

CREATING A QUANTITATIVE, PRE-HOSPITAL DIAGNOSTIC TOOL TO ASSESS TRAUMATIC BRAIN INJURIES

CHALLENGE: Develop a Field-Based Device for "more likely than not" TBI Assessments

OBJECTIVE 1 – TBI Background and Rationale

- Traumatic Brain Injuries (TBI's) make up 30% of injury-related deaths in the US (2)
- In 2010, direct and indirect costs of all TBI's in the US were 76.5 billion dollars (2)
- Emergency rooms fail to diagnosis about 56%-80% of TBI injuries (3)
- Mobility, memory, reaction time, cognitive function and communication are affected by TBIs (1)
- The Glasgow Coma Scale, aka GCS, is a way to measure levels of consciousness, and is the primary neurological assessment used by first responders (4)

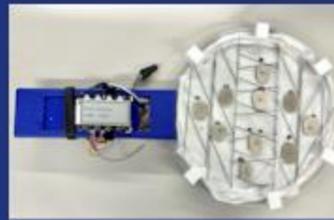
OBJECTIVE 2 – TBI Assessment and Triage Capability

Triage: in emergency medicine, deciding patient(s) stability and determining the appropriate level of care pre- and post-definitive care

- Pre-hospital care has limited diagnostic resources, yet major decisions such as immediate interventions, hospital choice, and transport are being made before definitive care (6)
- Rhode Island state protocols state that every suspected TBI patient needs to go to a level one trauma center (7)
- A systematic review of triage tools in the US and UK found that elderly patients are often under-triaged (5)
- The same review found that the GCS accurately predicted TBIs only 40.8% of the time (5)

AY '24-'25 PROTOTYPE TBI Assistive Indicator Device

Prototype with carbon fiber overlay. Latest stage of development.



LED labeling and wire inputs used for developing sequences.



Example storage material and housing on ambulance



IN USE -

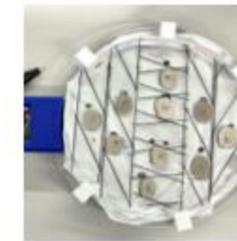
- Provider uses screen to start the sequence.
- Lights will turn on in that sequence.
- Patient will attempt to touch the pads under the lights as they come on.
- Device records reaction time by timing how long it takes patient to complete sequence.

CURRENT DEVELOPMENT



3D printed device handle with screen/wiring. Simple and succinct text for easily readable results.

Touchpads attached to carbon fiber overlay. Holes cut in fabric to always display light above the given touchpad.

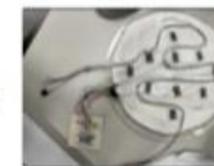


PREVIOUS DEVELOPMENT



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Mapping out wiring and aligning lights with touchpad placement.



Wiring being placed for screen to be implanted.

FUTURE DIRECTIONS

Diagnosis: Identification of an injury/illness based on symptoms

Prognosis: The likely prediction regarding an injury/illness based on symptoms

The goal is to make a diagnostic device for first responders/trainers; but the current development is mostly prognostic. Future directions will be aimed mainly on data collection and trial design to increase diagnostic ability.

- Gather data on reaction time from healthy individuals versus TBI victims to implement accurate screenings
- Design clinical trial connecting field usage to definitive care diagnosis to prove use in assessment and triage
- Design clinical trial in non-emergent setting to gather feedback on design and ability to obtain data
- Create touch capacitive cover that is multi-use and able to be sanitized
- Optimize power with rechargeable battery
- Optimize layout and clinician facing handle
- Optimize programming with multiple sequences

REFERENCES

1. "Get the Stats on Traumatic Brain Injury in the United States" (2018, August 9). [Brainline. https://www.brainline.org/article/get-stats-traumatic-brain-injury-united-states](https://www.brainline.org/article/get-stats-traumatic-brain-injury-united-states). Accessed 13 October 2024.
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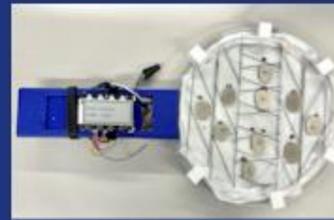
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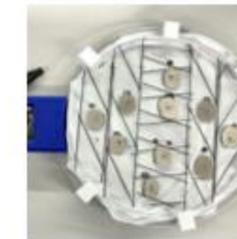
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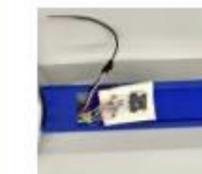


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