Applying Neuroplasticity Principles in Dysphagia Treatment
Taking Evidence-Based Practice to the Next Level

Georgia A. Malandraki, PhD, CCC-SLP, BCS-S
Assistant Professor
Speech, Language and Hearing Sciences
Purdue University
Indiana Speech Language and Hearing Association 2015

Disclosures

Purdue I-EaT Laboratory and Research Clinic
((maging, Evaluation and Treatment of Swallowing Laboratory)
Lab email: swallowinglab@purdue.edu

Dedicating this lecture to Professor Jerilyn Logemann
(1942-2014)

OUTLINE
- Case Study
- Dysphagia Treatment
  -
  -
  -
- Next level of EBP
  -
  -
- Revisiting the Case Study - Discussion
- Conclusions

Case Study
Treatment Design
Case Study

• 75 y/o female, s/p CVA in January 2013 and second CVA in July 2013
• MRI: infarcts in left basal ganglia, right and left internal capsule, possible infarcts in brainstem
• July 2013:
  – Oropharyngeal dysphagia, inability to manage secretions, severe pharyngeal delay and weakness, reduced hyolaryngeal excursion; silent aspiration; dysarthria and left side facial and oral weakness
  – Therapy: NPO status; hyolaryngeal excursion and pharyngeal strengthening home exercises were prescribed

Case Study

• August 2013:
  – Outpatient visit
  – Still NPO; on G-tube and afraid to eat
  – Physiology: reduced BOT retraction; pharyngeal delay; silent aspiration with large volumes of thick liquids; mild diffuse pharyngeal residue; prolonged oral prep time; mild oral residue; reduced lingual strength
  – Respiratory health: good
  – Weight: 112 pounds, maintained weight

Case Study

• What dysphagia treatment(s) would you recommend?
  – Design and write the outline of a treatment plan for this patient
  – Compensatory strategies
  – Rehabilitative strategies (amount, repetitions, days etc.)
  – Duration
  – Follow-up
  – We will discuss this at the end of the session

Dysphagia management

G

• Respiratory compromise
  – Prevention of malnutrition and dehydration

Dysphagia management

Goals

• When possible, re-establish oral feeding
• Meet patient’s nutritional and psychological needs
• Improvement of QOL

Now…
let’s take a closer look

Dysphagia Treatment and the Evidence
Dysphagia Treatment Types

A) Behavioral
  1. Symptomatic-compensatory
  2. Rehabilitative
  3. Emerging!

B) Medical surgical treatment

What is Research Evidence?

- Best Available Research Evidence: "researchers, practitioners, and policy-makers to determine whether or not a prevention or a treatment program, practice, or policy is actually achieving the outcomes it aims to and in the way it intends".


Levels of Research Evidence

- Other forms of evidence
  - Experiential Evidence: based on the professional insight, understanding, skill, and expertise that is accumulated over time
  - Contextual Evidence: based on factors that address whether a strategy is useful, feasible to implement, and accepted by a particular community or patient!

BUT...

- Puddy, R. W. & Wilkins, N. (2011)

A Framework for Thinking About Evidence

- Best Available Research Evidence
- Evidence Based Decision Making
- Experiential Evidence
- Contextual Evidence

Figure 1

Puddy, R. W. & Wilkins, N. (2011)
Current Research Evidence in Dysphagia Treatment

Research Evidence
- Compensatory interventions
  - Postures
  - Maneuvers
  - Dietary adaptations
  - Environmental changes

Immediate outcomes

Research Evidence and Levels of Evidence
- Lingual strengthening
- Suprahyoid muscle strengthening and ROM exercises
  (Sheker et al. 1997; Logemann et al. 2005; Yoon et al. 2012)
- Expiratory muscle strength training
  (Pitts et al. 2009; Treche et al. 2010; 2014)
- Customized regimens: MDTP
  (Crary et al. 2012), LSVT (El Sharkawi et al. 2002)
- Neuromuscular Electrical Stimulation
  (reviews: Ludlow, 2010; Greegange et al. 2012; Studie & Ludlow, 2013)

Levels 4 to 2B
Levels 3B to 2A
Levels 2B to 1B
Levels 2B
Levels 4 to 1B

Emerging treatments
- Non-invasive brain stimulation
  - Repetitive Transcranial Magnetic Stimulation (rTMS)
  - Transcranial direct current stimulation (tCDS)
    (Kumar et al. 2011)

Research Evidence and Levels of Evidence
Levels 3B to 2A

Noninvasive brain stimulation in stroke

Emerging treatments
- Non-invasive brain stimulation
  - Repetitive Transcranial Magnetic Stimulation (rTMS)
  - Transcranial direct current stimulation (tCDS)
Current Reality in Dysphagia Treatment

Reality Check
- A Survey of USA Dysphagia Practice Patterns
  (Carnaby & Harenberg, 2013)
A brainstem stroke case study

Research Evidence
Advantages
- Principals
- Published randomized clinical trials (few)
- Positive results

Research Evidence
Limitations
- None has highest!
- Clinicians want to try more than one
- Patient specific
  - Patient adherence?
How can we improve our patients’ chances for rehabilitation given these limitations?

By enhancing our ...

• Experiential Evidence

• Contextual Evidence

For swallowing, this means...

• We have to:
  a. use our knowledge of the complex physiology and neurophysiology of the swallowing mechanism;
  b. take advantage of as many principles of experience dependent neuroplasticity as possible

Experiential Evidence Enhancement

• “Evidence-based rehabilitation programs need to be developed upon the knowledge of nervous system function and control over the sensorimotor task being rehabilitated”

• “AND follow principles of experience-dependent plasticity”
  (Charles & Gordon, 2006; Klein and Jones, 2008)

Swallowing Neurophysiology

Highly Complex

PNS

NOT A MERE REFLEX ANYMORE, BUT A RESPONSE!

(Malandraki et al. 2009; 2011; Martin & Sessle, 1993; Miller, 1986; Miller, 1993)
Principles of experience-dependent plasticity

1. Use it or lose it
2. Use it and improve it
3. Plasticity is experience-specific
4. Repetition matters
5. Intensity matters
6. Time matters
7. Salience matters
8. Age matters
9. Transference
10. Interference

By enhancing our

- Experiential Evidence
- Contextual Evidence

For swallowing this means

- Patient-centered factors
  - Holistic evaluation / Salience!
  - Take into consideration the whole person
  - Wishes, goals, treatment selection, foods
  - clear explanations; HW sheets; photos or video
- Therapy-related factors
  - Think about dosing, frequency and duration!
- Social factors
  - Think about caregivers and participation

Revisiting the Case Study

- Look at the treatment plan you designed
- What would you change to make your treatment more neuroplasticity-principled and more prone to succeed in terms of adherence?

How can you combine this information (neuroplasticity and adherence) with the Research Evidence and maximize patient outcomes?
Our suggestions...

Per our protocol (Intensive Dysphagia Rehabilitation, IDR)
1. Understand patient’s diagnosis and swallowing disorder by completing a holistic and comprehensive evaluation
2. Patient’s preferences on foods need to be considered
3. Choose specific targets for treatment WITH patient

Malandraki et al. 2014

Per our protocol (Intensive Dysphagia Rehabilitation, IDR)
4. Target 1 or 2 at best treatment areas for rehabilitation (choose priority areas but also areas the patient can work on)
5. Use compensatory treatments as stepping stones, but always with rehabilitation
6. Choose from evidence and combine evidence treatments
7. For exercise based treatments, follow principles of exercise physiology

Malandraki et al. 2014

Per our protocol (Intensive Dysphagia Rehabilitation, IDR)
8. Include functional targeted practice or make exercises functional and patient specific! PRINCIPLE OF SALIENCE!
9. To increase adherence:
   a. Engage caregivers
   b. Think about intensity of therapy and bouts of therapy instead of long protocols
   c. HW sheets / health literacy
   d. Follow-up

Malandraki et al. 2014

Summary points
- Evidence is available for you to critique and decide when and how to use
- Principles of rehabilitation and experience-dependent plasticity are essential to maximizing patient outcomes
- Patient-centered, therapy-centered and social factors should be considered to increase adherence

Selected References
Other Useful Resources

- ASHA’s website on EBP
  - http://www.asha.org/members/ebp/
- ASHA’s evidence Maps
  - http://ncepmaps.org
- Free webinar on NEMS evidence (Ludlow)
  - https://vimeo.com/106350419
- DRS list of resources
  - http://www.dysphagiaresearch.org/?page=Resources

THANK YOU!!