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Back to Basics: Applying Clinical Reasoning to the Clinical Swallow Assessment

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Moderated by:
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Back to Basics: Bedside/Clinical Assessment

Angela Mansolillo, MA/CCC-SLP, BCS-S
Or….

Applying clinical reasoning to the clinical assessment process!

Learning Outcomes

After this course, participants will be able to:
- Describe three components of a clinical swallow evaluation and the evidence that supports them.
- Identify risk factors for aspiration in various patient populations.
- Identify appropriate interventions based on results of clinical assessment.
Why Clinical Assessment?

Clinical Assessment Doesn’t Tell Me if My Client is Aspirating…

- True! But…
  - Clinical assessment answers questions that instrumental assessment doesn’t answer
  - Clinical assessment allows for gathering of critical diagnostic information
  - Clinical assessment results in more efficient instrumental assessment
  - Clinical assessment engages the patient in a way that instrumental assessment does not
Why Clinical Assessment?

Clinical Assessment vs Instrumental Assessment
- Cognitive assessment
- Positioning
- Fluctuations in performance; fatigue; endurance
- Simulate mealtimes
- Self-feeding
- Appetite; interest in eating
- Assess “functional” eating
- Aspiration risk factors, signs, symptoms

Reviewing the Medical Record
Chest X-Ray Terminology

1. Density/Opacity
2. Consolidation – more diffuse opacity
3. Infiltrates

All refer to filling of airspaces with…??
Fluid, pus, proteins, WBC’s, bacteria…
May be associated with pneumonia

- Atelectasis – Collapse of alveoli with loss of lung volume
- May be associated with pneumonia…but basilar atelectasis sometimes related to insufficient inspiratory effort
Chest X-Ray Terminology

- Edema: fluid in alveolar or interstitial spaces; often CHF
- Effusion: fluid in pleural cavity; often CHF, PE, CA
- Typically, NOT associated with pneumonia

Laboratory Values

- Complete Blood Count (CBC)
  - White Blood Cell Count (High=infection)
  - White Cell Differential (Identified # and type of WBC’s)
- Assist with id of type of infection
Laboratory Values

1. Neutrophils: *increase with bacterial infection*, inflammation, bone marrow disease; decrease with severe infection, chemo
2. Eosinophils: increase with *allergic reactions*; decrease with infection
3. Basophils: increase with *inflammation*, rad rx
4. Lymphocytes: increase with *viral infection*, rad rx; decrease with *immune system disease* – lupus, HIV; provides insight into robustness of immune system
5. Monocytes: increase with *infections in general*

Laboratory Values

CBC (cont)
- Red Blood Cell Count
  - (Low=disease process; High=dehydration)
- Hematocrit - volume of RBC’s
  - (id of anemia, but high in dehydration)
- Hemoglobin - # RBC’s
  - (high with COPD, CHF, high with dehydration)

*Insight into efficiency of oxygen transport, hydration*
Laboratory Values

CBC (cont)
- Mean Corpuscular Volume
- Mean Corpuscular Hemoglobin
- Mean Corpuscular Hemoglobin Concentration

Identification of anemia
- Platelet Count (decreased with pneumonia and other infection)

Laboratory Values

- Blood Urea Nitrogen: measures waste from protein metabolism
  - High = Dehydration, renal failure, CHF, dehydration
  - Low = Low protein or malabsorption, over-hydration

- Creatinine: waste product of muscle metabolism; measure of kidney function
  - High = renal disease, kidney failure, urinary tract blockage
  - Low = BUN/Creatinine ratio suggests inadequate protein intake
Laboratory Values

**Body Mass Index**

- $<18.5 = \textit{underweight}; \textit{likely nutritional compromise}$
- $18.5 - 24.9 = \textit{normal}$
- $25-29.9 = \textit{overweight}$
- $30-39.9 = \textit{medically obese}$
- $>40 = \textit{morbidly obese}$

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**Laboratory Values**

**Glucose**

- Formed from carbohydrates
- Transported to cells for storage as glycogen by insulin
- Hypoglycemia – results from malnutrition, alcoholism, excess insulin
- High glucose levels – DM, burns, renal failure, steroid use
Laboratory Values

- **Albumin**: protein in plasma; slow to change in response to supplementation
  - Low = Malnutrition, over-hydration or during acute inflammatory process
  - High = Dehydration

- **Pre-Albunin**: protein in gastric mucosa, pancreas, and liver; better indicator for short term changes (e.g. response to supplementation)
  - Low = Nutrition risk

Laboratory Values

- **Sodium**
  - Low = CHF, med effects
  - High = Dehydration

- **Potassium**
  - High = Dehydration, kidney failure
Laboratory Values

Homeostasis
- Acid/Base balance must be maintained throughout the body
- Lungs and kidneys work together to keep pH in balance
- Respiratory system responds to changes in pH by increasing or decreasing ventilation
- Renal system retains or excretes hydrogen and bicarbonate ions (HCO₃⁻)
- Decreased renal function can result in increased respiratory rate

Laboratory Values
So…to look at acid/base balance…

- The respiratory component:
  - PaCO₂: partial pressure of arterial CO₂ i.e. amt of CO₂ in blood (35-45)

- The renal component:
  - HCO₃⁻: plasma bicarbonate (22-26)
Laboratory Values

Blood oxygenation

ABGs
- PaO2: partial pressure of O-2 i.e. amt of O-2 dissolved in blood (80-100 mmHg)
- Sat%: oxygen saturation (95-100%)

Pulse Oximetry
- >95% but…
- Lower in COPD
- Patient specific parameters

Laboratory Values

Look for Insight into:
- Nutritional compromise
- Respiratory status
- Anemia (general debilitation)
- Dehydration
- Immune System Compromise
- Infection
Understanding Oxygen Requirements

FiO2: Percentage of oxygen in total gas patient is receiving (e.g. FiO2 of room air is 21%)

Flow: volume delivered per minute; liters per minute (lpm)

*These measures are independent of each other*

Non-invasive Positive Pressure Ventilation (NPPV)

- Facial mask connected to ventilator, CPAP unit or BPAP unit
- Provides larger tidal volume without increase in respiratory effort
- May prevent need for intubation, re-intubation
- Reduces complications associated with respiratory failure, intubation
Understanding Oxygen Requirements

NPPV and Swallowing

- Not a well-studied relationship
- Removal of mask intermittently for fluid/food intake is often part of protocols
- Consider RR, effort, baseline 0-2 saturation

High Flow Nasal Cannula (HFNC)

- Allows for provision of higher flow oxygen – 35-60 lpm (traditional nasal cannula limited to 12-15 lpm)
- Increased patient comfort (absence of mask; provision of humidification)
- CPAP effect decreases atelectasis
- Decreases WOB
But…

- CPAP effect difficult to measure; pressure in pharynx may increase aspiration by “blowing” secretions, etc into airway
- Inaccurate perception of lower severity (Sure…go ahead and feed her…!)
- “Risk of aspiration” generally considered a contra-indication for use
- Little is known re: impact on swallowing physiology

Need to consider RR, saturation, breathing/swallow coordination, presence of dyspnea…

Case History

Ask About…

- Other imaging (MRI, CT, previous swallow studies)
- Staff, family observations, concerns
- Dependent for feeding?
- Prolonged mealtimes
- Weight loss
- Voice, speech changes
- Medications
- Level of alertness
Initial Impressions?

- Awake, alert?
- Positioning?
- Obvious neurological deficits?
- Tubes? Lines?
- Communication?

Dysphagia – Dysarthria Connection?

Literature review: 2018

- Of patients with dysphagia, 76-90% have dysarthria as well
- Dysarthria is a strong clinical indicator of swallowing impairment

Wang, et al, 2018
Case History

Patient Complaints?
- Timing of symptoms – sudden onset; progressive?
- Frequency of symptoms – constant? Intermittent?
- Pain/discomfort? Site? Frequency?
- With what foods/liquids?

Positioning Effects

As a General Rule…
- Comfortable
- As upright as possible
- Facilitate self-feeding
Positioning Effects

Position to Improving Respiration
Improve chest excursions via:

- Decrease pillows behind head to improve upper chest wall movement
- Shoulders in neutral position to open anterior chest wall; (towel rolls or pillows under elbows; roll between waist and medial aspect of elbow)
- Spine – towel roll lengthwise along the spine


Cognitive Assessment

Orientation (person, place and year) and ability to follow 1-step directions assessed prior to FEES

N = 4053 patients, varying diagnoses, aged 10-105 yrs

- Disoriented patients had 31% higher aspiration rate on thin liquids (not on puree)
- Patients unable to follow directions had 57% higher chance of aspirating thin liquids; 48% higher chance of aspirating puree

Leder, Suiter, and Warner, 2009
“Cognitive Dysphagia”

Dysphagia in older people is often a “functional” disorder

- Difficulty adapting behavior as conditions change
- Difficulty adjusting body position
- Reduced awareness of environmental cues
- Limited ability to self-monitor, self-correct

Winchester and Winchester, 2015

Cough Assessment

Reflexive Cough

- Brainstem “cough center”
- Variation in neurological mediation - vagus, peripheral nerves
- Evidence to suggest that different irritants produce cough along different neural pathways
- In Larynx/Trachea triggered largely by mechanical stimulation
- Bronchial cough generally triggered by mucus, edema
- Laryngeal innervation not necessarily needed to trigger
Cough Assessment

Reflexive Cough

- Stimulation lower in respiratory tract – increase in inspiratory phase (attempt to pull air below irritant?)
- Stimulation in/around vocal folds – shorter inspiratory phase/stronger expiratory phase (airway protection?)

Cough Assessment

Potential for effective cough?

- Muscle strength
- Respiratory capacity
- Cilia integrity
- VF function
Cough Assessment

Urge to Cough
In subjects who can estimate their urge to cough…
- Urge increases
- Cough intensity increases
- Voluntary control increases

Davenport, 2007; Davenport, 2009

So…perhaps we should be asking clients about this?

Cough Assessment

Cough and angiotensin-converting-enzyme (ACE) inhibitors
- Used to treat HTN, CHF (e.g. Capoten/captopril, Vasotec/enalapril, Altace/ramipril)
- Reduce tension in blood vessels, reduce blood flow
- Increase cough sensitivity; lower cough threshold; i.e. people who take them cough with less stimulation
- Some evidence to suggest that they could prevent aspiration and aspiration pneumonia (Marik, 2003)
Cough Assessment

Voluntary cough?
“Modest” relationship between voluntary cough and aspiration/penetration in PD patients
Pitts, et al, 2008

Reduced peak expiratory flow in voluntary cough differentiated ALS patients with and without dysphagia

Respiration

As breathing changes…so does swallowing…
Respiration

**Work of Breathing Physiologic:** force required to overcome elastic and frictional resistance
- Expansion of lungs against recoil
- Airway resistance

Respiration

**Rate**
- At rest (norm = 10-14 bpm)
- Change with demands of swallowing?

**Depth**
- Shallow?
- Pain with breathing?

**Coordination**
- Changes across bolus types, size
- Single swallows vs. serial swallows
- Changes with fatigue?
Respiration

Listen!
Stridor?
- On inspiration – obstruction likely *above* glottis
- Bi-phasic – likely *at or just below* glottis
- On expiration – likely *tracheal*

Respiratory Muscle Strength
- Maximum expiratory pressures (Via EMST device)
- Pulmonary Function Tests (functional vital capacity, expiratory volumes, peak flow)
Also…
- Trunk control; positional stability
- Observations re: WOB
Respiration

Oxyhemoglobin Saturation
Via Pulse Oximetry
- Adults: 95% +
- COPD??
- Children: 90%
Indication of the “work of breathing”

Respiration

Pulse Oximetry
- Measurement of % hemoglobin that is saturated with oxygen
- Transmission of red/infra-red light through the bloodstream
- Oxygenated and deoxygenated hemoglobin transmit light differently; measured via two different frequencies of light
- Oximeter calculates saturation based on the two transmissions
Respiration

**Pulse Oximetry and Aspiration**

- Several studies looking for correlation between changes in Pulse Ox and aspiration - *No reliable correlation* (Britton, et al, 2018)
- Better for measurement of “work of breathing”, endurance for feeding

But...

- Low pre-swallow saturation (<94%) may be predictive (Steele and Cichero, 2014)

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**Respiration**

*Dyspnea*

- Air hunger
- Increased physical work of breathing
- Chest/lung tightness

**Assessment (speech and swallowing)**

- Observe in a variety of contexts, demands
- Include patient’s perception

Hoit, et al, 2011
Respiration

Look for…
- Increased respiratory rate
- Inspirations mid-word or phrase
- Decreased syllables/breath
- Activation of neck, upper rib cage muscles
- Holding bolus in oral cavity to take extra breaths
- Pausing between swallows for breath

Oral Mechanism Examination

- Lips
- Tongue
- Jaw
- Velum

Range, speed, strength…

Also, condition of oral cavity, dentition
Oral Mechanism Examination

How important is the oral mechanism examination?
3919 subjects; variety of diagnoses; ages 2-105

- Impaired lingual ROM
- Facial asymmetry

Increased risk of aspiration


Oral Health Assessments

- Brief Oral Health Status Examination
- Oral Health Assessment Tool
- Assessment of Current Oral Hygiene Care
Oral Health Assessment

To what extent can patient be independent?
- Manual dexterity
- Vision/Perception
- Positioning
- Level of alertness
- Attention to task
- Cognition

Laryngeal Assessment

- Cough
- Vocal Quality
- Pitch Elevation
Laryngeal Assessment

Change in Vocal Quality

But...
- Little inter-rater agreement

Pitch Elevation
- Pitch elevation assessment followed by VFSS; assessed instrumentally and perceptually (by clinician)
- Reduced pitch elevation was predictive of thin liquid aspiration; i.e., the lower the maximum pitch, the higher the risk


Maximum Phonation Time
- Reduced MPT in patients with PD correlated with reductions in laryngeal elevation (but not with aspiration)

Ko, et al, 2018
Swallow Trials

Given normal swallow variability, need to include...
  - Variety of bolus types
  - Variety of bolus sizes
  - Straw and cup sips
  - Serial swallows
  - Cued and non-cued swallows

Swallow Trials

Serial Swallows
  - P/A scores higher for serial swallows as compared to single sips
  - Laryngeal penetration higher in normals and CVA pts with serial swallows

So...
  - Do serial swallows as part of eval
  - Penetration is normal finding

Corey and Daniels, 2009
Swallow Trials

Clinical Assessment – Symptoms

- Dysphonia
- Dysarthria
- Abnormal gag response
- Abnormal volitional cough
- Cough after swallow
- Vocal change after swallow

Daniels, et al, 1998

Swallow Trials

Clinical Assessment - Symptoms

- Vocal quality change
- Cough after swallow
- Abnormal volitional cough
- Dysphonia
- Dysarthria
- Hemispatial neglect

Daniels, et al, 2006
Swallow Trials

Post Stroke Patients
- Poor oral hygiene
- Breathy voice
- Wet vocal quality
- Difficulty with larger volumes (3 oz of thin liquid)
- Jaw weakness

McCullough, et al, 2005

Swallow Trials

Is Absence of Gag Response Predictive of Aspiration?


NO! (Leder, 1996; Leder, 1997; Leder and Espinosa, 2002; McCullough, et al, 2001)

So…What’s the answer?
- Not likely to separate aspirators from non-aspirators
- Does provide insight into neuro status
Swallow Trials

Laryngeal Palpation?

- Significant variability in hyoid elevation (Molfenter and Steele, 2011)
- Frequent barriers to palpation
- Was correlated with HLE on VFSS with \textit{some bolus types} (Rangarathnam and McCullough, 2016)
- Recent study compared clinician assessment via palpation to VFSS: able to id differences in \textit{anterior hyoid movement} but not elevation and did not differentiate clients re: function (Brates et al 2019)

- May be helpful in determination of \textit{whether} swallow occurred

Swallow Trials

\textbf{Respiratory Factors Associated with Aspiration}

- Rapid RR (>25 bpm)
- Low baseline oxygen saturation (<94%)
- Inconsistent swallow-respiratory pattern
- Post-swallow inhalation
- Short swallow apnea duration

Steele and Cichero, 2014
Swallow Trials

Clinical Assessment – Symptoms

- CVA patients – evaluated in areas of medical history, oral motor function, speech/voice, and trial swallows; compared to VFSS
- No one item predictive of aspiration but…
- Risk factors in every category increased aspiration risk
- Multiple risk factors in history (pneumonia, feeding tube, need for suction, malnutrition) also predictive

Rosenbek et al, 2004

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Swallow Trials

Clinical Assessment – Symptoms

CVA patients – compared to VFSS

- Spontaneous cough during swallowing and clinician’s overall estimate of aspiration risk had good specificity and sensitivity
- Impaired laryngeal elevation, dysphonia, wet- hoarse vocal quality moderately predictive
Swallow Trials

Mann Assessment of Swallowing Ability

- Protocol for clinical assessment
- Scores assigned for respiration, behavior, comprehension, speech, oral motor movements, test swallows
- Swallow integrity score – i.e. Clinician’s risk assessment – was more predictive of aspiration than the ordinal score.


Swallow Trials

Clinical Assessment – Symptoms

SLPs and RNs assessed individual clinical signs (cough, tongue lateralization, vocal quality, post-swallow responses) in order to predict aspiration; then compared to MBS

Unable to predict aspiration based on assessment of a single clinical sign…BUT

When asked to predict aspiration based on all of the signs combined, predictive ability increased significantly

Steele, et al, 2011
So…

“…the concern consistently expressed in the research about SLPs inconsistent use of recommended CBSA components may be misplaced…
Standardized item-based assessments *may constrain the clinical reasoning process*…
It is likely that *awareness of one’s own clinical reasoning processes* will increase diagnostic specificity and sensitivity, and in turn improve clinical management and outcomes…”


(Italics are mine! 😊)

Assessing Aspiration Pneumonia Risk

Risk Factors for…
- Aspiration

And…
- Aspiration Pneumonia
Aspiration Pneumonia Risk?

- Consider overall medical condition, medical stability, comorbidities, presence of infection
- Consider nutritional status, hydration
- Consider pulmonary status
- Consider oral hygiene

Swallow Trials

Evidence to support sensory interventions:

- **Sour** (Logemann, 1995; Pelletier and Lawless, 2003)
- **Carbonation** (Sdravou et al, 2012; Morita et al, 2009; Larsson, et al, 2017; Turkington et al, 2019)

And…

- **Cold + Sour** (Cola, 2012; Hamdy et al, 2003)
- **Cold + High flavor** (Krival and Bates, 2012)
Swallow Trials

Compensations

- Volitional swallow – less spill to pharynx in healthy subjects (Palmer, 2007)
- Effortful swallow – increased pharyngeal amplitude; voluntary swallow? Also, improves esophageal peristaltic amplitudes in some (Neki et al, 2012; Takasaki et al, 2011)

Pacing

- Compensates for weakness, slowness
- Allows for appropriate oxygenation with increased RR

Bolus size

- Changes swallow components (Butler et al, 2010)
Swallow Trials

Chin Down Head Position

- Reduces aspiration by reducing space between tongue base and pharyngeal wall, epiglottis and arytenoid; narrows laryngeal vestibule
- And...requires more effort
- But...positions airway below pyriform sinuses; may increase aspiration of post-swallow residue


Esophageal dysphagia

Why should I care?

- Oropharyngeal and esophageal dysphagia can co-exist (Gullung, et al, 2012)
- Esophageal dysphagia can result in oropharyngeal symptoms (Triadafilopoulos, et al, 1992)
- Interventions for oropharyngeal swallow function may impact esophageal function
Effects of Maneuvers

- Healthy subjects: effortful swallow, Mendelsohn, normal swallowing; manometry
- Mendelsohn: more non-peristaltic swallows
- Effortful swallow: fewest non-peristaltic swallows

O'Rourke et al, 2014

Making Recommendations

- Diet
- Thick Liquids
- NPO?
- Medication Administration?
- Exercise
- Palliative Care/End of Life Patients
- And…
Do I Need Instrumental Assessment?

Instrumental Assessment Can...
- Define anatomy and physiology
- Identify “reason” for dysphagia
- Detect aspiration
- Allow for exploration of bolus variables, strategies and maneuvers

But it Cannot...
- Rule out aspiration
- Determine the impact of the dysphagia on an individual
- Simulate mealtimes
- Predict outcomes

What Type of Instrumental Assessment Do I Need?

MBS/VFSS
- View of phase transition
- Hyo-laryngeal excursion is visible
- Oral bolus management is visible
- Assessment of esophageal clearance

FEES
- Assessment of laryngeal appearance
- Is larynx functioning to protect the airway
- Assessment of pharyngeal sensation (?)
What Type of Instrumental Assessment Do I Need?

*Both will tell me:*
- Did aspiration occur? If so, why?
- How did the patient respond to the aspiration?
- Which maneuvers, strategies were attempted…which ones were effective?
- What is the recommended diet level (and why)?

*Neither will tell me:*
- What happens over the course of a mealtime?
- What are the effects of fatigue, low endurance?
- What happens in natural feeding environments?

Concluding Thoughts…

- It’s about the “big picture”
- Aspiration vs Aspiration Pneumonia Risk
- Decisions re: further assessment
- ID appropriate, impairment-based interventions