

## Penetration-Aspiration Scale

The Penetration-Aspiration Scale (PAS) was developed by Dr. Rosenbeck and colleagues in 1996. The PAS is a metric used for identifying the severity of penetration and aspiration events during an instrumental swallow assessment. It was designed to be used with Modified Barium Swallow Studies (MBSS) in clinical and research settings. It is also commonly used with Flexible Endoscopic Evaluation of Swallowing (FEES) in clinical and research settings.

The PAS is an 8-point scale which describes depth of penetration-aspiration and whether or not the material is expelled from the airway. In the first figure below you can see that a rating of 1 is no penetration or aspiration, ratings 2-5 are penetration, and ratings 6-8 are aspiration. Let's start with definitions for the **first** portion of the scale. Penetration is defined as passage of material into the larynx but not below the vocal folds. Aspiration is defined as passage of material below the level of the VFs. Material that is sitting on the vocal folds but has not passed the border of the VFs is still considered penetration. For a visual, please see the second figure below which identifies anatomical landmarks. Penetration is defined as passing beyond the outline of 4 (vestibule) and aspiration is defined as passing beyond the border of 5 (VFs), into 6 (sub-glottis).

The **second** portion of the scale addresses whether or not the material is ejected from the airway. If penetration occurs and all material is cleared from the laryngeal vestibule post-swallow, then a score of 2 or 4 is given. If penetration occurs and there is residue remaining within the laryngeal vestibule or on the VFs, then a score of 3 or 5 is given. Typically, when penetration occurs a spontaneous clearing swallow would be expected, but not a cough response. This is not part of the scale necessarily, but something that we may comment on in our reports. Aspiration that is ejected out of the airway is scored as a 6 and aspiration that is not ejected is a 7 or 8.

The **third** piece to the scale addresses sensation of an aspiration event. If aspiration is observed and there is response, or effort to eject, then a score of 6 or 7 is given. If aspiration is observed and there is no response or spontaneous effort made to eject the material, then a score of 8 is given. A score of 8 is what is typically defined as silent aspiration.

The ratings of the scale are generally listed in order of severity. Aspiration is thought to be more severe than penetration. Material being ejected from the airway would be seen as less severe than residue remaining. No response to aspiration is judged to be the most severe. One limitation of the scale is that it does not include amount of penetrated or aspirated material. That is addressed in the DIGEST-FEES scale that we will review at a later time.

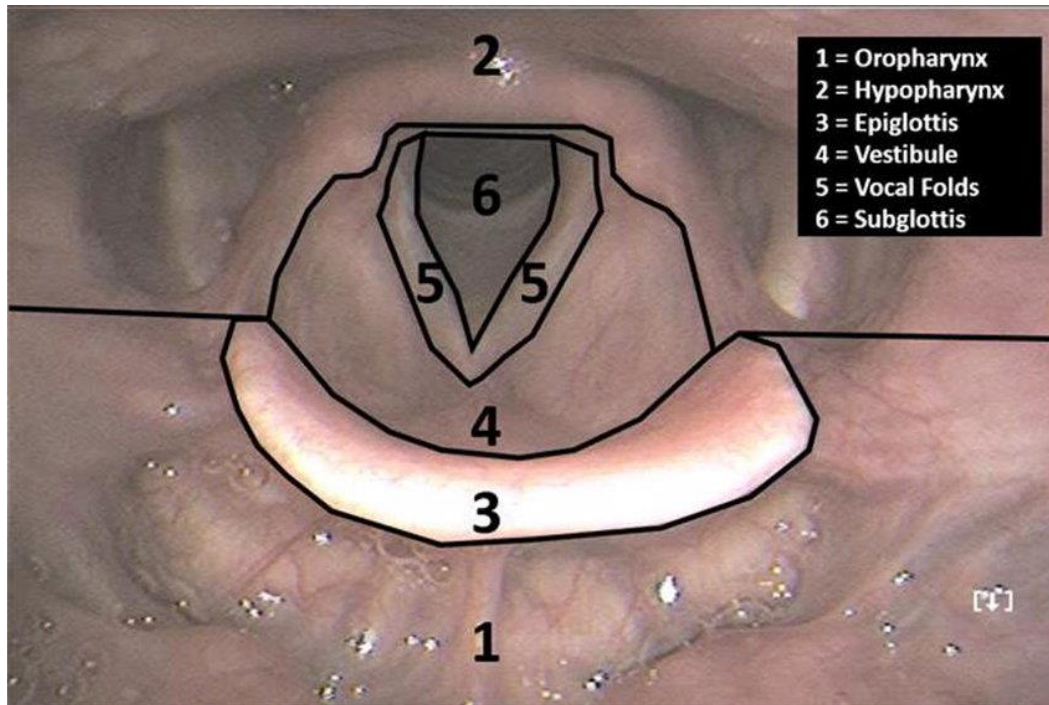
How do we use the PAS in our reports? You will see a table consisting of each consistency and delivery method tested along with a PAS rating and a residue rating. We generally provide the

worst or most consistent PAS score that occurred during the specific PO trials if more than one trial is given. We will also provide additional details in the notes section of the table that give information on variability of PAS scores and physiological impairments related to penetration-aspiration events.

How does this information help you clinically? You will have objective data on how often your patient is having events of airway invasion with specific consistencies and modalities of delivery. Assessment of airway invasion and ability to expel material will help you evaluate your patients' level of severity and risk. In addition, we will provide specific recommendations on how to improve safety and reduce events of airway invasion.

#### 8-Point Penetration-Aspiration Scale (PAS)

PAS	Description
1	No material enters the airway.
2	Material enters the airway, remains above the vocal folds, and is ejected from the airway.
3	Material enters the airway, remains above the vocal folds, and is not ejected from the airway.
4	Material enters the airway, contacts the vocal folds, and is ejected from the airway.
5	Material enters the airway, contacts the vocal folds, and is not ejected from the airway.
6	Material enters the airway, passes below the vocal folds, and is ejected into the larynx or out of the airway.
7	Material enters the airway, passes below the vocal folds, and is not ejected from the trachea despite effort.
8	Material enters the airway, passes below the vocal folds, and no effort is made to eject.



Resources:

Rosenbek JC, Robbins JA, Roecker EB, Coyle JL, Wood JL. A penetration-aspiration scale. *Dysphagia*. 1996 Spring;11(2):93-8. doi: 10.1007/BF00417897. PMID: 8721066.

Curtis JA, Seikaly ZN, Dakin AE, Troche MS. Detection of Aspiration, Penetration, and Pharyngeal Residue During Flexible Endoscopic Evaluation of Swallowing (FEES): Comparing the Effects of Color, Coating, and Opacity. *Dysphagia*. 2021 Apr;36(2):207-215. doi: 10.1007/s00455-020-10131-0. Epub 2020 May 11. PMID: 32394024.