her response to protective and therapeutic maneuvers should be assessed wherever possible.”** (ACR, 2017)

Evidence to consider for **ASPIRATION**:

SLP RESOURCES

Jo, H., Park, J. G., Min, D., Park, H. won, Kang, E. K., Lee, K. J., & Baek, S. (2016). Incidence of Pneumonia After Videofluoroscopic Swallowing Study and Associated Factors. *Dysphagia*, *31*(1), 41–48. https://doi.org/10.1007/s00455-015-9656-8

Hazelwood, R. J., Armeson, K. E., Hill, E. G., Bonilha, H. S., & Martin-Harris, B. (2017). Identification of Swallowing Tasks From a Modified Barium Swallow Study That Optimize the Detection of Physiological Impairment. *Journal of speech, language, and hearing research : JSLHR*, *60*(7), 1855–1863. https://doi.org/10.1044/2017_JSLHR-S-16-0117

Miles, A., McFarlane, M., Scott, S., Hunting, A. (2018). Cough response to aspiration in thin and thick fluids during FEES in hospitalized inpatients. International journal of language and communication disorders. 53(5): 909-918. doi: 10.1111/1460-6984.12401

RADIOLOGY/MED RESOURCES

Santos, C.F. & Steen, B. (2014). Aspiration of Barium Contrast. *Case reports in pulmonology.* https://doi.org/10.1155/2014/215832

Albeldawi, M & Makkar, R. (2012). Barium aspiration. New England Journal of Medicine. http://www.nejm.org/doi/full/10.1056/NEJMicm1108468#t=article

Hundemer, GL, Kumar, V., Vaduganathan, M. (2015) Large-Volume Barium Aspiration. *Baylor University Medical Center Proceedings* **28**:2, 183-184.

Sun, J., & Li, Z. (2018). Study on the Correlation between Barium Radiography and Pulmonary Infection rate in the Evaluation of Swallowing Function. *Clinics (Sao Paulo, Brazil)*, *73*, e182. https://doi.org/10.6061/clinics/2018/e182

Ueha, R., Nativ-Zeltzer, N., Sato, T., Goto, T., Yamauchi, A., Belafsky, P. C., & Yamasoba, T. (2019). The effects of barium concentration levels on the pulmonary inflammatory response in a rat model of aspiration. *European Archives of Oto-Rhino-Laryngology*, *277*(1), 189–196. doi: 10.1007/s00405-019-05666-4

Case study (**aspiration** of barium)

"Barium is an inert material that can cause anywhere from an asymptomatic mechanical obstruction to serious symptoms of respiratory distress that can result in patient death."
-*Case Reports in Pulmonology.*

2014 report in ***Case Reports in Pulmonology:*** 79yo with incidental finding of barium in the lungs. Barium was aspirated several months prior during an MBS.

Aspirated barium that is not removed by pulmonary clearance can remain in the lungs permanently, thus affecting future x-ray results.

He presented with no symptoms, remained healthy.

Case study

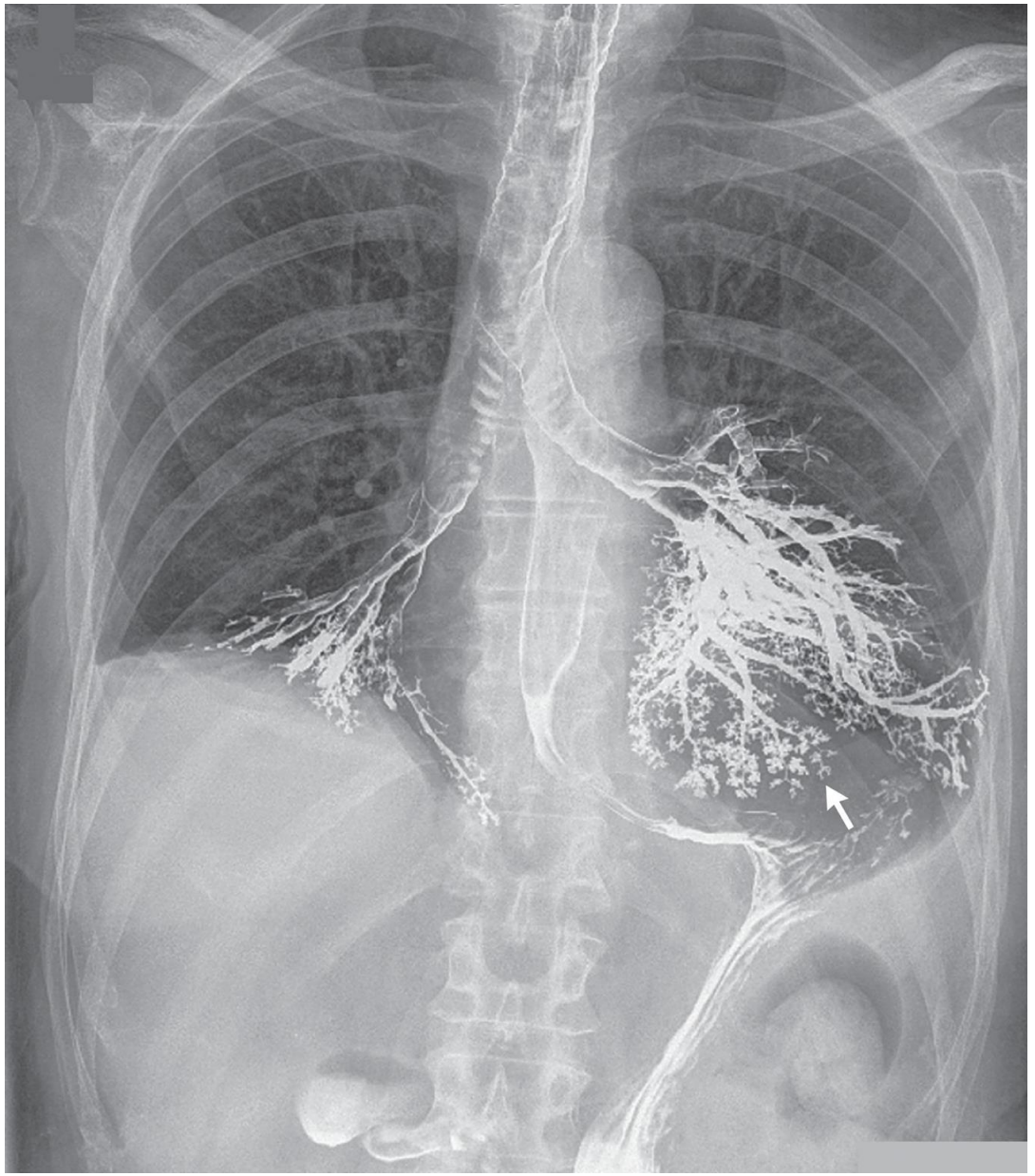
Barium Aspiration, *New England Journal of Medicine*, 2012

79yo male evaluated for unintentional weightloss and dysphagia.

Silently aspirated significant amount of barium during rapid sequence swallow task.

Barium was suctioned extensively.

Circulatory shock, cardiac arrest, anoxic brain injury, intubation, hospice and death.

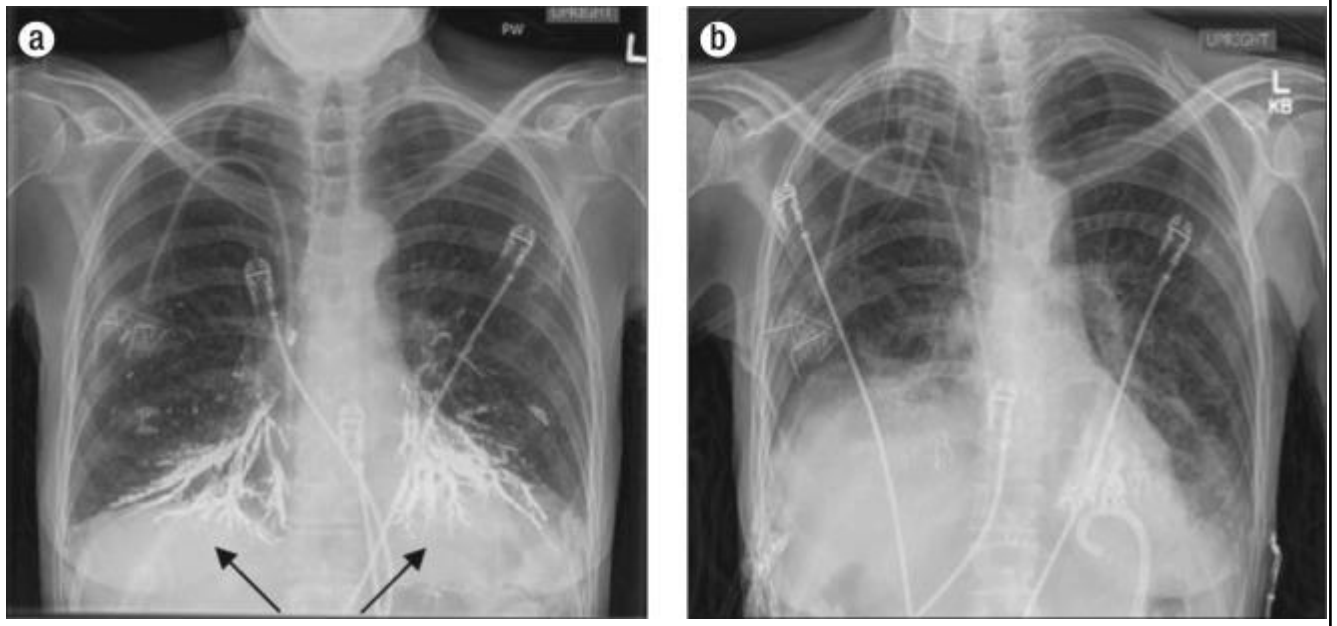


https://www.nejm.org/doi/full/10.1056/NEJMicm1108468

Case study

"56-year-old woman with stage IV tongue squamous cell carcinoma and longstanding dysphagia. The patient rapidly developed hypoxemic respiratory failure from the resultant chemical pneumonitis. However, her respiratory status improved with supportive care alone in 48 hours. Barium aspiration is rare and often produces dramatic radiographic findings, but is **generally associated with a favorable prognosis**.

Barium studies are commonly used in the interrogation of the upper gastrointestinal tract. Although barium sulfate is an inert material, it rarely can cause severe complications"



Immediately after aspiration

48 hours after with supportive intensive care

doi: 10.1080/08998280.2015.11929222

Gregory L. Hundemer, Varun Kumar, Muthiah Vaduganathan. (2015) Large-Volume Barium Aspiration. *Baylor University Medical Center Proceedings* **28**:2, 183-184.

ASHA practice guidelines on **AP VIEW**

"At minimum, a VFSS includes the following protocols:

...Obtaining lateral **and** anterior–posterior views of oral cavity, pharynx, and upper esophagus, as needed, for each of the bolus types"

ACR practice guidelines on **AP VIEW**

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"The examination should include evaluation of oral and pharyngeal function and morphology in the lateral projection. **Evaluation in the frontal projection may be useful to further evaluate an abnormality identified on the lateral projection."**

Evidence to consider for **AP view**:

SLP RESOURCES

Jones, B. & Donner, M.W. Dysphagia (1989). Examination of the patient with dysphagia. *Dysphagia, 4*(3), 162-172. doi:10.1007/BF02408041

Martin-Harris B, Brodsky MB, Michel Y, Castell DO, Schleicher M, Sandidge J, Maxwell R, Blair J. (2008). MBS measurement tool for swallow impairment–MBSImp: establishing a standard. Dysphagia 23, 392–405. (10.1007/s00455-008-9185-9)

Martin-Harris, B., & Jones, B. (2008). The videofluorographic swallowing study. *Physical medicine and rehabilitation clinics of North America*, *19*(4), 769–viii. doi:10.1016/j.pmr.2008.06.004

RADIOLOGY RESOURCES

Carucci, L. R., & Turner, M. A. (2015). Dysphagia revisited: common and unusual causes. *RadioGraphics*, *35*(1), 105–122. doi: 10.1148/rg.351130150

Fynes, M. M., Smith, C., & Brodsky, M. B. (2019). Contrast imaging applications in the modified barium swallow study: when, how, and why? *Applied Radiology, 48(*5), 3-8.

Martin-Harris, B., & Jones, B. (2008). The videofluorographic swallowing study. *Physical medicine and rehabilitation clinics of North America*, *19*(4), 769–viii. doi:10.1016/j.pmr.2008.06.004

ASHA's Practice Guidelines for **ESOPHAGEAL SWEEP**

2017 revision:

"**Dysphagia** is defined as problems involving the oral cavity, pharynx, **esophagus, or gastroesophageal junction**." (ASHA, 2017)

"SLPs also recognize causes and signs/symptoms of esophageal dysphagia and make appropriate referrals for its diagnosis and management." (ASHA, 2017)

ACR practice guidelines on **ESOPHGEAL SWEEP**

"**A complete patient evaluation** may also include spot images of the pharynx for structural assessment ***and an esophagram***, as symptoms of dysphagia are often poorly localized.

This practice parameter focuses on assessment of the pharynx. ***For evaluation of the esophagus, see the ACR Practice Parameter for the Performance of Esophagrams and Upper Gastrointestinal Examinations in Adults.***" (ACR, 2017)

Evidence to consider for **ESOPHAGEAL SWEEP**

SLP	RADIOLOGY/MEDICINE
Watts, S., Gaziano, J., Jacobs, J., & Richter, J. (2019). Improving the Diagnostic Capability of the Modified Barium Swallow Study Through Standardization of an Esophageal Sweep Protocol. *Dysphagia*, 34(1), 34–42. https://doi.org/10.1007/s00455-018-09966-5 Jones, B. & Donner, M.W. Dysphagia (1989). Examination of the patient with dysphagia. *Dysphagia, 4*(3), 162-172. doi:10.1007/BF02408041	Gates, J., Hartnell, G. G., & Gramigna, G. D. (2006). Videofluoroscopy and swallowing studies for neurologic disease: A primer. *Radiographics*, *26*(1), 22. https://doi.org/10.1148/rg.e22 Allen JE, White C, Leonard R, Belafsky PC. Comparison of esophageal screen findings on videofluoroscopy with full esophagram results. *Head and Neck*. 2012;34(2):264–269)

Radiology & SLP resources (**esoph. sweep**)

Radiographics:

Swallowing is clinically described "as involving three anatomically and temporally distinct phases: oral, pharyngeal, **and** esophageal. In reality, these phases are often **interrelated**." (Gates, 2006, p.22)

Dysphagia:

Referred sensation- 30% of patients had previously undiagnosed GERD, and 50% of those patients only reported pharyngeal symptoms: "in many cases, previous evaluations had failed to yield the correct diagnosis because the examinations had been focused on the head and neck and had not included evaluation of the esophagus" (Jones, 1989, p. 319)

Identified esophageal disease via esophageal sweep in 26% of its participants, including anatomic abnormality (69%), dysmotility (17%), and combined abnormality (14%): "an expanded MBS study may lead to early identification of esophageal disorders, encourage multidisciplinary patient care, and improve patient health outcomes" (Watts, 2019, p.34)

Head and Neck:

In this study, screening of the esophagus had identified up to 63% of the participating patients with esophageal disease as formally diagnosed on esophagram: "...esophageal screening is a simple tool that may guide further esophageal investigation." (Allen, 2012, p.264).

ASHA's Practice Guidelines-
RADIATION EXPOSURE

- Acceptable radiation exposure levels are **set by the radiology department and controlled by the radiologist.**

- The SLP and radiologist work together to ensure that the observations are completed within the dosage limits for the patient; dosage amount is **As Low as Reasonably Achievable** (ALARA) as recommended by the International Commission on Radiological Protection (ICRP) **without affecting the accuracy of the swallowing assessment** (ASHA, 2004a). **Frame rates should also be discussed**. Consider the patient's cumulative need for radiological procedures given his or her diagnosis, and proceed as clinically reasonable.

- Decreased fluoroscopic pulse rate reduces radiation exposure **but** may also influence clinician judgments and findings during the assessment (Bonilha et al., 2013a).

Significant swallowing deficits or decreased clinician experience may lead to an increase in fluoroscopy times (Bonilha et al., 2013b).

Federal regulations mandate that all fluoroscopic equipment contain a timer that has a **maximum of 5 minutes** (U.S. Food and Drug Administration, n.d.). Although the timer may sound during a VFSS, it is ***not* an indication that the VFSS must stop**. It is only a reminder to the clinician(s) that 5 minutes of radiation have elapsed. The clinician takes care to reduce radiation beyond this time point, and additional swallow attempts beyond this point are well-justified, allowing for additional information for recommendations.

ACR practice guidelines
RADIATION EXPOSURE

“The examination should be performed with a pulsed fluoroscopy unit using a frame rate sufficient for diagnostic quality and in keeping with the principles of ALARA.”

“...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 t**he diagnostic image quality necessary to achieve the clinical objective**”

Evidence to consider for

RADIATION EXPOSURE

SLP RESOURCES

Bonilha, H. S., Huda, W., Wilmskoetter, J., Martin-Harris, B., & Tipnis, S. V. (2019). Radiation risks to adult patients undergoing modified barium swallow studies. *Dysphagia*, 34(6): 922-929.

Bonilha H. S., Blair J., Carnes B., Huda W., Humphries K., McGrattan K., … Martin-Harris B. (2013). Preliminary investigation of the effect of pulse rate on judgments of swallowing impairment and treatment recommendations. *Dysphagia*, 28, 528–538. https://doi.org/10.1007/s00455-013-9463-z

Bonilha, H. S. , Humphries, K. , Blair, J. , Hill, E. G. , McGrattan, K. , Carnes, B. N. , … Martin-Harris, B. (2013). Radiation exposure time during MBSS: Influence of swallowing impairment severity, medical diagnosis, clinician experience, and standardized protocol use. *Dysphagia*, 28(1), 77–85.

RADIOLOGY RESOURCES

Cohen, M.D. (2009). Can we use pulsed fluoroscopy to decrease the radiation dose during video fluoroscopic feeding studies in children? *Clinical Radiology*, 64(1), 70-73.

Fynes, N.M., Smith, C., & Brodsky, M.B. (2019). The modified barium swallow study: when, how, and why? *Applied Radiology*, 48 supplement(5)

SLP resources (**radiation exposure**)

Dysphagia

Radiation exposure at 30fps was an average of 0.27mSv per exam, which is similar to the radiation exposure associated with living **32 days** on earth. (Bonilha, 2019)

Using the MBSImP protocol → average of < 3 minutes. (Bonilha, Humphries, Blair, et al, 2013)

"The cancer risk from an adult undergoing a VFSS is so low that it is not reasonable to alter the exam in a manner that may reduce diagnostic accuracy in order to reduce radiation exposure. This data paired with our findings that decreasing the pulse rate from 30 to 15fps **reduced diagnostic accuracy in 37%** of swallows and **changed treatment strategies in 47%** of those patients further indicates that pulse rates of 15pps or below should not be used for adult VFSSs." Dr. Heather Bonilha, SIG 13….. Referencing the article below:

Bonilha, H.S., Blair, J., Carnes, B., Huda, W., McGrattan, K., Humphries, K., Michaels, Y., Martin-Harris, B. (2013). Preliminary investigation of the effect of pulse rate on judgments of swallowing impairment and treatment recommendations. *Dysphagia*, 28(4): 528-538.

Rad resources (**radiation exposure**)

Applied Radiology

"In terms of temporal resolution, 30 frames per second, which is the standard continuous fluoroscopic image rate, is required during the swallow study to allow for the freeze-frame and slow-motion video viewing essential to understanding swallowing physiology" (Fynes, Smith, & Brodsky, 2019).

Clinical Radiology

"Decreasing the fluoroscopic pulse rate cannot be used as a method of decreasing radiation dose during performance of video fluoroscopic studies because it will potentially result in non-detection of episodes of supraglottic penetration of liquid barium." (Cohen, 2009, pp. 70)