The Yale Swallow Protocol: When, How, and Why Use It

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  - Salary from University of Kentucky
- **Nonfinancial**
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Learning Objectives

1. Distinguish how screening differs from evaluation
2. Examine the role of screening in the continuum of dysphagia evaluation
3. Analyze issues related to who, what, when, and how to screen
4. Examine how accuracy of a screening protocol is determined
5. List the steps of the Yale Swallow Protocol (YSP), including pass/fail criteria

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Chapter 1

Screening Versus Evaluation

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What Is Screening?

- “Swallowing screening is a pass/fail procedure to identify individuals who require a comprehensive assessment of swallowing function or a referral for other professional and/or medical services”[1]

1. American Speech-Language-Hearing Association, 2014

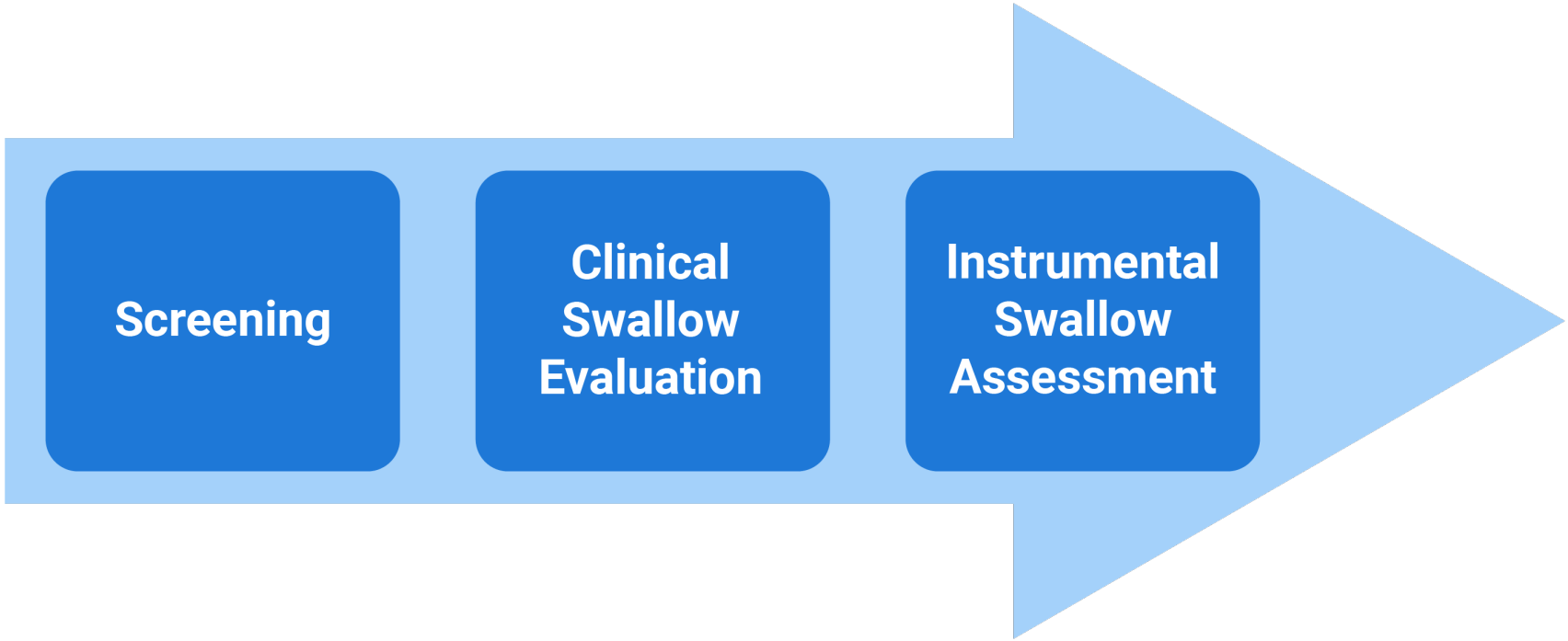
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Goals of Screening

1. Determine likelihood dysphagia is present
2. Determine need for formal assessment
3. Determine when it is safe to recommend resumption of an oral diet

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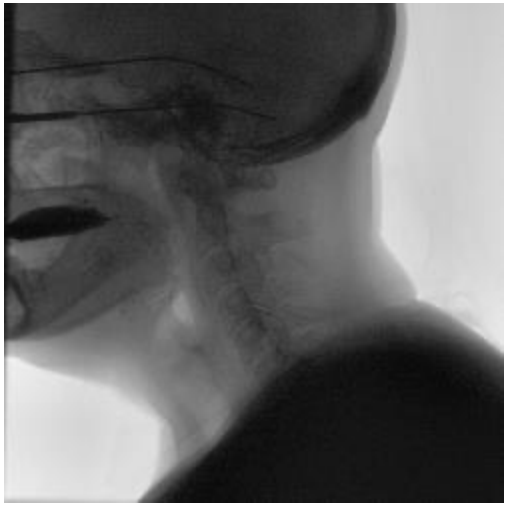
Continuum of Dysphagia Evaluation



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Diagnostic Tests vs. Screening

- **Diagnostic tests**
  - Used to confirm or rule out a condition
- **Screening**
  - Used to determine likelihood of a condition's being present





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Screens Should Be

- Quick
- Easy to administer
- Inexpensive

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Why Screen?

- Dysphagia is associated with a 40% increase in hospital length of stay[1]
- Overall cost to hospitals for caring for individuals with dysphagia is as much as $10 billion annually[2]
- Patients with dysphagia are approximately four times more likely to be readmitted within 30 days of discharge[3]

1. Altman et al., 2010
2. Altman, 2011
3. Chu & Pei, 1999

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Why Screen? (cont.)

- Instrumental assessment is considered the gold standard
- Why not do instrumental assessment with all patients?

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Why Screen? (cont.)

- Risk of pneumonia is 11 times higher for patients with severe dysphagia and aspiration
- Hospitals using a mandatory and formal dysphagia screening have lower pneumonia rates than those without[1,2]

1. Hinchey et al., 2005
2. Odderson et al., 1995

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Why Screen? (cont.)

- ASHA, AHA, and VHA all recommend screening patients who are suspected of having dysphagia
- Dysphagia screening for individuals admitted to the hospital with stroke or suspicion of stroke is recommended or required in the US, Canada, Australia, and the United Kingdom[1]

1. Martino et al., 2000

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Why Screen? (cont.)

- The Joint Commission says all patients with stroke should be screened before **ANY** oral intake, including medications

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Summary

- Screening is the first step in the continuum of swallowing evaluation
- It provides us a systematic means of identifying individuals who do or do not need a full evaluation
- It should provide cost, time, and resource savings when compared to evaluations

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Chapter 2

Issues in Screening

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Screening Test Accuracy

- **Validity**
  - The ability of the tool to identify individuals with the condition in question and those individuals without the condition in question

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Screening Test Accuracy (cont.)

- Sensitivity
- Specificity
- Positive predictive value
- Negative predictive value

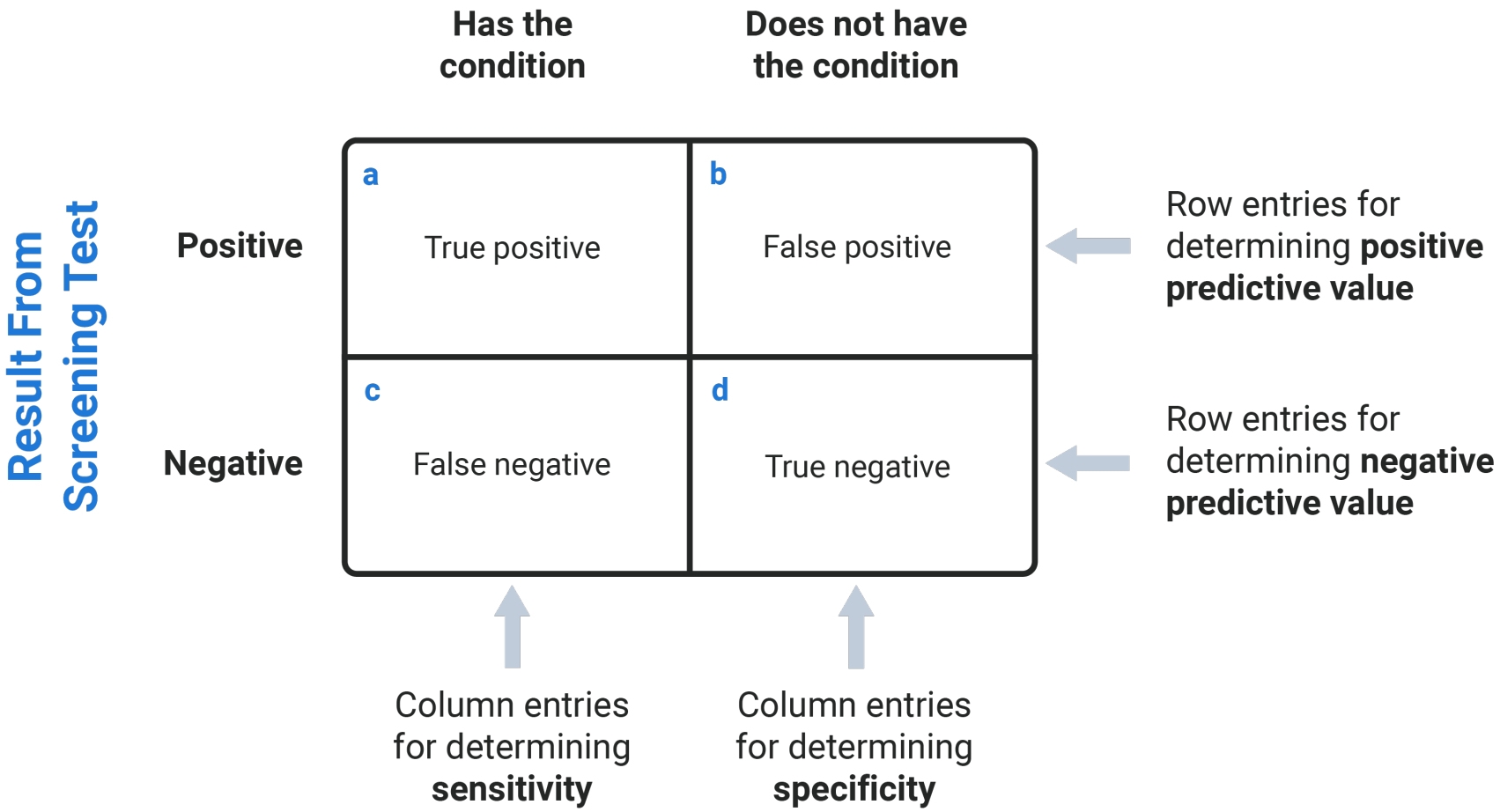
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Sensitivity

- The percentage of true positives
- The proportion of people with the condition who will have a positive result (fail the screen)
- **Highly sensitive screens**
  - Useful for ruling out a condition if a person has a negative result

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Status of Person According to "Gold Standard"



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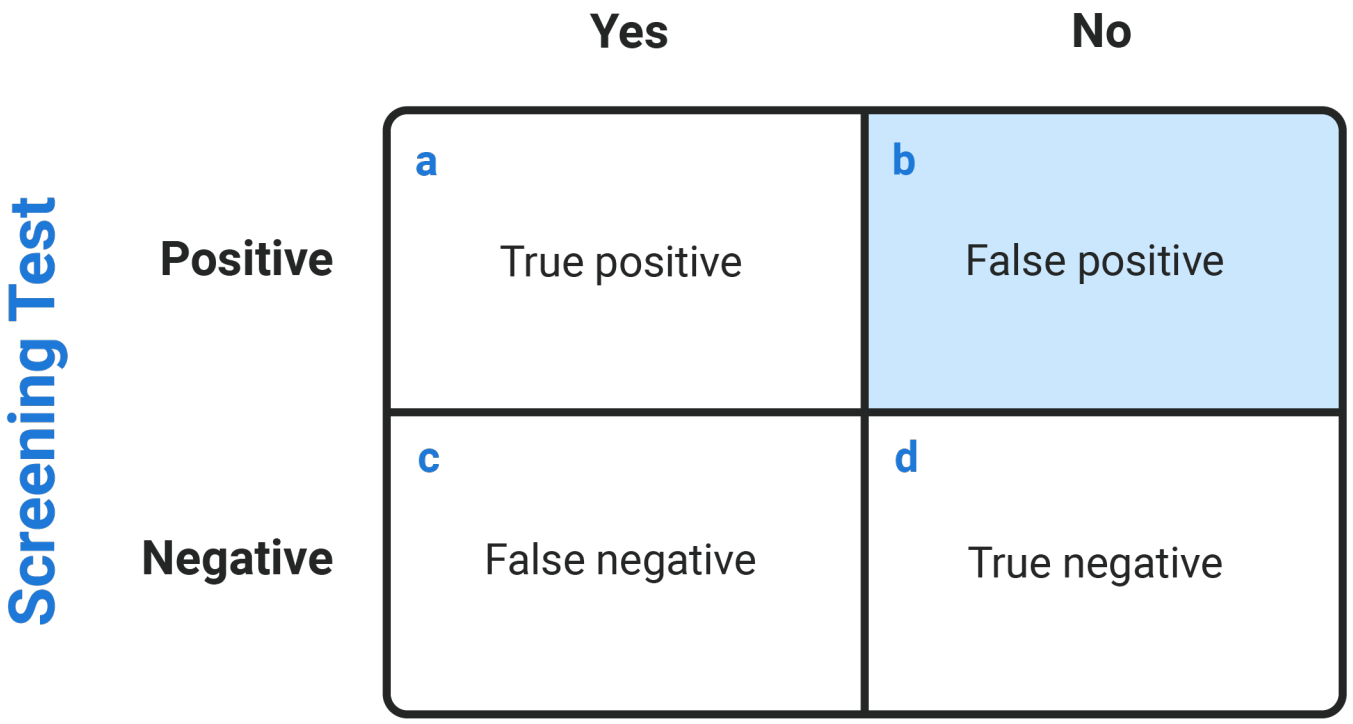
Specificity

- **Proportion of individuals without the condition who have a negative result on the screen**
  - How well a test identifies individuals without the condition
- Highly specific tests are useful for ruling in individuals with the condition

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Screening Test Accuracy

Aspiration on Instrumental Exam



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Predictive Values

- **Positive predictive value**
  - Probability patients with a positive test result have the condition
- **Negative predictive value**
  - Probability patients with a negative test result do not have the condition

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Some Math

- **Sensitivity** = a / (a + c)
- **Specificity** = d / (b + d)
- **PPV** = a / (a + b)
- **NPV** = d / (c + d)

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Screening Test Accuracy

- Highly sensitive tests often have low specificity
- **This is acceptable with a screening tool**
  - We don’t want to miss people with the condition
    - **BUT** we may over-refer for diagnostic testing

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What Makes a Good Screening Test?

- Standards for Reporting of Diagnostic Accuracy (STARD) statement

Bossuyt et al., 2015

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STARD Statement

- **Checklist of 25 items, 6 categories**
  1. Identification of the article
  2. Participant description
  3. Description of reference standard
  4. How the tests were administered
  5. Reporting of results
  6. Discussion of use of test

Bossuyt et al., 2015

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Aspiration vs. Dysphagia

- Dysphagia can occur without aspiration, but aspiration often occurs due to dysphagia
- Is aspiration our only concern?

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Should Only SLPs Administer Screenings?

- Nurses can administer with training[1,2]
- So can physicians[3]

1. Warner et al., 2014
2. Anderson et al., 2016
3. Turner-Lawrence et al., 2009

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Models of Screening

- **Nurse-administered**
  - Staff trained by SLPs
  - Patients who fail are referred to SLP
- **Either nurse- or physician-administered**
  - All patients referred to SLP
- **Physician-administered**
  - Administered as part of routine medical evaluation
  - Physician refers patients who fail screen to SLP
- **No screening**

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Screening Procedures Can Include

- Questionnaires or interviews
- Oral mechanism exam
- Observation for signs/symptoms of aspiration
- Laryngeal cough testing

American Speech-Language-Hearing Association, n.d

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Screening Questionnaires

- EAT-10[1]
- Sydney Swallow Questionnaire[2]

1. Belafsky et al., 2008
2. Wallace et al., 2000

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EAT-10

- Developed as a patient-reported outcomes measure
- Has been used to screen for aspiration and/or dysphagia in individuals with ALS, COPD, head and neck cancer, etc.

1. Regan et al., 2017
2. Arrese et al, 2017
3. Bartlett et al., 2022
4. Donohue et al., 2022

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Sydney Swallow Questionnaire

- 17 questions
- Uses a visual analog scale
- Some have used it to identify dysphagia in individuals with head and neck cancer[1,2] and neuromuscular disease[3]

1. Dwivedi et al., 2010
2. Dwivedi et al., 2012
3. Audag et al., 2021

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Issues With Questionnaire Only

- No observation of swallowing
- Who completes it?

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Screenings Including Bolus Administration

- **Water only**
  - 3-ounce water swallow test[1]
  - Yale Swallow Protocol[2]
  - Toronto Bedside Swallowing Screening Test[3]
  - 100 ml water swallow test[4]
  - Rapid Aspiration Screening for Suspected Stroke[5]

1. DePippo et al., 1994
2. Leder & Suiter, 2014b
3. Martino et al., 2009
4. Patterson et al., 2011
5. Daniels et al., 2016

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Issues With Using Water Only

- **How much?**
  - Smaller volumes (e.g., 5 ml) have high specificity but low sensitivity[1]
  - Larger volumes have high sensitivity but low specificity[2, 3]
    - But is a large volume safe?
- **Is water enough?**
  - Do we need to try other bolus types?

1. Brodsky et al., 2016
2. Suiter & Leder, 2008
3. Brodsky et al., 2016

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Screenings Including Bolus Administration

- Volume-Viscosity Swallow Test[1]
- Gugging Swallow Screen[2]

1. Clavé et al., 2008
2. Trapl et al., 2007

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Cough Reflex Testing

- **Usually involves nebulized citric acid of different concentrations**
  - Delivered via face mask or mouthpiece
- Results appear to correlate with cough response on VFSS and FEES[1]
- Lack of standardization[2]

1. Miles et al., 2013
2. Wallace et al., 2019

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Spontaneous Swallowing Frequency

- Swallow frequency rates were lower in patients with dysphagia

Carnaby et al., 2019

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Does One Size Fit All?

- Some screens focus on specific patient populations (e.g., RASS)
- Others are meant for broader patient populations (e.g., YSP)

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Does One Size Fit All? (cont.)

- Cardiothoracic surgery
- ALS
- Post extubation
- Stroke
- Head and neck cancer
- Tracheostomy

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Summary

- Screening test accuracy must be determined by comparing results to a reference standard
- **There remains considerable disagreement about**
  - **If** we should screen
  - **What** we should screen
  - **Who** we should screen
  - **When** we should screen
  - **How** we should screen

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Chapter 3

The Yale Swallow Protocol

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Yale Swallow Protocol

- Systematic protocol for identifying individuals who are at risk for aspiration
- **Goal of our research is to develop**
  - A valid and reliable screening tool for determination of aspiration risk
  - A screening tool that can be used across several healthcare delivery settings
  - A screening tool that can be used reliably by several healthcare professionals

Leder & Suiter, 2014b

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3-Ounce Water Swallow Test

- **3-ounce water swallow test**
  - Widely used clinical screening to determine risk of aspiration
  - **Patients are given 3 ounces of water and asked to drink the entire amount**
    - **Failure**
      - Inability to consume entire 3 ounces
      - Coughing/throat clear within 1 minute of test administration

DePippo et al., 1994

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3-Ounce Water Swallow Test (cont.)

- **Is silent aspiration volume dependent?**
  - Individuals who aspirated silently with smaller (5 ml) bolus volume failed the 3-ounce water swallow test[1]
  - Single sips (5 ml or less) were less sensitive than larger amounts (90–100 ml) for determining aspiration risk[2]

1. Leder et al., 2011
2. Brodsky et al., 2016

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Clinical Utility of the 3-Ounce Water Swallow Test

- **We sought to expand the clinical utility of the 3-ounce water swallow test**
  - Does the 3-ounce water test identify patients who aspirate?
  - Does failure on the 3-ounce water test indicate that individuals are unsafe for an oral diet?
  - Does passing the 3-ounce water test indicate an ability to tolerate an oral diet without the need for further instrumental assessment?

Suiter & Leder, 2008

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Clinical Utility of the 3-Ounce Water Swallow Test (cont.)

- **Subjects**
  - All FEES performed from Dec 1999 to Sept 2006
  - **N = 3,000**
    - **Males:** 1,669 (55.6%); X = 66.8 y, Range = 2.2–105 y
    - **Females:** 1,324 (44.3%); X = 70.1 y, Range = 3.0–105 y
      - (**Missing data:** gender = 7 [0.2%] patients; age = 18 [0.6%] patients)

Suiter & Leder, 2008

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Clinical Utility of the 3-Ounce Water Swallow Test (cont.)

- **12 diagnostic categories**
  - Cardiothoracic surgery: N = 180
  - Esophageal surgery: N = 63
  - Head/Neck surgery: N = 111
  - Neurosurgery: N = 232
  - Medical: N = 492
  - Pulmonary: N = 451
  - Cancer: N = 125
  - Left stroke: N = 227
  - Right stroke: N = 203
  - Brainstem stroke: N = 38
  - Parkinson's disease: N = 18
  - Dementia: N = 86

Suiter & Leder, 2008

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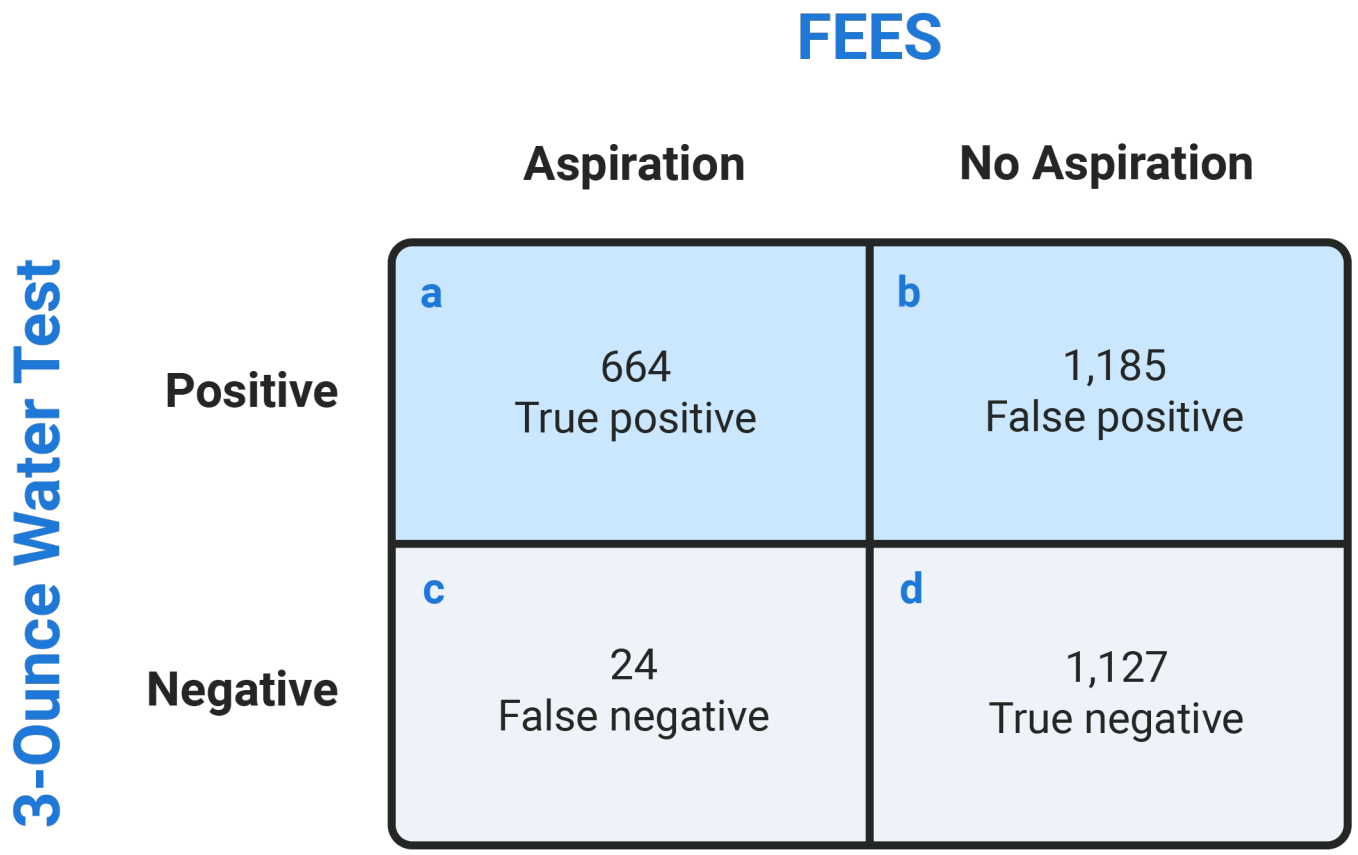
Clinical Utility of the 3-Ounce Water Swallow Test (cont.)

- **All subjects completed FEES then 3-ounce water swallow test**
  - Tester was not blinded
  - FEES served as the criterion standard to which results of the 3-ounce water test were compared

Suiter & Leder, 2008

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Can the 3-Ounce Water Test Accurately Identify Individuals Who Aspirate Thin Liquids?



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Can the 3-Ounce Water Test Accurately Identify Individuals Who Aspirate Thin Liquids? (cont.)

- **Sensitivity** = 96.5%
- **Specificity** = 48.7%
- **Positive predictive value** = 35.9%
- **Negative predictive value** = 97.9%

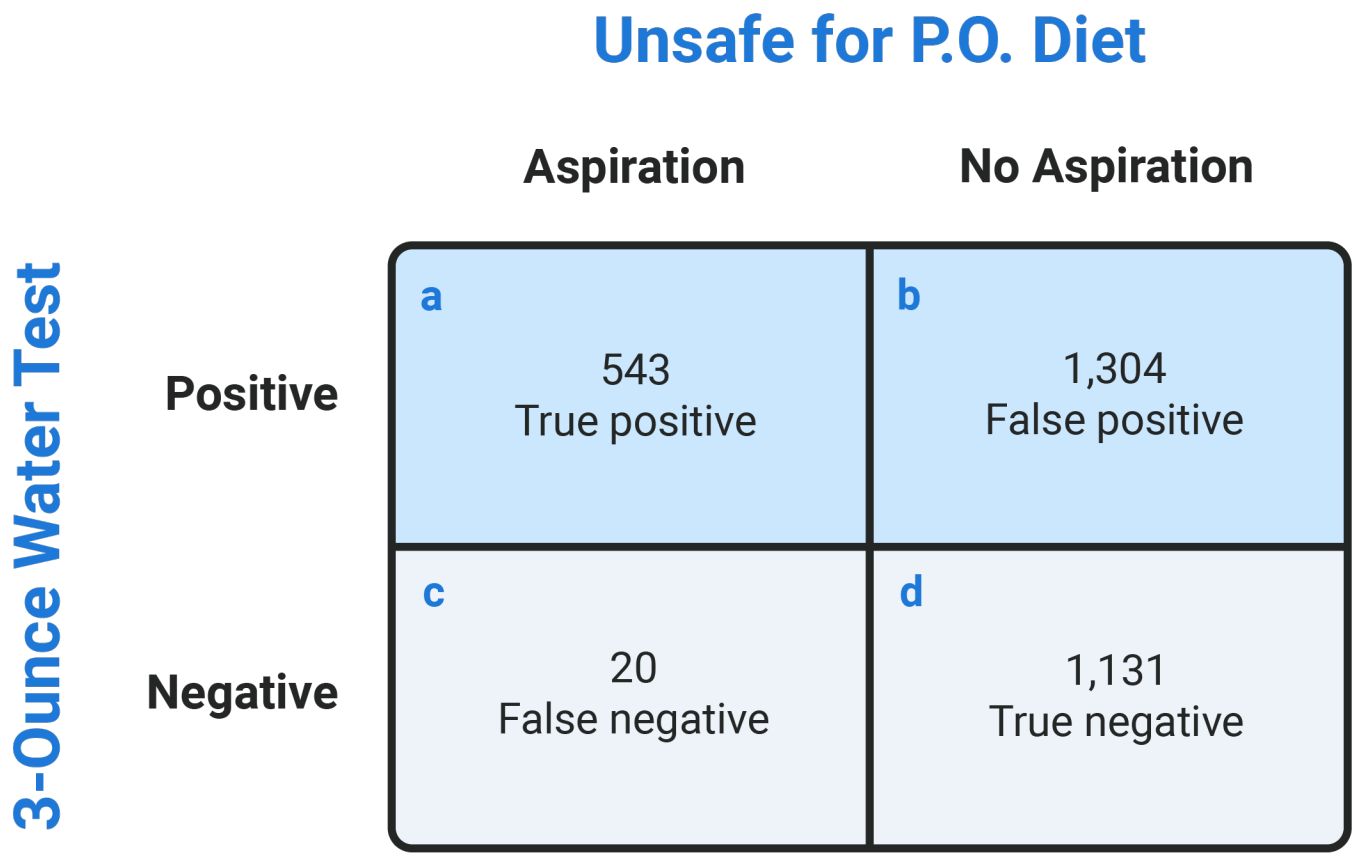
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Can the 3-Ounce Water Test Accurately Identify Individuals Who Aspirate Thin Liquids? (cont.)

- **Conclusions**
  - **High sensitivity plus high negative predictive value**
    - Good predictor of a patient's ability to tolerate thin liquids
  - **High false positive rate (49.7%) plus low specificity**
    - Nearly half of the individuals who failed the 3-ounce challenge did not aspirate during FEES
    - Thus, the 3-ounce water test over-refers individuals for instrumental assessment

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Does Failure on the 3-Ounce Water Test Indicate Inability to Tolerate an Oral Diet?



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Does Failure on the 3-Ounce Water Test Indicate Inability to Tolerate an Oral Diet? (cont.)

- **Sensitivity** = 96.4%
- **Specificity** = 46.4%
- **PPV** = 29.4%
- **NPV** = 98.3%

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Does Failure on the 3-Ounce Water Test Indicate Inability to Tolerate an Oral Diet? (cont.)

- **High sensitivity plus high negative predictive value**
  - Passing the 3-ounce test is a good predictor of ability to tolerate an oral diet
- **Low specificity plus high false negative rate**
  - Many patients were recommended for nil by mouth status unnecessarily

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Caveats

- Tester was not blinded
- Results based only on FEES results (not VFSS)
- Results are based on an SLP administering the screening test
- Studies were based on a referred sample rather than a consecutive sample

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Orientation and Command Following

- **Do ability to follow commands and orientation status affect odds of aspiration?**
  - Referred sample of 4,070 patients
  - **Ages:** 10–105 years
  - 2296 males, 1766 females (data missing for 8)
  - 14 diagnostic categories

Leder et al., 2009

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Orientation and Command Following (cont.)

- **Orientation**
  - What is your name?
  - Where are you right now?
  - What year is it?
- **Command following**
  - **Done in conjunction with oral-mechanism exam**
    - Open your mouth
    - Stick out your tongue
    - Smile
- **Swallowing then assessed with FEES**

Leder et al., 2009

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Orientation and Command Following (cont.)

- **Results**
  - Odds of liquid aspiration were 31% greater for those not oriented x 3
  - Odds of liquid aspiration were 57% greater for those not able to follow commands

Leder et al., 2009

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Oral Mechanism Examination

- **Do results of an oral-mechanism examination reflect odds of aspiration risk?**
  - Lip closure
  - Lingual range of movement
  - Facial symmetry
- **3,919 participants**
  - 1,780 females, 2,314 males
  - Ages 2–105 years
  - 14 diagnostic categories
- **Oral mechanism exam followed by FEES**

Leder et al., 2013

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Oral Mechanism Examination (cont.)

- **Reduced lingual range of motion was associated with increased odds of aspiration**
  - Participants with decreased lingual ROM had 2.72 times the odds of aspiration as those with adequate lingual ROM
  - Decreased lingual ROM was an independent risk factor for aspiration

Leder et al., 2013

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Yale Swallow Protocol

Orientation and command following

Oral mechanism examination

3-ounce water swallow test

Leder & Suiter, 2014b

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Yale Swallow Protocol

Yale Swallow Protocol

Step 2: Administration Instructions

Perform protocol if patient is an aspiration risk and ALL Step 1 boxes are checked NO

- **Brief Cognitive Screen**[a]: __ What is your name? __ Open your mouth
  __ Where are you right now? __ Stick out your tongue
  __ What year is it? __ Smile
- **Oral-Mechanism Examination**[b]: __ Labial closure
  __ Lingual range of motion
  __ Facial symmetry (smile/pucker)
- **3-Ounce Water Swallow Challenge**[c]:
- Sit patient upright at 80-90° (or as high as tolerated >30°)
- Ask patient to drink the entire 3 ounces (90cc) of water from a cup or with a straw, in sequential swallows, and slow and steady but without stopping
  (Note: Cup or straw can be held by staff or patient)
- Assess patient for coughing or choking during or immediately after completion of drinking

[a,b] Information from the brief cognitive screen and oral mechanism examination provide information only on odds of aspiration risk with the 3-ounce water swallow challenge and should not be used as exclusionary criteria for screening.

[c] It is permissible to repeat the 3-ounce water swallow challenge if it is thought the patient may pass with a second attempt.

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Populations for Whom We Do NOT Recommend Use of YSP

- Patients with tracheostomy tubes
- Patients with head and neck cancer who have undergone radiation treatment

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Additional Studies

- Validation of the Yale Swallow Protocol[1]
- Nurse-administered Yale Swallow Protocol[2]
- Five-day follow-up in acute care[3]
- Use of YSP in intensive care and step-down unit[4]
- Use of YSP in skilled nursing facilities[5]
- Use of YSP in patients post-extubation[6]
- Systematic review of water swallow protocols[7]

1. Suiter et al., 2014
2. Warner et al., 2014
3. Leder & Suiter, 2014a
4. Leder, Suiter, Warner, & Kaplan, 2011
5. Ward et al., 2020
6. Leder et al., 2019
7. Brodsky et al., 2016

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How Are People Trained to Screen?

- **Suggested content includes**
  - Prevalence and incidence of feeding and swallowing problems
  - Adverse health outcomes associated with feeding and swallowing problems
  - Goal of screening and how it fits into the evaluation process
  - Review of screening items

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How Are People Trained to Screen? (cont.)

- **Additional suggested content includes**
  - Audiovisual examples
  - Supervised practice
  - Assessment of reliability
  - How to document

Suiter et al., 2020

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Summary

- The Yale Swallow Protocol is a valid, easy to administer, evidence-based protocol to screen for aspiration risk
- Its use has been studied across multiple healthcare settings and with multiple patient populations

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Q&A Session With
Jo Puntil, MS, CCC-SLP, BCS-S

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Question

- Do I need to have permission to use the Yale Swallow Protocol in my facility?
  - Is the protocol copyrighted?

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Question

- We are currently using the Yale Swallow Protocol in our facility. Our _____ department wants to revise the protocol and add items (e.g., presence of dysarthria) to the protocol. Are you okay with this?

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Question

- Can the Yale Swallow Protocol be used for individuals on high-flow nasal cannula?

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Question

- Does failure on the Yale Swallow Protocol mean a patient **MUST** have an instrumental swallow assessment?

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Question

- If a patient fails the 3-ounce water swallow test, can we use a different type of bolus (e.g., nectar-thick liquids) instead?

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Question

- “I vaguely remember at an ASHA talk your offering that initially a cough or throat clear for up to one minute after the screen was considered a failed screen. If I remember correctly, you and Dr. Leder felt that a cough or throat clear up to one minute after could be secondary to anything. Therefore, if the patient coughs/ clears throat within that minute after, this is still considered a pass.”
- Is this correct?

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Audience Q&A

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