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

Angela Mansolillo, MA, CCC-SLP, BCS-S

Moderated by:
Amy Natho, MS, CCC-SLP, CEU Administrator, SpeechPathology.com

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CONTINUED

Back to Basics: Bedside/Clinical Assessment

Angela Mansolillo, MA/CCC-SLP, BCS-S

CONTINUED

Or….

Applying clinical reasoning to the clinical assessment process!

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CONTINUED

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.

CONTINUED

Why Clinical Assessment?

CONTINUED

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

CONTINUED

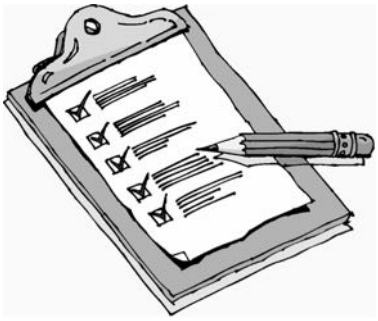
Why Clinical Assessment?

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

CONTINUED

Reviewing the Medical Record



CONTINUED

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

CONTINUED

Chest X-Ray Terminology

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

CONTINUED

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

CONTINUED

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

CONTINUED

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**

CONTINUED

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

CONTINUED

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)

CONTINUED

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

CONTINUED

Laboratory Values

Body Mass Index

<18.5 = underweight; likely nutritional compromise

18.5 – 24.9 = normal

25-29.9 = overweight

30- 39.9 = medically obese

>40 = morbidly obese

CONTINUED

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

CONTINUED

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

CONTINUED

Laboratory Values

- Sodium
  - Low = CHF, med effects
  - High = Dehydration
- Potassium
  - High = Dehydration, kidney failure

CONTINUED

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 (HCO_3)
- Decreased renal function can result in increased respiratory rate

CONTINUED

Laboratory Values

So…to look at acid/base balance…

- The respiratory component:
  - PaCo2: partial pressure of arterial CO-2 i.e. amt of CO-2 in blood (35-45)
- The renal component:
  - HCO3: plasma bicarbonate (22-26)

CONTINUED

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

CONTINUED

Laboratory Values

Look for Insight into:

- Nutritional compromise
- Respiratory status
- Anemia (general debilitation)
- Dehydration
- Immune System Compromise
- Infection

CONTINUED

Understanding Oxygen Requirements

FiO2: Percentage of oxygen in total gas patient is receiving (e.g. Fi02 of room air is 21%)

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

These measures are independent of each other

CONTINUED

Understanding Oxygen Requirements

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

CONTINUED

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

CONTINUED

Understanding Oxygen Requirements

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

CONTINUED

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…

CONTINUED

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

CONTINUED

Initial Impressions?

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

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CONTINUED

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

CONTINUED

Case History

Patient Complaints?

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

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CONTINUED

Positioning Effects

As a General Rule…

- Comfortable
- As upright as possible
- Facilitate self-feeding

CONTINUED

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

Massery, 1994.

CONTINUED

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

CONTINUED

"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

CONTINUED

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

CONTINUED

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?)

CONTINUED

Cough Assessment

Potential for effective cough?

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

CONTINUED

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?

CONTINUED

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)

CONTINUED

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

Plowman, et al, 2016

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CONTINUED

Respiration

As breathing changes…so does swallowing…

CONTINUED

Respiration

Work of Breathing Physiologic: force required to overcome elastic and frictional resistance

- Expansion of lungs against recoil
- Airway resistance

CONTINUED

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?

CONTINUED

Respiration

Listen!

Stridor?

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

CONTINUED

Respiration

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

CONTINUED

Respiration

Oxyhemoglobin Saturation

Via Pulse Oximetry

- Adults: 95% +
- COPD??
- Children: 90%

Indication of the "work of breathing"

CONTINUED

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

CONTINUED

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)

CONTINUED

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

CONTINUED

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

CONTINUED

Oral Mechanism Examination

- Lips
- Tongue
- Jaw
- Velum

Range, speed, strength…

Also, condition of oral cavity, dentition

CONTINUED

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

Leder, S, et al, 2013

CONTINUED

Oral Health Assessments

- Brief Oral Health Status Examination

http://consultgerirn.org/uploads/File/trythis/try_this_18.pdf

- Oral Health Assessment Tool

http://www.cda-adc.ca/_files/dental_profession/practising/best_practices_seniors/using_ohat_tool_halton_slides_2007_10.pdf

- Assessment of Current Oral Hygiene Care

http://www.healthcare.uiowa.edu/igec/tools/oralhealth/currentOralHygiene.pdf

CONTINUED

Oral Health Assessment

To what extent can patient be independent?

- Manual dexterity
- Vision/Perception
- Positioning
- Level of alertness
- Attention to task
- Cognition

CONTINUED

Laryngeal Assessment

- Cough
- Vocal Quality
- Pitch Elevation

CONTINUED

Laryngeal Assessment

Change in Vocal Quality

- Predictive of aspiration (Daniels, et al, 1998, Daniels, et al, 2006, Weir, et al, 2009)

But…

- Little inter-rater agreement

CONTINUED

Laryngeal Assessment

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

Malandraki, et al, 2011; Rajappa, et al, 2017

Maximum Phonation Time

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

Ko, et al, 2018

CONTINUED

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

CONTINUED

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

CONTINUED

Swallow Trials

Clinical Assessment – Symptoms

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

Daniels, et al, 1998

CONTINUED

Swallow Trials

Clinical Assessment - Symptoms

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

Daniels, et al, 2006

continued

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

continued

Swallow Trials

Is Absence of Gag Response Predictive of Aspiration?

YES! (Horner, et al, 1988; Horner, et al, 1993; Daniels, et al, 1998)

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

CONTINUED

Swallow Trials

Laryngeal Palpation?

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

CONTINUED

Swallow Trials

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

CONTINUED

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

CONTINUED

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

CONTINUED

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.

Gonzalez-Fernandez, et al, 2011.

CONTINUED

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

CONTINUED

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…"

McAllister, et al, 2016

(Italics are mine! ☺)

CONTINUED

Assessing Aspiration Pneumonia Risk

Risk Factors for…

- Aspiration

And…

- Aspiration Pneumonia

CONTINUED

Aspiration Pneumonia Risk?

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

CONTINUED

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)

CONTINUED

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)

CONTINUED

Swallow Trials

Compensations

Pacing

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

Bolus size

- Changes swallow components (Butler et al, 2010)

CONTINUED

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

Hori et al, 2011; Terre and Mearin, 2012; Welch et al, 1993; Young et al, 2015

CONTINUED

Esophageal dysphagia

Why should I care?

- Oropharyangeal and esophageal dysphagia can co-exist (Gullung, et al, 2012)
- Esophageal dysphagia can result in oropharyngeal symptoms (Triadafilopoulous, et al, 1992)
- Interventions for oropharyngeal swallow function may impact esophageal function

CONTINUED

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

CONTINUED

Making Recommendations

- Diet
- Thick Liquids
- NPO?
- Medication Administration?
- Exercise
- Palliative Care/End of Life Patients
- And…

CONTINUED

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

CONTINUED

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 (?)

CONTINUED

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?

CONTINUED

Concluding Thoughts…

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