

COGNITIVE CHANGES AFTER A STROKE

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“I CANNOT MAKE YOU UNDERSTAND. I
CANNOT MAKE ANYONE UNDERSTAND
WHAT IS HAPPENING INSIDE ME. I CANNOT
EVEN EXPLAIN IT TO MYSELF.”

— Franz Kafka, *The Metamorphosis*

Why is this important

- More than 50% of patients have some sort of cognitive decline post-CVA (Barker-Collo, et. Al, 2009).
- Cognitive Decline is a more important determinant of broader outcomes as opposed to physical impairments (Barker-Collo, S. et. Al, 2009).
- Cognitive decline is a major cause of disability in patients with CVAs. Furthermore, there is some evidence that there is continued decline post-CVA (Levine, et. Al, 2015.).

Trajectory of Cognitive Decline after Incident Stroke (Levine, et. Al, 2015)

- A study by Levine et al., 2015 examined the rate of cognitive decline for 23,572 participants 45 years or older without baseline cognitive impairment. 515 survived a stroke incident and 23,057 remained stroke free.
- Patients were followed 6 years post-CVA.
- Changes in global cognition, new learning, and verbal memory were noted.
- Patients with stroke had a faster global cognitive and executive function decline when compared with those who had not had a stroke (19.2% vs 8.7%; $P < 0.001$).

- There was a significant rate of decline in global cognition, compared to pre-stroke rate of decline (odds ratio 1.23 per year; 95% CI 1.10-1.38; P=0.097).
- Although, there was a significant acute declines in new learning and verbal memory immediately after the stroke (Word list learning: 1.80 points; 95% CI, 0.73-2.86; P=0.001, and Word List Delayed Recall: 0.60; 95% CI, 0.13-1.07; P=0.012). New learning and verbal memory increased over time after the stroke. (P-values for change in slope after the stroke were 0.91 for WLL and .70 for WLD).
- Even though the initial decline in these areas was significant, the rate of decline after 1 year was the same as the pre-stroke rate of decline

Limitations of this Study

- This study did not include patients with Aphasia.
- The study was unable to control for stroke features (location, laterality, severity)
- Only community dwelling participants were enrolled in the study.
- Sample size for the cohort in this age group was smaller than the which may have impacted the statistical significance of the secondary measures (i.e. verbal memory)

Cognitive Areas Impacted



Attention/Impulsivity



Memory



Executive
Functions



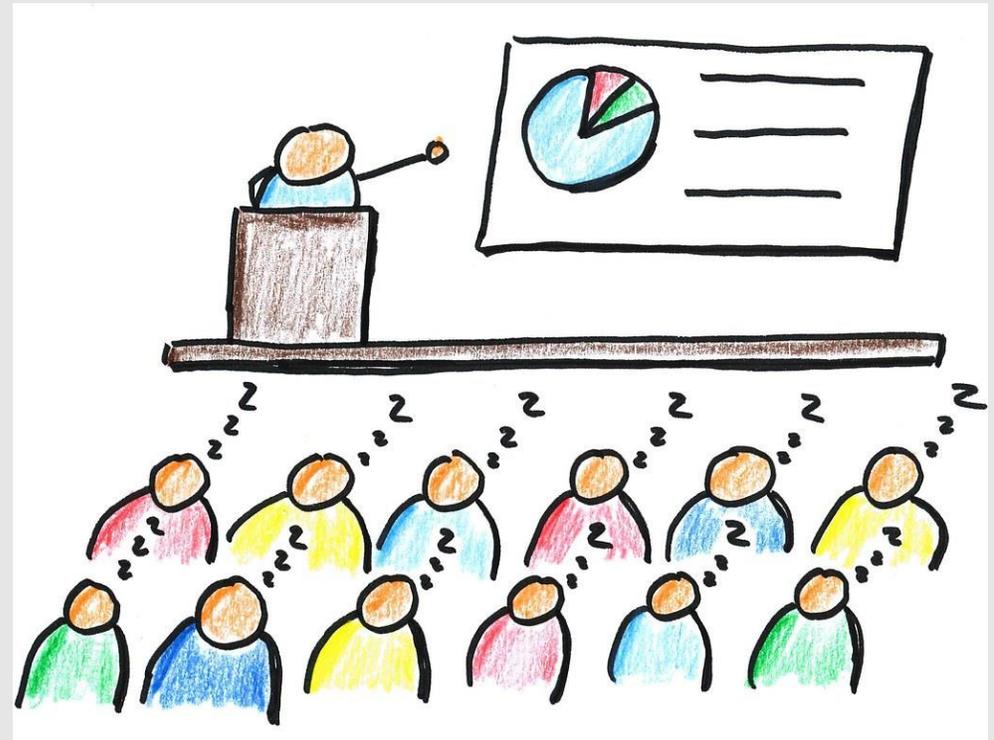
Emotional Impacts

Attention

- There are a variety of forms of attention including:
 - Sustained Attention: The ability to focus on a specific task.
 - Divided Attention: The ability to focus on more than one aspect of a task or more than one task at a time.
 - Selective Attention: The ability to examine small important details of a task.

Sustained Attention

- Many patients post-CVA have decreased sustained attention.
- This impacts the ability to learn new information.
- It also impacts overall comprehension and memory.
- Sustained attention may be as little as 30-60 seconds in some patients.



Divided Attention



- Divided attention is the ability to pay attention to multiple streams of information at the same time. (ie. Driving a Car)
- The inability to divide attention can impact everyday activities, such as cooking, childcare, shopping, driving, and other activities.

Selective Attention

- The ability to pay attention to important details in a task.
- This includes the ability to ignore information that is not important for the task at hand. Such as, completing a task in a noisy or distracting environment.
- For example, being able to talk to someone on the phone while completing a written task.
- This can be difficult for patients post-CVA because of fatigue and other physical impacts from the CVA.



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Example of Selective Attention

<https://youtu.be/vJG698U2Mvo>



THOMAS

*Names in case studies are not the names of actual patients

I can still drive!



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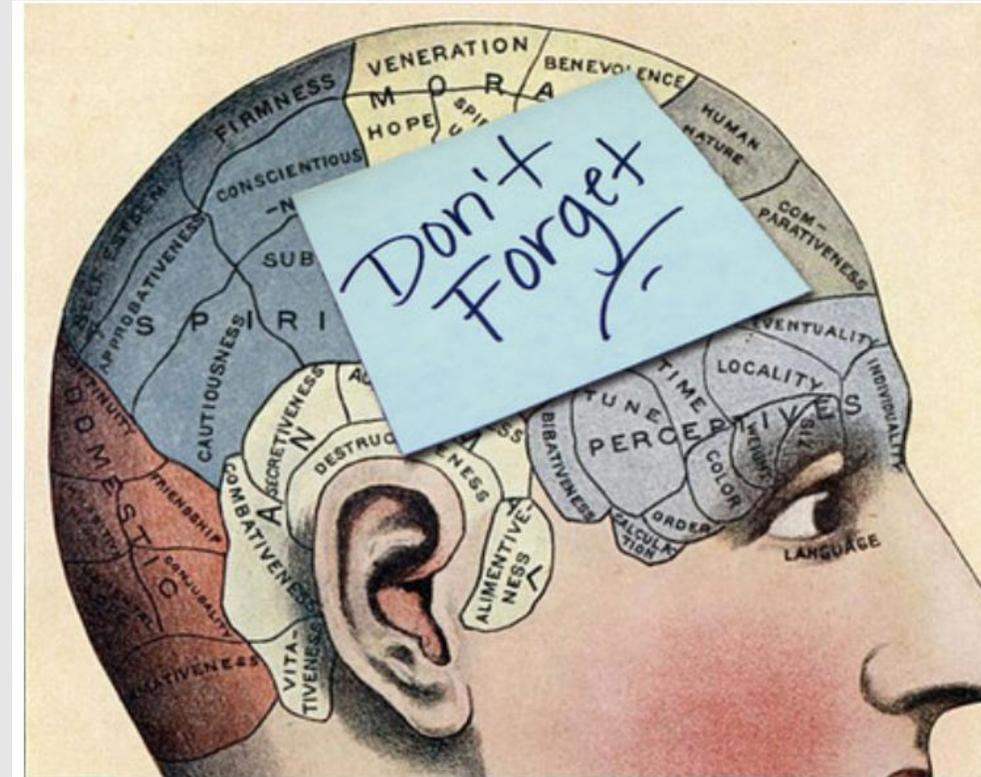
- Thomas initially had a small stroke with minimal impairments. While driving home from the hospital he had another CVA in the right hemisphere.
- Due to left sided visual hemianopsia, he was unaware that he was driving on the wrong side of the road.
- He was pulled over by the police but denied any problems. He even wanted to keep driving!

Attention deficits

- Because he was impulsive, and had decreased sustained attention, he had difficulty keep attention to one task for more than about 1 minute.
- He also had difficulty focusing on more than one task at a time (Divided Attention).
- Plus difficulty working in distracting circumstances (Selective Attention).
- Furthermore, he was impulsive, and a fall risk, as he would try and stand, even though he had left-sided hemi-paresis.
- Decreased attention combined with poor impulse control and impaired executive functions impeded his ability to return home.

Memory

- Types of memory include:
 - Short-term memory
 - Working memory
 - Long-term memory
 - Procedural memory
 - Prospective memory



Short Term Memory Vs Long Term Memory

Short-Term Memory

- This type of memory consists of items that need to be recalled for short amounts of time.
- Sometimes considered the scratch pad of the mind.
- This type of memory is an important element of working memory.
- Inability to lay down short-term memory, inhibits the ability to make long-term memories.

Long-Term Memory

- These types of memories can be episodic memories
- These can also consist of recall of information for ADLS and routines.
- Long-term Memory is rarely impacted by CVAs.
- This can be problematic, because the patient may recall what they could do and be unable to recall what they can't do, because of STM loss.

Working Memory

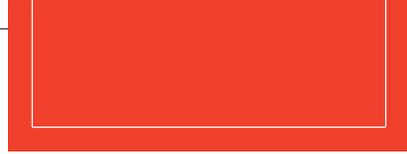
- This type of memory is the ability to take information from the Short-Term Memory and manipulate that information.
- For example, walking to a phone and dialing a phone number someone just gave you.

Procedural Memory

- This is the ability to recall how to complete routine procedures such as driving a car.
- It is also the ability to complete these routine tasks, with out any conscious effort.
- Therefore a patient may not recall what happened the day before, but they can still recall how to brush their teeth or complete other routine activities.

Prospective Memory

- This is the ability to recall that you will need to complete a memory at a future time.
- This includes, things like recalling a doctor's appointment.
- Prospective Memory is difficult, because many times a patient thinks he should be able to recall this information, but because of short-term memory and attention deficits will forget about the activity.
- Procedural memories include ingrained habits, but lack of short-term memory and decreased self awareness impedes the patient's ability to see their deficits.



SUSAN

What was I doing?

- Susan had a CVA which significantly impacted her memory.
- Her ability to converse well with others masked her difficulties with memory.
- Many times she would use humor to cover up her deficits.
- Her intact language made her appear more capable than she was, but this was a thin veneer.



Memory Deficits

- Susan had short-term memory deficits. She had difficulty recalling that she even had a stroke or that she was in the hospital.
- At times she would forget what she was doing in the middle of a task.
- Her long-term memory was intact, as was her prospective, and procedural memory, so she was able to complete familiar routines.
- Still new routines were difficult. For example, using the nurse call light. She simply got up and went about her business.

Executive Functions



- What you don't know you don't know **can** hurt you.
- Executive Functions are the abilities to think about thinking.
- Poor impulse control is an example of difficulties with Executive Functioning.
- Self-monitoring for task completion, awareness of how long a task will take and planning the steps to complete the task are all examples of executive functioning.

Executive Function Self-Awareness



You know you don't know and know what to do.



You know you don't know, but don't know how to ask.



You don't know what you don't know



I don't know why I did that!



This is related to difficulties with attention and poor self-awareness.



At times, the patient simply does not know what they don't know.



It also may be due to ingrained habits, coupled with decreased ability level.



Impulsivity can be a barrier to adapting to the new situation post-CVA.

A quick note on Impulsivity!



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MATT

I am just fine! Thank you.

- After his CVA Matt had difficulty with Executive Functions, as well as memory, and attention.
- He was impulsive and had little self-awareness of deficits. In fact, he claimed to be “just fine”. Even though he was unable to walk, transfer, or complete most ADLs.
- He believed that as soon as he left the hospital, his life would return to the way it had been. In fact, he planned on driving himself home.





- Even when confronted with his deficits, Matt continued to deny them, blaming his difficulties on others, the equipment, or simply being in the hospital.
- Matt vehemently insisted on leaving the hospital and refused to participate in therapies.
- He required a lot of encouragement and education to realize the extent of his deficits.

Emotional Impacts of CVA

- This is an often-overlooked area.
- Many times patients are told how “lucky” they are to have survived the stroke.
- Lability and depression are also a common side-effect of a CVA. Many patients will cry easily and be embarrassed by their lability.
- However, Grief is a real underlying issue that needs to be acknowledged.
- Personality changes are also not uncommon.



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The Five Stages of Grief

- Post-CVA patients, family members, and those close to the patient may cycle through various stages of grief.
- These stages include: Denial, Anger, Bargaining, Depression and Acceptance.
- These stages do not occur in order, but can occur or reoccur in a cyclical fashion, especially as full awareness of deficits becomes more apparent to the patient and those close to them.



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Denial

- “I can’t believe that this happened to me.”
- “They say I had a stroke, but I don’t believe them.”
- “ When I get out of here, then I will be better.”
- Denial is a normal part of the grieving process. Our patients are grieving the loss of the person that they used to be and confronting a new reality.
- It’s easier to pretend that things haven’t changed, but eventually the reality of the situation becomes clear.



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Anger



- "I am no longer capable! This is not fair!"
- "I am so sorry. He never used to act that way!"
- Many times when patients are in this stage, families will be surprised by how different their loved one's personalities seem.
- Feeling angry and out-of-control is a typical response many patients have. Coupled with impulse control issues, and memory problems, they may say things that they later regret.

Bargaining

- “If I do the work, then I can go back to normal?”
- “If only, I had taken my medicine, then I wouldn’t be here.”
- “If only, I hadn’t been so stubborn, I would have come to the hospital sooner.”
- This is the “what if” stage. Patients try to bargain their way out of the current situation but thinking of things that they could have done differently.
- This impedes them from focusing on what they need to do now to get better, but again as they work through the grieving process this is an important step. It helps them realize that they can be proactive.



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Depression

- “I don't know why I can't stop crying.”
- “I can only think about the things that I can't do anymore!”
- “I am useless, no good to anyone like this.”
- Coupled with lability, this can be a difficult stage. Many times families and patients think they should be happy that they survived.
- Loss of self, independence, even one's sense of belonging are all impacted by the CVA. Patients need reassurance that what they are feeling is normal.



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Acceptance



- “Things may be different, but I can find a way!”
- “ I can and I will!”
- “My family loves me, and I know we can beat this together!”
- In this stage Patient’s and their loved ones are more aware of their deficits.
- Patients are more motivated to continue the rehab process and make adaptations as needed.
- Not all patients reach this stage before leaving the hospital.



HOPE

“She was always so capable.”

- Hope’s family and even Hope herself are stuck in the denial of the severity of her CVA. Hope has right-sided hemiparesis, is on thickened liquids, and has difficulty completing even routine ADLS without assistance.
- Hope has intact expressive language skills, but has difficulty with comprehension, attention, memory, and executive functions.
- Since, Hope is so talkative, it is easy for her family to forget about her deficits. Both her and her family are having difficulties believing or accepting the extent of her deficits.

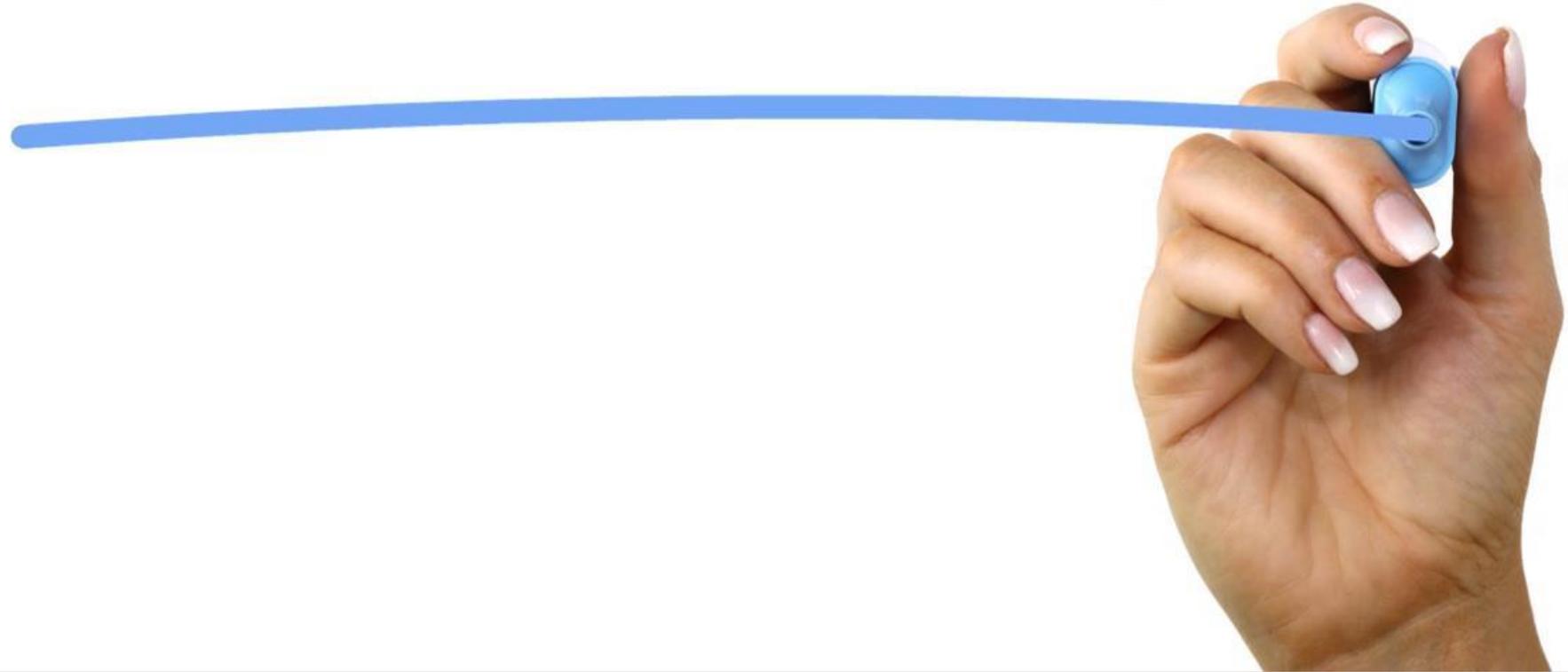


- Hope and the family try to bargain with the hospital to send her home earlier, since her deficits are not “that bad”.
- However, she requires 24/hour supervision which they are unable to provide.
- At first Hope and the family are angry about this, but after a family visit and working with therapists, they can truly see the extent of her deficits, and the importance of continued rehab services.



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QUESTIONS



Literature Cited

- Barker-Collo, S. L., Feigin, V. L., Lawes, C. M., Parag, V., Senior, H., & Rodgers, A. (2009). Reducing attention deficits after stroke using attention process training: a randomized controlled trial. *Stroke*, 40(10), 3293-3298.
- Levine, D. A., Galecki, A. T., Langa, K. M., Unverzagt, F. W., Kabeto, M. U., Giordani, B., & Wadley, V. G. (2015). Trajectory of cognitive decline after incident stroke. *Jama*, 314(1), 41-51.