2025 North Carolina Brain Injury Conference

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Lumina on Wrightsville Beach

> BRAIN INJURY ASSOCIATION OF NORTH CAROLINA

Al in TBI Care: Practical Tools for Providers, Patients, and Caregivers

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Disclosures

- I am employed by UNC Physicians Network full-time and receive a salary from them for my work with the UNC THRIVE and UNC Brain and Body Programs.
- I receive no direct compensation from any AI-related companies.
- I own stock in a variety of technology companies that are investing heavily in AI, including Google, Meta, and Nvidia.
- I receive occasional compensation for work as an expert witness in TBI-related court cases.
- I will receive an honorarium for this presentation today to cover travel and lodging.
- This presentation reflects my personal views and does not necessarily represent the official position of The Brain Injury Association of America, The Brain Injury Association of North Carolina, UNC Chapel Hill, the UNC THRIVE Program, or the UNC Brain and Body Program.

Disclaimer

For Educational Purposes Only

• This presentation should not be interpreted as formal medical advice and should not replace professional healthcare guidance from a provider that has reviewed the details of your specific case.

Al is a Tool, Not a Replacement

- Al can **support** TBI rehabilitation but does **not replace** licensed medical professionals.
- Like the internet and other technologies, direct use of AI may not be appropriate or feasible for some TBI survivors. I recommend that if a TBI survivor is going to use AI solutions, it should always be done initially with caregiver or professional supervision to ensure safety.

Limitations & Risks

- Al may provide **inaccurate, biased, or outdated** information—always **verify medical details** with a provider.
- Medical decisions, treatment plans, and medications should never be based on AI recommendations alone.

Data Privacy & Security

- Avoid entering **personal health information** into non-secure AI platforms.
- Only use **HIPAA-compliant** AI tools for handling sensitive medical data.



THRIVE PROGRAM

Now with UNC THRIVE Program

- Multidisciplinary rehab for veterans and first-responders with mild-to-moderate TBIs
- Patients see ~10 disciplines over 3 days
- ~50% of patients return for 2 or 3-week intensive outpatient program (IOP).

• Grant-funded program, eliminating barriers to care

- Discharge status
- Insurance status
- Place of residence
- Part of the Avalon Action Alliance
 - National network with 7 TBI centers, 11 post-traumatic stress programs, and 2 substance abuse centers.
- I also see retired NFL players as part of UNC's Brain and Body Program.

Objectives

Introduction to AI technology and large language models (LLMs)

Educate on practical ways to use AI in medical and everyday settings

Discuss pros and cons of AI as well as future of technology





AI: Why does it matter?

Medical Professionals

- Enhances creativity and personalizes treatments
- Will help quickly and fully learn and analyze medical histories
- Effortless documentation

TBI Survivors

- Helps personalize the rehab experience
- Facilitates home exercise programs
- Improves independence via AI communication tools

TBI Caregivers

- Enhanced support tools, even for less tech-savvy people
- Improved communication with TBI survivor
- Assistance with brainstorming ideas for rehab and life participation







Al: What is it?

- Large language models (LLMs)—systems trained to understand and generate text.
 - LLMs **predict words** based on patterns learned from books, articles, conversations, and other texts.
 - LLMs feed text through layers of "transformers", which allow the program to analyze input from numerous different angles
 - Homonyms, pronouns, adjective+noun pairs, first and last names, etc.



Lee, T. B., & Trott, S. (2023, July 27). *Large language models, explained with a minimum of math and jargon. Understanding AI*. Retrieved from <u>https://www.understandingai.org/p/large-language-models-explained-with</u>





Location	Latitude	Longitude	
Seoul, South Korea	37.6	127.0	
Tokyo, Japan	35.7	139.8	
San Francisco	37.8	-122.4	× /
Los Angeles	34.1	-118.2	



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Interesting Implications

Geographical maps only have 2 dimensions, but LLMs have thousands.

 As high as 12,000+ in some cases, but now more like ~3,000

Mapping words in this way leads to some fascinating outcomes

 Can understand word relationships and extrapolate





Interesting Implications

Leads to many of the same biases as real humans In earlier models, if you asked it "What is 'doctor' minus 'man' plus 'woman'?" it would output "nurse."

These models can understand puns and ambiguity in language well

 Always has the various meanings of a word at its 'fingertips', even the less common ones







"The other day I met a Polish DJ, and a Czech one too."





Here's the breakdown:

1. Literal Interpretation:

The sentence sounds like someone is telling a simple story about meeting two DJs—one from Poland and one from the Czech Republic. Nothing unusual so far.

2. The Pun (Where the Joke Happens):

When you hear "Czech one too," it sounds almost identical to "check one, two," which is what DJs or audio engineers often say into a microphone during a soundcheck (to test the mic).

- "Czech" = "Check"
- "one too" = "one, two" (counting for a mic check)
- 3. Why It's Funny:

The punchline creates a surprise because your brain shifts from thinking about meeting DJs to recognizing that the sentence sounds like a DJ doing a mic check: "Check one, two."

Not just written words...

- Major rehab potential with AI-generated images, videos, and digital worlds.
 - Virtual reality (VR) rehab environments tailored to patient needs.
 - Al-driven adaptive gaming for cognitive and motor rehabilitation.
 - AI-powered visual storytelling for therapy and education.
 - On-the-fly audio language translation.
- Complex ethical considerations
 - "Deepfakes", misinformation, and copyright considerations
 - Loss of human touch in art (which is the whole point!)
 - Lack of consent of authors to have their works used to train AI







How I'm Using Al

• First and foremost, AI is for brainstorming

• Predict follow-up questions to presentations...

• Personalized, relevant therapy materials

- Medical professional → Hypothetical case studies and patient questions
- Military \rightarrow Fake intelligence reports
- Office employee \rightarrow Email practice
- Student \rightarrow Reading passage on their area of study
- Specific dialect or speech difficulty → Word and sentence lists or paragraphs that heavily feature challenging speech sounds







How My Patients are Using Al

- Creating plans to reach goals
- Writing assistance and editing
- Brainstorming questions to help bring back memories of important events
- Generating journaling prompts to help process memories and emotions
- Making additional therapy activities for themselves
 - Reading/writing practice
 - Role-playing conversations







How Caregivers Are Using Al

- Organizing and summarizing lengthy medical histories
- Brainstorming questions to make medical appointments more productive
- Assisting with written communication with medical team
- Generating home exercise activities for their loved one
- Brainstorming recreational activities that a person can do given specific limitations







Easy ChatGPT Tasks for Cognition-Focused Practice

Budgeting practice

Error detection games

Event planning practice

Grocery list generating and planning

Perspective-taking practice

Role playing ideas

Route planning practice

Storytelling practice

Summarization practice



Easy ChatGPT Tasks for Speech and Language Practice

Challenging speech sound word/sentence lists or paragraphs

Fill-in-the-blank tasks

Generating conversation starters

Metaphor/idiom practice

Minimal pair drills (Cat/Bat/Hat/Sat/etc)

Question/Answer Practice

Synonym/antonym practice

Storytelling practice

Word/sentence lists containing vocab from relevant topics



How I'm Planning to Use AI Next...

New voice-based version of ChatGPT

• Opportunities for independent practice with conversational skills

OpenBrain Al

- Useful for clinicians to do complex, automated language analysis
- Audio transcription and automatic translation, IPA transcription
- Readability scoring, phonology, morphology, syntax, semantic measures, and lexical measures

Automated Meeting Transcription (Otter.ai)

- Generates summaries and transcriptions of meetings
- Helpful in both business and medical contexts



Exciting Developments

Voiceitt and Google Project Relate

- $\,\circ\,$ Apps that use AI to "translate" non-standard speech for unfamiliar listeners
- Still works in progress, but recent developments in AI have helped rapidly accelerate their development

• Starkey Edge AI RIC RT Hearing Aids

- $\,\circ\,$ AI powered hearing aids uses AI's understanding of language to better identify and amplify specific speech sounds
- $\,\circ\,$ Currently quite expensive (\$3500-\$4000) and prescription only

OpenAl Whisper

- $\,\circ\,$ Extremely effective speech transcription
- $\,\circ\,$ Wide variety of potentially helpful use cases





Points of Caution

- Mistakes and Fabrication: AI still gets things wrong and even inadvertently makes things up
- Energy Consumption: Very heavy energy use
- Risk of Self-Diagnosis: Medical selfdiagnosis can go very wrong
- Erosion of Human Skills: Over-reliance could lead to a reduction in baseline human skills
 - Recent Microsoft study showed reduction in baseline critical thinking skills in some AI users





Points of Caution

- Bias & Fairness: Al systems can perpetuate biases that existed in the data they were trained on.
- Job Displacement: Automation is already replacing many jobs.
- **Privacy & Security:** Data breaches are always a risk. Be careful what you put into an AI program.
- A Little Learning is a Dangerous Thing: Al programs can give users a false sense of expertise in complex topics.



How Should We Proceed?



• Forward, cautiously

- Incredible tool to help those in need
- The human touch will always be important.
- Like other technologies, AI can be used for good or bad.
- Bad things might happen, but we're not going to make them any less likely by not engaging.



The Future of Al in Medical Care **Hyper-personalized rehabilitation** – AI will tailor exercises based on a patient's needs and goals

Faster medical documentation – AI is already automating doctor's notes, improving efficiency.

Earlier detection of conditions – AI can help catch rare diagnoses and identify phenotypes earlier.

Streamlining research – AI can summarize vast amounts of medical literature, speeding up development of new treatments.

Better, safer self-diagnosis and patient education – "GPT Agents" are showing great promise in early research



The Future of AI in Everyday Life **Education shift:** Transforming learning, for better or worse

Review summaries: Generates concise Amazon review insights

Al notifications: Apple Al summarizes notifications for clarity

Smart replies: Suggests and edits email/text responses

Entertainment picks: Improves recommendations for movies, music, and more.



Prompt Examples for Daily Life

Create a simple daily schedule for a TBI survivor, with reminders for medication at mealtimes, rest breaks, and therapy exercises. Help me make a grocery list and plan an easy meal. I want to make a basic chicken burrito bowl like the ones they make at Chipotle, but I want to use premade ingredients where possible.



Prompt Examples for Functional Communication Practice

Evaluate this email I wrote to my boss about returning to work after a brain injury. Suggest improvements. Clarity and conciseness are important to me given my recent injury. Give me conversation starters for reconnecting with friends when I feel socially isolated. Feel free to ask me follow-up questions if it would help create better prompts.



Prompt Examples for an SLP

Provide a structured worksheet for a TBI survivor to track their symptoms and energy levels. Create a personalized wordfinding exercise for a patient with moderate anomic aphasia. The patient loves dogs, UNC basketball, and Italian food.



Prompt Example for Rehab Tasks...The Long-Winded Version

I have a patient who is struggling with staying on topic after a TBI. He has previously mentioned that this issue happens a lot when he is talking with his friends when they watch NFL games together. Can you first generate a script for me that shows three friends talking about an NFL game that they are watching, but halfway through the script, one of the characters gets off-topic in a way that kind of breaks the normal, unwritten rules of conversation? Make the moment of transition one that starts with a comment that is on-topic but then veers off. I want to give this script to the patient to see if he can identify this moment.

Then, give me some NFL-related role-play conversational topics for us to practice staying on-topic.



Writing Good Prompts



Describe the desired outcome: "Summarize this article in 3-4 sentences using simple language." Don't be afraid of follow ups: If it's 80% right, tell it what's wrong with the other 20%.

2

Break down complex requests into pieces: Don't ask it to do two things at once if you can avoid it.



More context is good: When in doubt, give extra details—it can handle it!

More Tips



Starting point: Treat responses as drafts, not final answers.

It's conversational: Talk to it like a person. If you don't understand or need help, say so!

2

Verify important info: Always confirm elsewhere.

3

 Request different perspectives and supporting evidence.



Premium Version: The paid version is better.

• There is a limit to how much it can generate before you have to take a break.

Basic AI Tools

ChatGPT.com

 \odot Generally considered best all-around solution

• Deepseek.com

 \odot More adept at complex technical tasks, including coding \odot General world knowledge seems to be less robust

Gemini.Google.com

 \odot Can interface directly with your Google account (Calendar, email, etc) \odot Known to hallucinate more than ChatGPT

• Microsoft Copilot

Based on ChatGPT

 $\odot \mbox{Less}$ generalized, more focused on use within Microsoft's ecosystem





Key Takeaways

- Al is here to stay, whether we like it or not.
- **Practical Applications**: Despite some controversy, it has many practical applications that can help TBI survivors take control of their recovery.
- Always Verify Critical Info: AI makes mistakes—it can provide inaccurate information and perpetuate biases.
- It is changing healthcare. Automatic documentation, personalized treatment, and rapid analysis of health records will improve outcomes.
- Al is great at teaching you to use Al. If you don't know what to write, just ask it for help like you would a person.



Questions?





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- For veterans and first responders with history of concussion/mild to moderate TBI
- Our program and the philanthropic support it receives allow us to care for all veterans and first responders regardless of:
 - Discharge status
 - Insurance coverage/VA benefits
 - Distance (travel included)
- thriveprogram.unc.edu

