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Vanderbilt SLP Journal Club: Prognosis for Aphasia Across the Continuum of Care
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Moderated by:
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Learning Objectives

After this course, participants will be able to:

- Describe the critical components of language recovery in the acute, sub-acute and chronic phases of recovery.
- Describe the factors that influence decisions for discharge disposition.
- Describe the variables that may aid the provision of a prognosis for language recovery.
Before we get started…

How many of you work in:
- acute care?
- skilled nursing facility?
- inpatient rehabilitation?
- outpatient rehabilitation?
- a non-medical setting?

Objectives

- Purpose of Prognosis
- Patterns of reorganization of language
- Influence of aphasia on discharge disposition
- Prognostic variable method
Purpose of Prognosis

To predict the eventual outcome reached by a patient at a specific time, and/or the amount of change a patient will make over a specified period of time.

- Tailor treatment for each individual
- Set realistic goals
- Allocate resources appropriately
Objectives

- **Purpose of Prognosis**

- **Patterns of reorganization of language**

- **Influence of aphasia on discharge disposition**

- **Prognostic variable method**

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**Review Article**

**What Is the Nature of Poststroke Language Recovery and Reorganization?**

**Swathi Kiran**

1. Department of Speech, Language, and Hearing Sciences, Sargent College of Health & Rehabilitation Sciences, Boston University, 635 Commonwealth Avenue, Boston, MA 02215, USA
2. Massachusetts General Hospital, Boston, MA, USA

Three main topics related to poststroke language recovery and reorganization:

1. The nature of anatomical and physiological substrates in the infarcted hemisphere
2. Current neuroimaging evidence for language recovery post-stroke
3. Change in connectivity as a function of recovery post-stroke
Phases of Recovery

- Acute Phase
- Sub-acute Phase
- Chronic Phase

**Acute Phase of Recovery**

- Reperfusion of tissue


Kiran (2012)
Prediction Based on Perfusion Abnormality

Hypoperfusion of specific brain regions, via magnetic resonance perfusion weighted imaging (PWI), is associated with disruption of selective lexical functions.

Hillis, Kane, Tuffiash, Ulatowski, Barker, Beauchamp, & Wityk (2001)
Reperfusion and Language Performance

- Reperfusion of the same regions, in the absence of infarct in that region, would restore the associated lexical function.

Hillis, Kane, Tuffiash, Ulatowski, Barker, Beauchamp, & Wityk (2001)

- 5 patients with poor perfusion, but not infarction, of Brodmann’s area 22 (BA 22), and 1 patient with poor perfusion Brodmann’s area 37 (BA 37) as well as BA 22

Hillis, Kane, Tuffiash, Ulatowski, Barker, Beauchamp, & Wityk (2001)
Reperfusion and Language Performance

- Each patient was treated with induced blood pressure elevation to increase perfusion of the ischemic and dysfunctional tissue
- Daily testing of naming and comprehension

Hillis, Kane, Tuffiash, Ulatowski, Barker, Beauchamp, & Wityk (2001)
Reperfusion and Language Performance

**FIG. 5.** Mean performance of patients who showed improved lexical-semantics, before and during treatment. Shaded columns represent percentage errors in oral naming; solid columns represent percentage errors in word/picture verification (comprehension).

Hillis, Kane, Tufflash, Ulatowski, Barker, Beauchamp, & Wityk (2001)

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Reperfusion of ...

- Wernicke's area
- MTG, fusiform, Broca’s, & Wernicke's
- LIFG

Hillis, Barker, Beauchamp et al. (2001)
Davis et al. (2008)
Take Away

- “...reperfusion of the hypo-perfused area during the acute stages is a critical component of recovery of language and also underscores of the importance of these regions in various aspects of language processing in the brain.” (p.5)

Kiran (2012)

Sub-acute Phase of Recovery

- Resolution of diaschisis

Hypometabolism of structurally normal areas remote from the infarct
Resolution of Diaschisis

- Cappa et al. (1997)
  - 8 patients with aphasia due to unilateral left hemisphere stroke
  - Language testing and PET study performed at 2 weeks and 6 months post-stroke

- Acute phase (2 weeks):
  Widespread hypometabolism

- Sub-acute phase (6 months):
  Bilateral metabolic recovery
  Improved language function

- Price et al. (2001)
  - 4 patients with aphasia (PWA) and lesion in posterior inferior frontal cortex
  - Viewed words vs. consonant strings while in a scanner
  - In non-neurologically damaged individuals activation occurs in posterior inferior frontal, middle temporal, and posterior inferior temporal cortices
  - In PWA, abnormal activation in the damaged inferior frontal cortex AND undamaged inferior temporal cortex
Take Away

- In the subacute phase, “…recovery of language is dependent on the persistence of hypoperfusion and hypometabolism in regions proximal and distant from the site of lesion. It is likely that the resolution of diaschisis is dependent on the extent of neural plasticity possible in the peri-infarct tissue and the nature and scope of behavioral rehabilitation.” (p.6)

Kiran (2012)

Chronic Phase of Recovery

- Role of the ipsilesional hemisphere

[Brain diagrams]
Ipsilesional Hemisphere

- Turkeltaub et al. (2011)
  - Meta-analysis of functional neuroimaging studies using language tasks to examine the neuroplastic changes that occur in recovery from aphasia
  - Control participants activated left hemisphere language areas
  - PWA activated left hemisphere language areas, new left hemisphere areas, and right hemisphere areas homotopic to left language areas

Ipsilesional Hemisphere Activation following treatment

- Increased bilaterally
  - Fridriksson et al. 2006
  - Fridriksson et al. 2007

- Increased ipsilaterally
  - Fridriksson et al. 2010
Take Away

- “…the evolution of studies examining rehabilitation in poststroke aphasia increasingly points towards the principal engagement of perilesional regions in supporting training induced language recovery and is consistent with Turkeltaub et al.’s [59] suggestions about the role of the left IFG and perilesional regions in natural language recovery.” (p.7)

Kiran (2012)

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Questions for the group

- In your experience, does the presence of aphasia influence whether a patient is discharged to inpatient rehab?
- If so, is the decision based on severity of aphasia? That is, individuals with more severe aphasia go to inpatient rehab.

Role of Aphasia in Discharge Location After Stroke

Marlis González-Fernández, MD, PhD1, Asare B. Christian, MD1, Cameron Davis, MS2, and Argye E. Hillis, MD, MA1,2,3
1Department of Physical Medicine and Rehabilitation, Johns Hopkins University, School of Medicine, Baltimore, Maryland, USA
2Department of Neurology, Johns Hopkins University, School of Medicine, Baltimore, Maryland, USA
3Department of Cognitive Science, Johns Hopkins University, School of Medicine, Baltimore, Maryland, USA

- Examine the relationship between language deficits and discharge to an institutional setting
- Hypothesized that comprehension would be associated with discharge after adjusting for OT and PT needs
Influence of Aphasia on Discharge Disposition

- 152 subjects who had a clear discharge location (88 - home, 50 – acute rehabilitation unit, 14 - nursing home or other institutional setting)
- Subjects with a diagnosis of stroke or TIA were included in the study

Assessment tasks:
- Oral naming of pictures
- Written naming of pictures
- Oral naming with tactile input
- Oral reading
- Oral spelling
- Repetition of pseudowords
- Written spelling to dictation
- Spoken word-picture verification
- Written word-picture verification

González-Fernández, Christian, Davis, & Hills, 2013
Influence of Aphasia on Discharge Disposition

Auditory Comprehension:
- Institutional setting: 63.6%
- Home setting: 42.9%

Reading Comprehension and Tactile Naming:
- Institutional setting: 70.7% and 62.9%
- Home setting: 54.0% and 43.6%

Objectives

- Purpose of Prognosis
- Patterns of reorganization of language


- Influence of aphasia on discharge disposition


- Prognostic variable method

Prognostic Variable Method

- Use data from biographical, medical, and behavioral variables to infer a patient’s potential for a positive outcome or significant amount of change in performance
- Other methods
  - Behavioral profiles
  - Statistical prediction

Prognostic Variables in Aphasia

- Biographical variables
  - age
  - education
  - premorbid intelligence
  - occupational status
- Medical variables
  - etiology
  - extent of lesion
  - physical condition
  - time post-onset
- Behavioral variables
  - severity of aphasia
  - type of aphasia
  - performance on verbal/nonverbal measures
Prognostic Variables

Plowman, Hentz, & Ellis (2012)

- **Biographical Variables**
  - Gender – no evidence
  - Handedness – no evidence
  - Age – mixed evidence
  - Education/socio-economic status – no evidence
  - Intelligence – mixed evidence

- **Medical/Behavioral Variables**
  - Initial stroke and aphasia severity*
  - Site/size of lesion*

* Positive evidence
### Age

#### Important indicator
- Eisenson (1949)
- Wepman (1951)
- Vignolo (1964)
- Sands, et al. (1969)
- Holland, et al. (1989)
- Laska et al. (2001)

#### Not important indicator
- Culton (1971)
- Sarno & Levita (1971)
- Keenan & Brassel (1974)
- Kertesz & McCabe (1977)
- Lendrem & Lincoln (1985)
- Wertz & Dronkers (1990)
- Basso (1992)
- Pedersen et al. (2004)
- Inatomi et al. (2008)

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#### When all else is equal, age is not a significant predictor of outcome or amount of change

- VA Cooperative Study data – highly controlled sample of individuals with aphasia (sensory loss, coexisting medical deficits, etc)
Initial Severity of Aphasia

- General belief that individuals with less severe aphasia have potential for a better ultimate outcome.

Kertesz & McCabe (1977) caution against inferring that higher outcome levels are synonymous with a larger amount of change.

- Broca’s and Wernicke’s aphasic patients often demonstrate the most change
- Anomic aphasic patients have the better ultimate outcome.
Language Measures

de Riesthal and Wertz (2004)

- **Outcome at 48 weeks postonset**
  - Token Test — PICA
  - PICA — PICA, RFP
  - Word Fluency — PICA, RFP
  - Conversation — PICA

*positively correlated

- **Change from 4-48 weeks postonset**
  - Token Test — PICA
  - PICA — PICA
  - RFP — RFP
  - Word Fluency — PICA
  - Conversation — PICA

*negatively correlated
Site and Size of Lesion

- General consensus that the site and size of lesion that causes aphasia can influence recovery from aphasia

Mohr et al. (1978)
- Lesions to Broca’s area alone do not result in persisting Broca’s aphasia, only transient mutism is seen at onset, which resolves into a mild speech disorder, dyspraxia. (Baby Broca’s)
- Persisting Broca’s aphasia results only from extensive lesions in the territory of the upper division of the left MCA. This includes: Broca’s area, adjacent prefrontal cortex, anterior parietal regions, the insula, and underlying white matter. (Big Broca’s)
Site and Size of Lesion

Mazzoni et al. (1990)
- Recovery patterns in 45 patients with aphasia
- Smaller lesions – Improvement in auditory comprehension (AC), verbal expression, and written expression.
- Medium size lesions – Improvement in AC and verbal expression
- Large lesions – Improvement in AC

Site and Size of Lesion

Alexander et al. (1990)
- Lesions in frontal operculum that extend into deep white matter – more severe, persistent non-fluent aphasia

Kertesz et al. (1993)
- Lesions involving supramarginal gyrus, angular gyri, and superior temporal area, but sparing superior and middle temporal gyri – better recovery of auditory comprehension
Time Post-onset

- When does spontaneous recovery occur?
  - 2 months (Culton, 1969)
  - 3 months (Lendrem & Lincoln, 1985)
  - 6 months (Basso et al., 1979; Deal & Deal, 1978; Kertesz & McCabe, 1974; Vignolo, 1964)

- Wertz et al. (1981) report % of total improvement with treatment in 3 month periods
  - 0-3 months - 65%
  - 3-6 months - 18%
  - 6-9 months - 10%
  - 9-12 months - 7%
Recovery from aphasia after stroke is rapid, variable and dynamic

We're still not very good at prognosis but...

We know medical management impacts recovery

Biographical, medical, and behavioral variables are associated with recovery

We can distinguish between
1. Ultimate outcome
2. Amount of change

Wilson 2014

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Review

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References


