Fiberoptic Endoscopic Evaluation of Swallowing (FEES) for Patients with Neurogenic Dysphagia

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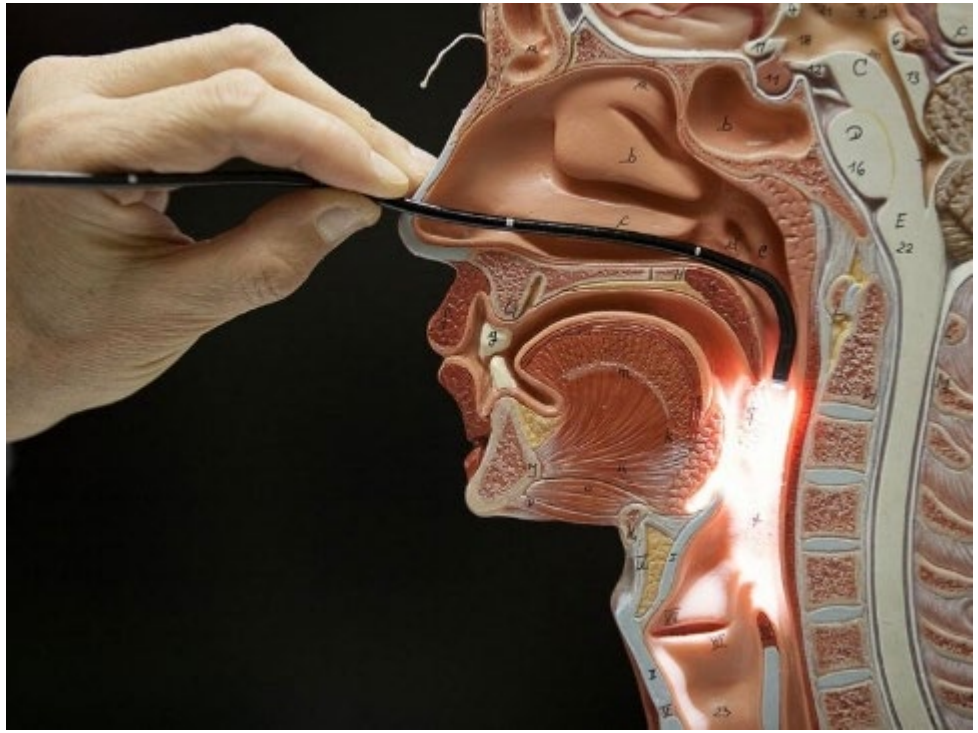
Disclosures

- Lauren Duhon and Hannah Jumonville are employees of Ochsner Therapy & Wellness. We have no financial gains to disclose.

Agenda

- What is neurogenic dysphagia?
- The Clinical Swallow Assessment
- What is FEES?
- Different diagnoses with typical physiologic impairments seen on instrumental swallow evaluation
- MBSS and FEES comparison
- Severity scales used in instrumental swallow evaluations
- Making diet recommendations and pillars of aspiration-related PNA
- Demonstration



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Neurogenic Dysphagia

Neurogenic dysphagia represents a large burden for patients, health care professionals and society.

Swallowing involves the complex coordination of over 25 pairs of muscles/nerves, central control in the brainstem and cortex as well as pharyngeal sensation.

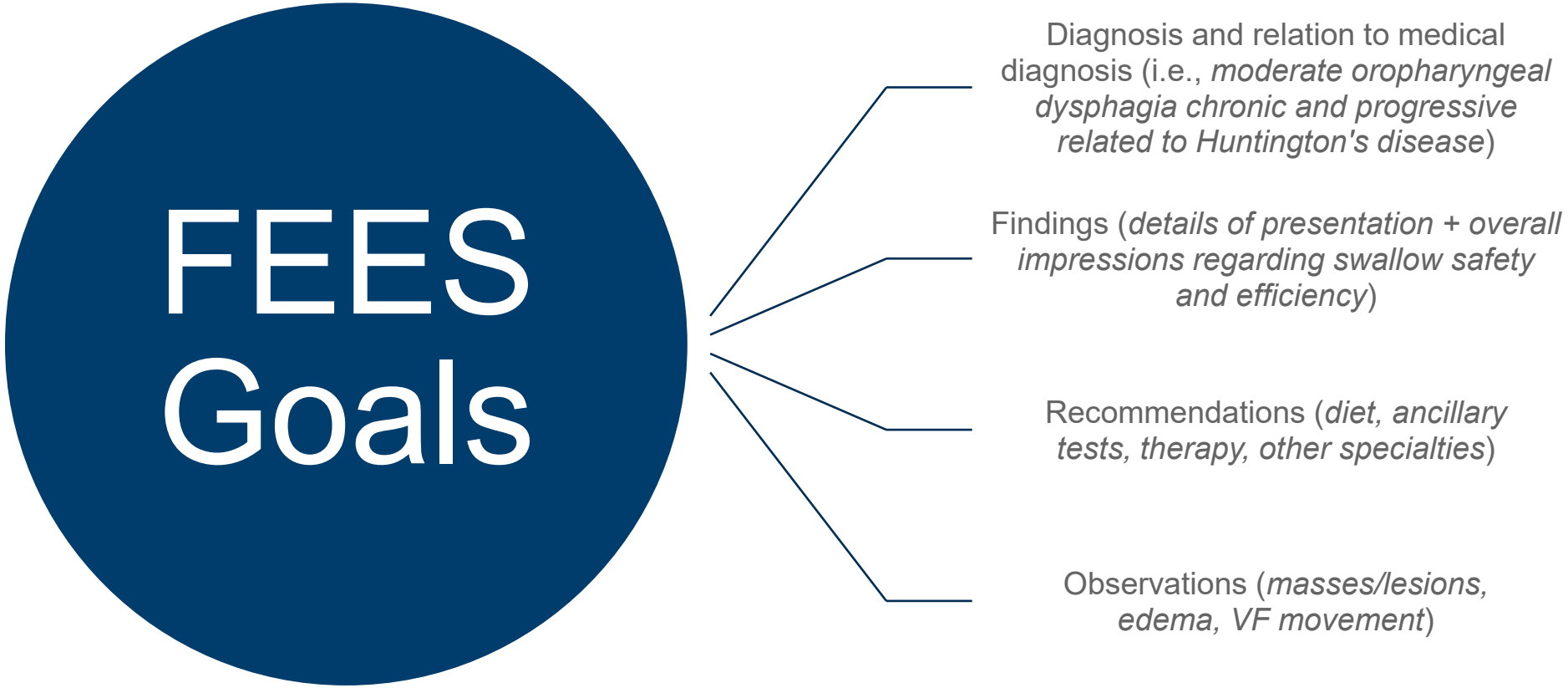
Various pathophysiologic mechanisms impaired secondary to neurogenic conditions may result in dysphagia due to anatomical and/or functional impairments.

Clinical Swallow Evaluation

Image courtesy of hfsc.org

FEES

- Fiberoptic Endoscopic Evaluation of Swallowing involves passing a nasoendoscope through the patient's nare into their nasal cavity to nasopharynx and oropharynx/hypopharynx. Various consistencies/textures are presented to evaluate primarily the safety of swallow and pharyngeal efficiency of swallow and ultimately, the patient's ability to meet nutrition/hydration needs.



Different Diagnoses + What is Seen on Imaging +Typical Physiologic Impairments of each Diagnosis

CVA: Brainstem
- Cricopharyngeal spasm
- Pharyngo/laryngeal movement disorder

Parkinson's Disease
- Vallecular residue
- Premature spillage

Myositis
- Pharyngeal residue
- Premature bolus spillage

ALS
- Pharyngeal residue (PS and valleculae)
- Premature bolus spillage
- Reduced pharyngeal contraction and bolus clearance

CVA: Supratentorial
- Premature bolus spillage (poor bolus control/oral phase impairment)
- Pharyngeal residue

Myasthenia Gravis
- Vallecular residue
- Premature bolus spillage
- Prolonged oral transit
- Poor secretion management
- Fatigable swallow weakness

MBSS

Image courtesy of dysphagiacafe.com

FEES

Use of dual tests (MBSS and FEES)

Both MBSS and FEES are considered the "gold standard" of dysphagia instrumental swallow evaluation.

In some cases, to fully assess the complexity of a patient's dysphagia, both MBSS and FEES may be beneficial.

I.e., A patient with a known history of cortical CVA complains of "food getting stuck" during the swallow as well as unintentional weight loss and coughing. A FEES is completed revealing silent aspiration of thin liquids (IDDSI 0) during the swallow with moderate safety impairment but no efficiency impairment. Findings are insufficient to explain patient's symptoms and an MBSS is ordered. MBSS is completed revealing severe retention of bolus at distal esophagus with significantly delayed esophageal emptying. Patient would benefit from ST to address swallow safety impairment, but also needs further medical workup with GI.

Advantages and Disadvantages of MBSS

MBSS assesses oral, pharyngeal and cervical esophageal phases of swallow

MBSS must be performed with radiology either in hospital fluoroscopy suite or in mobile MBSS van

MBSS can be limiting for patients who cannot leave room/home due to positioning or acuity of condition

Indicators for MBSS:

- Oral dysphagia/bolus control or manipulation issues
- Suspicion of aspiration
- Reported globus sensation/food sticking in throat
- Suspected esophageal dysphagia

Limitations:

- Fluoroscopy is turned off between swallows, so information may be missed when turned off
- Cannot view laryngeal surface of anatomy
- Food must be mixed with barium which may change viscosity

Extra benefits:

- Screening of esophageal phase of swallow down to LES if desired

Advantages and Disadvantages of FEES

FEES assesses pharyngeal phase of swallow before, during and after swallow from superior view.

- Can infer information about oral and esophageal phases

Can be performed in any location: OP, inpatient, hospital bed, chair, home, nursing home, etc., since equipment is portable.

May not be appropriate for patients with anatomical changes to nasal cavity/nasopharyx post-operatively, or patients with dementia or who are comatose

Indicators for FEES:

- Suspicion of aspiration
- Patients needing upgrade/downgrade of diet
- Patients with laryngeal/pharyngeal cancers, paralyzed VFs
- Patients requiring multiple swallow studies
- Secretion management

Limitations:

- Some patients have difficulty tolerating nasoendoscope
- "White out" during swallow, may miss penetration or aspiration during the swallow
- Assumption about oral/esophageal impairments

Extra Benefits:

- Assess velopharyngeal functioning/nasal cavity/nasopharynx anatomy and physiology as well as laryngeal and pharyngeal anatomy/physiology
- Assess unilateral deficits and fatigue over course of study (no time limitations)
- FEES can be used a biofeedback tool for voice/swallowing therapy
- Can use "real" food and liquids

Anatomical Visualization of FEES

- Nasal cavity
- Velopharyngeal juncture
- Uvula
- Base of tongue

- Trachea
- Larynx
- Pyriform Sinus
- True Vocal Cords
- False Vocal Cords

- Aryepiglottic Folds
- Inter-arytenoid space
- Arytenoid cartilage
- Epiglottis
- Posterior pharyngeal wall
- Lateral pharyngeal walls

Medical Issues and Nasal Endoscopy

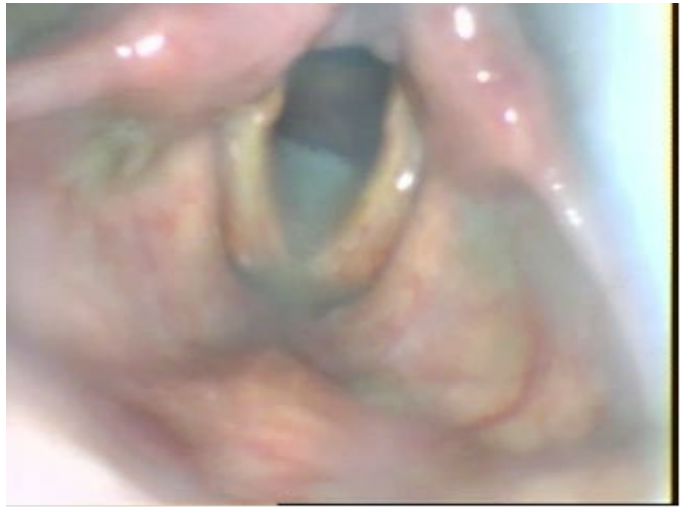
- Epistaxis
- Laryngospasm
- Vasovagal response
- Gagging
- Vomiting
- Hypersensitivity

Penetration / Aspiration Scale (PAS)

Penetration-Aspiration Scale	
PA Scale Score	**Description**
1	No contrast enters the airway.
2	Contrast enters the airway, remains **above** the vocal folds, and **is ejected** from the airway (not seen in the airway at the end of the swallow).
3	Contrast enters the airway, remains **above** the vocal folds, and **is not ejected** from the airway (is seen in airway after the swallow).
4	Contrast enters the airway, **contacts the vocal folds**, and **is ejected** from the airway.
5	Contrast enters the airway, **contacts the vocal folds**, and **is not ejected** from the airway.
6	Contrast enters the airway, **crosses the plane of the vocal folds**, and **is ejected** from the airway.
7	Contrast enters the airway, **crosses the plane of the vocal folds**, and **is not ejected** from the airway despite effort.
8	Contrast enters the airway, **crosses the plane of the vocal folds**, **is not ejected** from the airway and there is **no response** to aspiration.

Penetration (PAS 2-5)

Aspiration (PAS 6-8)

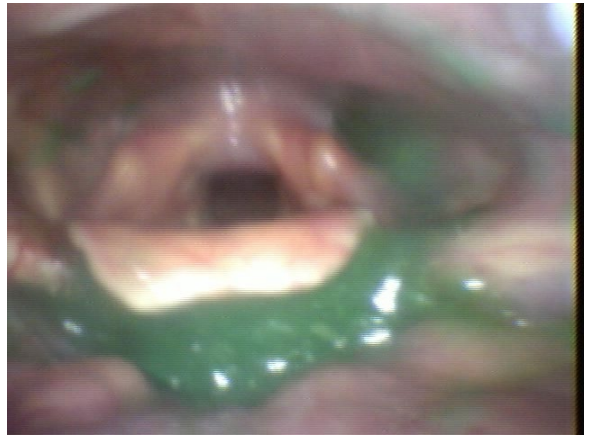


Neubauer PD, Rademaker AW, Leder SB. The Yale Pharyngeal Residue Severity Rating Scale: An Anatomically Defined and Image-Based Tool. Dysphagia. 2015 Oct;30(5):521-8. doi: 10.1007/s00455-015-9631-4. Epub 2015 Jun 7. PMID: 26050238.

Vallecular Residue

- Weakness in posterior movement of the tongue base or pharyngeal constrictors result in vallecular residue on the weak side(s)
- Yale Pharyngeal Residue Scale
  1. None: No Residue
  2. Trace: Trace coating of mucosa
  3. Mild: Epiglottic Ligament Visible
  4. Moderate: Epiglottic Ligament Covered
  5. Severe: Filled to Epiglottic Rim



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Pyriform Sinus Residue

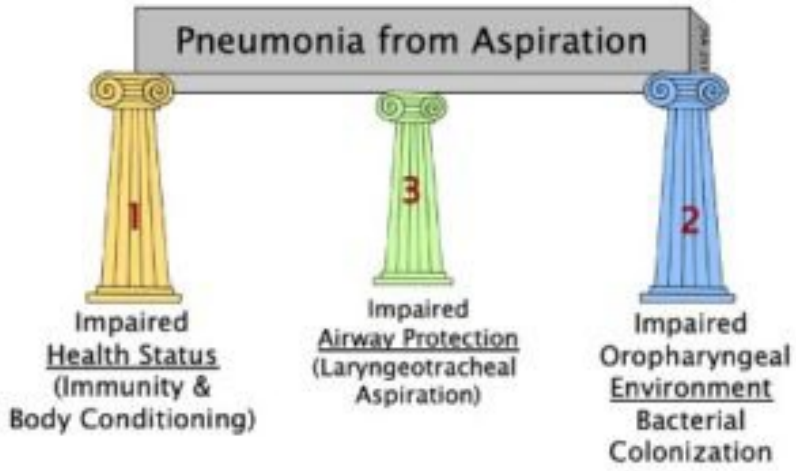
- Weakness of pharyngeal constrictors results in residue on the weak side of the pyriform sinuses

- Yale Pharyngeal Residue Scale
  1. None: No Residue
  2. Trace: Trace coating of mucosa
  3. Mild: Up to ¼ full
  4. Moderate: Up to ½ full
  5. Severe : Filled to Aryepiglottic Fold

Post Swallow: Reflux

- Bolus backflow from the esophagus can be viewed entering the laryngopharynx
- Reflux will often appear bubbly/frothy
- It is important to view the patient's response to refluxed material, as it approaches the airway
- Reflux that does not clear can result in penetration and/or aspiration

Pillars of Aspiration-Related Pneumonia



Three pillars of aspiration-related pneumonia include the importance of considering ALL three factors along with the individual patient's wishes prior to making a diet recommendation. The presence of aspiration alone visualized on swallow imaging does not equal pneumonia.

For example:

- A patient with advanced ALS who no longer has UE movement and therefore ***reliance on others for oral care, confirmed severely-impaired swallow safety and efficiency on FEES,*** and ***worsening overall health status with poor mobility,*** is at a high risk of developing aspiration-related PNA and alternate nutrition/hydration would be recommended.

- A patient with newly-diagnosed Parkinson's disease with mild balance impairment who uses a cane to ambulate has confirmed ***inconsistent, trace, audible aspiration of thin liquids on FEES with strong and productive cough to clear airway,*** otherwise ***adequate health and immune status***, and intact cognitive status with ***independent completion of ADLs including oral care,*** is at a low risk of developing aspiration-related PNA and dysphagia therapy with no diet restrictions would be recommended.

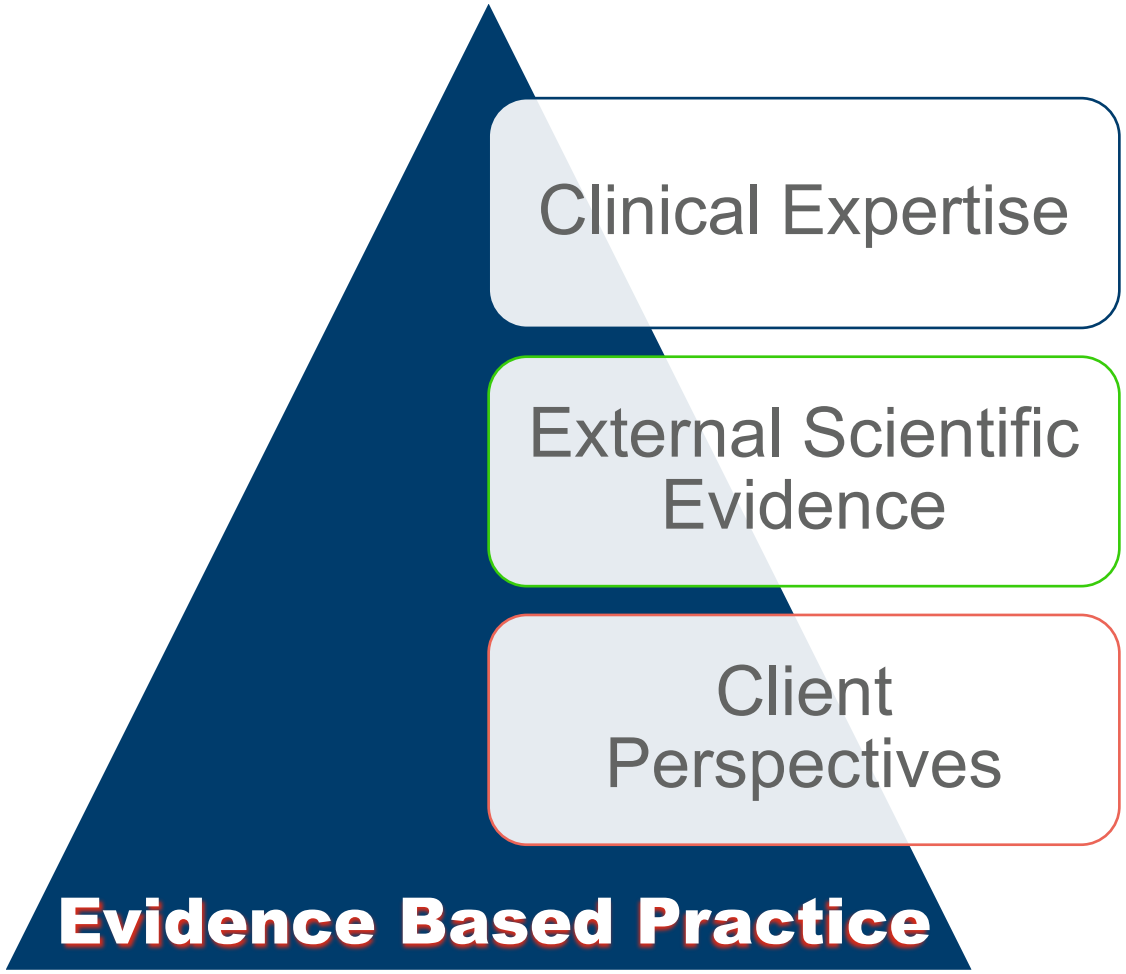
Ashford, J. R. (2005, March). Pneumonia: Factors Beyond Aspiration. *Perspectives in Swallowing and Swallowing Disorders (Dysphagia), 14, 10-16.*

Pillars of Aspiration-Related Pneumonia

Pneumonia "Risk" Predictor

Scenario	Immune System Status	+	Oral Health Status	+	Laryngeal Valve Integrity	=	Predicted Outcome
1	Normal	+	Healthy	+	No Aspiration	=	No Pneumonia
2	Normal	+	Healthy	+	Aspiration	=	No Pneumonia
3	Normal	+	Unhealthy	+	No Aspiration	=	No Pneumonia
4	Normal	+	Unhealthy	+	Aspiration	=	No Pneumonia
5	Compromised	+	Healthy	+	No Aspiration	=	No Pneumonia
6	Compromised	+	Unhealthy	+	No Aspiration	=	No Pneumonia
7	Compromised	+	Unhealthy	+	Aspiration	=	Pneumonia

Evidenced Based Practice



The ATMOS Scope

Handling - Made easy

- **ALL-IN-ONE-HANDLE** Integrated LED light source Camera electronics Mechanism for controlling the angle of deflection
- **ERGONOMICS** Comfortable posture owing to a functional design
- **THE EASIEST OPERATION** Triggering the image and video recording using the all-in-one handle
- **VISUALISATION** Best picture quality from a CMOS chip-on-tip technology Uniform illumination thanks to the integrated LED System

Demonstration

Thank you

Questions?

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Appendix and References

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References

- Tobias Warnecke, Bendix Labeit, Jens Schroeder, Alexander Reckels, Sigrid Ahring, Sriramya Lapa, Inga Claus, Paul Muhle, Sonja Suntrup-Krueger, Rainer Dziewas; Neurology Feb 2021, 96 (6) e876-e889; DOI: 10.1212/WNL.0000000000011350
- References:
- Ashford, J.A. (2021). *FEES 2021: Instrumental Dysphagia Assessment.* Basic FEES training course manual. Nashville, TN: Author
- Langmore, S. (2001). *Endoscopic Evaluation and Treatment of Swallowing Disorders.* New York: Thieme.
- Aviv, J.E., Kaplan, S.T., Thomson, J.E., Spitzer, J., Diamond. B., & Close, L.G. (2000). The safety of flexible endoscopic evaluation of swallowing with sensory testing (feesst): An analysis of 500 consecutive evaluations. *Dysphagia, 15,* 39–44.
- Kelly, A.M., Drinnan, M.J., & Leslie, P. (2007). Assessing penetration and aspiration: How do videofluoroscopy and fiberoptic endoscopy evaluation of swallowing compare? *Laryngoscope, 117,* 1723-1727.
- Brady, S. & Donzelli, J. (2013). The modified barium swallow and the functional endoscopic evaluation of swallowing. *Otolaryngology Clinics of North America, 46,* 1009-1022.
- Pisegna, J.M. & Langmore, S.E. (2016). Parameters of instrumental swallowing evaluations: Describing a diagnostic dilemma. *Dysphagia,* DOI 10.1007//s004455-016-9700-3, March, 17, 2016..
- Ashford, J. R. (2005, March). Pneumonia: Factors Beyond Aspiration. Perspectives in Swallowing and Swallowing Disorders (Dysphagia), 14, 10-16.
- Ashford, J. R. & Skelley, M. L. (2008, March). Oral Care and the Elderly. Perspectives in Swallowing and Swallowing Disorders (Dysphagia), 17, 19-26.
- Ashford, J. R. (2012, March). Oral Care Across Ages: A Review. Perspectives in Swallowing and Swallowing Disorders (Dysphagia), 21, 3-8.
- Mills, R. H. & Ashford, J. R. (2008, December). A Methodology for the Inclusion of Laboratory Assessment in the Evaluation of Dysphagia. Perspectives in Swallowing and Swallowing Disorders (Dysphagia), 17, 128-134.
- Ashford, J.A. (2021). FEES 2021: Instrumental Dysphagia Assessment. Basic FEES training course manual. Nashville, TN: Author

Dysphagia Outcome and Severity Scale (DOSS)

Table 1. Dysphagia outcome and severity scale—final revision

Full per-oral nutrition (P.O): Normal diet

Level 7: Normal in all situations
- Normal diet
- No strategies or extra time needed

Level 6: Within functional limits/modified independence
- Normal diet, functional swallow
- Patient may have mild oral or pharyngeal delay, retention or trace epiglottal undercoating but independently and spontaneously compensates/clears
- May need extra time for meal
- Have no aspiration or penetration across consistencies

Full P.O: Modified diet and/or independence

Level 5: Mild dysphagia: Distant supervision, may need one diet consistency restricted
- May exhibit one or more of the following
  - Aspiration of thin liquids only but with strong reflexive cough to clear completely
  - Airway penetration midway to cords with one or more consistency or to cords with one consistency but clears spontaneously
  - Retention in pharynx that is cleared spontaneously
  - Mild oral dysphagia with reduced mastication and/or oral retention that is cleared spontaneously

Level 4: Mild–moderate dysphagia: Intermittent supervision/cueing, one or two consistencies restricted
- May exhibit one or more of the following
  - Retention in pharynx cleared with cue
  - Retention in the oral cavity that is cleared with cue
  - Aspiration with one consistency, with weak or no reflexive cough
    - Or airway penetration to the level of the vocal cords with cough with two consistencies
    - Or airway penetration to the level of the vocal cords without cought with one consistency

Level 3: Moderate dysphagia: Total assist, supervision, or strategies, two or more diet consistencies restricted
- May exhibit one or more of the following
  - Moderate retention in pharynx, cleared with cue
  - Moderate retention in oral cavity, cleared with cue
  - Airway penetration to the level of the vocal cords without cough with two or more consistencies
    - Or aspiration with two consistencies, with weak or no reflexive cough
    - Or aspiration with one consistency, no cough and airway penetration to cords with one, no cough

Nonoral nutrition necessary

Level 2: Moderately severe dysphagia: Maximum assistance or use of strategies with partial P.O. only (tolerates at least one consistency safely with total use of strategies)
- May exhibit one or more of the following
  - Severe retention in pharynx, unable to clear or needs multiple cues
  - Severe oral stage bolus loss or retention, unable to clear or needs multiple cues
  - Aspiration with two or more consistencies, no reflexive cough, weak volitional cough
    - Or aspiration with one or more consistency, no cough and airway penetration to cords with one or more consistency, no cough

Level 1: Severe dysphagia: NPO: Unable to tolerate any P.O. safely
- May exhibit one or more of the following
  - Severe retention in pharynx, unable to clear
  - Severe oral stage bolus loss or retention, unable to clear
  - Silent aspiration with two or more consistencies, nonfunctional volitional cough
  - Or unable to achieve swallow

Diagnosis Classification	Observations
Normal	**Normal swallow peristalsis & airway protection (YRS 1; APS 1)**
Functionally Normal	**Swallow Peristalsis – Efficient** - Mild oral &/or pharyngeal delay - (YRS 2) – trace residue scattered in valleculae &/or lateral channels **Airway Protection – Normal** - (APS 2H) – **High Penetration** on 1 trial; larynx close/open action during swallow clears all material - (APS 2D) – **Deep Penetration** on 1 trial; larynx close/open action during swallow clears all material
Mild or Presbyphagia (65+)	**Swallow Peristalsis – Inefficient** - Inefficient mastication/oral retention-cleared with reflex swallow - (YRS 3) – Residue (5-25%) in 1 valleculae &/or lateral channel after initial swallow; cleared with 1 cleansing swallow **Airway Protection – Inefficiency to Safe** - (APS 2H) – **High Penetration** on 2 trials; larynx close/open action during swallow clears all material - (APS 2D) – **Deep Penetration** on 2 trials; reflex larynx close/open action during swallow clears all material - (APS 4T) – **Micro (trace) aspiration** on 1 trial with effective reflexive cough clearing the tracheal airway
Mild – Moderate	**Swallow Peristalsis – Inefficient** - Residue in oral cavity cleared with verbal cue - (YRS 3) – Residue (5-25%) in both valleculae &/or both lateral channels after initial swallow; cleared with 1 or 2 cleansing swallows **Airway Protection – Inefficient to Safe** - (APS 2H) – **High Penetration** on ≥3 trials; larynx close/open action during swallow clears all material - (APS 2D) – **Deep penetration** on ≥3 trials; larynx close/open during swallow &/or reflex throat clear/cough clears all material - (APS 3H) – **High Penetration** on 1 trial; larynx close/open during swallow &/or reflex throat clear/cough **does not** completely clear material - (APS 3D) – **Deep penetration** on 1 trial; reflex larynx close/open action during swallow &/or reflex throat clear/cough **does not** completely clear material - (APS 4T) – **Micro-aspiration** on 2 trials with effective reflexive cough clearing the tracheal airway - (APS 4S) – **Macro-aspiration** on 1 trial with effective reflexive cough clearing the tracheal airway - (APS 5T) – **Micro or droplet aspiration** on 1 or 2 trails with weak, ineffective, or no reflexive cough clearing tracheal airway
Moderate	**Swallow Peristalsis – Very Inefficient** - Residue in oral cavity partially cleared with repeated swallows; verbally cued - (YRS 4) – Residue (25 to 50%) in one/both valleculae &/or one/both lateral channels after initial swallow; partially cleared with one or more cleansing swallows **Airway Protection – Very Inefficient to Unsafe** - (APS 3H/3D) – **High or Deep Penetration** on 3 or fewer trials; reflex larynx close/open action during swallow &/or reflex throat clear/cough **does not** clear material - (APS 4T) – **Micro-aspiration** on 3 or more trials with effective reflex cough clearing tracheal airway - (APS 4S) – **Macro-aspiration** on 2 trials with effective reflex cough clearing the tracheal airway - (APS 5T) – **Macro-aspiration** on 3 or fewer trials with weak, ineffective, or no reflexive cough clearing tracheal airway
Moderate-Severe	**Swallow Peristalsis – Inefficient** - Residue in oral cavity, or loss of bolus & unable to clear or needs multiple cues - (YRS 4) – Residue (25 to 50%) in both valleculae, &/or both lateral channels, &/or post cricoid space after initial swallow; partially cleared with multiple cleansing swallows **Airway Protection – Unsafe** - (APS 3H/3D) – **High or Deep Penetration** on 4 or more trials; reflex larynx close/open action during swallow &/or reflex throat clear/cough **does not** clear material - (APS 4S) – **Macro-Aspiration** on 3 or more trials with effective reflex cough clearing the tracheal airway - (APS 5S) **Macro-aspiration** on 2 trials without effective reflex cough, or no reflex cough
Severe	**Swallow Peristalsis – Significantly Inefficient** - Unable to initiate &/or achieve complete swallow - Residue in oral cavity, or loss of bolus and unable to clear even with verbal cues - (YRS 5) – Residue (>50%) in both valleculae, both lateral channels, & post cricoid space after initial swallow; ineffective or no cleansing swallows **Airway Protection – Significantly Unsafe** - (APS 5S) – **Macro-Aspiration** on 3 or more trials without effective reflex cough, or no reflex cough clearing tracheal airway; or meets Protocol Bail-out Criteria