Management of severe traumatic brain injury

LAURA WILSON, PHD, CCC-SLP, CBIST

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Disclosures

I am a full-time employee at The University of Tulsa

KSHA is providing an honorarium for my participation today

I am a Certified Brain Injury Specialist Trainer through the ACBIS/BIAA

No other financial or non-financial relationships to disclose
Learning Objectives

1. Describe medical, neurobehavioral, and psychosocial factors that can impact intervention in individuals with severe traumatic brain injury

2. Identify appropriate assessment tools to help guide treatment of cognitive-communicative sequelae after severe TBI

3. Summarize the evidence-based treatment approaches used to address cognitive-communicative sequelae of severe traumatic brain injury
What do we mean by severe TBI?

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural imaging</td>
<td>Normal</td>
<td>Normal or abnormal</td>
<td>Normal or abnormal</td>
</tr>
<tr>
<td>LOC</td>
<td>Up to 30 minutes</td>
<td>30 minutes up to 24 hours</td>
<td>24 hours or more</td>
</tr>
<tr>
<td>AOC</td>
<td>Up to 24 hours</td>
<td>&gt; 24 hours</td>
<td>&gt; 24 hours</td>
</tr>
<tr>
<td>PTA</td>
<td>0-1 day</td>
<td>Between 1-7 days</td>
<td>&gt; 7 days</td>
</tr>
<tr>
<td>GCS</td>
<td>13-15</td>
<td>9-12</td>
<td>3-8</td>
</tr>
</tbody>
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TBI Outcomes

Chronic condition
Increased morbidity and mortality
Frequent comorbidities
Complicated continuum of care
Persistent cognitive, physical, psychosocial deficits
# Behavioral and psychosocial complications/comorbidities

<table>
<thead>
<tr>
<th>BEHAVIORAL</th>
<th>PSYCHOSOCIAL</th>
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</thead>
<tbody>
<tr>
<td>Aggression</td>
<td>Depression</td>
</tr>
<tr>
<td>Agitation/irritability</td>
<td>Anxiety</td>
</tr>
<tr>
<td>Apathy</td>
<td>Substance abuse</td>
</tr>
<tr>
<td>Denial of deficits and/or anosognosia</td>
<td>Other psychiatric disorders</td>
</tr>
<tr>
<td>Disinhibition</td>
<td>Social isolation/reduced social network</td>
</tr>
<tr>
<td>Eating disturbances</td>
<td>Caregiver burden</td>
</tr>
<tr>
<td>Flat affect/inability to recognize emotions</td>
<td>Reduction in participation</td>
</tr>
<tr>
<td>Impulsivity</td>
<td></td>
</tr>
<tr>
<td>Lability</td>
<td></td>
</tr>
<tr>
<td>Poor initiation</td>
<td></td>
</tr>
<tr>
<td>Poor judgment and reasoning</td>
<td></td>
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</tbody>
</table>

Kolakowsky-Hayner, Reyst, & Abashian, 2016
Continuum of care?

Determined by…

• Funding source
• Bed availability
• Ability to participate in therapy
• Medical needs
• Challenging behaviors
• Support system
Principles of assessment and treatment
WHO’s ICF: Implications for assessment
Environmental and personal factors?

Medical status, including history of brain injury
Premorbid cognitive-linguistic skills
Education, occupation, socioeconomic, cultural, and linguistic background
Auditory, visual, motor, cognitive (e.g., arousal), emotional, behavioral status
Review of auditory, visual, motor, cognitive, and emotional status.
Client and family goals and concerns
More considerations for assessment

Periodic, ongoing assessment

Use direct report from family and patients, naturalistic observation, and performance-based measures

Include tests with good ecological validity

Use dynamic assessment and hypothesis testing

ASHA Practice Portal; Coehlo et al., 2005
Treatment principles

✓ Shaping
✓ Graded cueing (push for self-monitoring)
✓ Distributed practice
✓ Errorless learning
✓ Remediation v. compensation

✓ Intervention MUST include intentional generalization
✓ Functional interventions
✓ Family involvement
✓ Assistive technology for cognition
✓ Limited evidence for transfer across cognitive domains

Sohlberg & Mateer, 2001
Timing of Intervention - early works!

Early and aggressive multidisciplinary neurorehabilitation
- Shorter length of coma
- Shorter length of stay in trauma/rehab
- Higher Rancho scores, less impairment
- Greater rates of return to home

Systematic early orientation program
- Longer PTA, better GOSE outcome at 12 months

Early multisensory stimulation
- 75 minutes per day, 14 days
- Better functional outcome (GOSE, DRS) at 12 months

Early multisensory stimulation for patients in a coma
- Family-delivered stimulation (30 minutes per day) led to higher levels of consciousness within the first week
- Therapist-delivered stimulation (100 minutes per day) led to higher levels of consciousness
- Nurse v. family delivered stimulation (80 minutes per day) - family-delivered led to higher level of consciousness, basic cognitive functioning, and sensory functioning.

Köngs et al., 2018
Intensity of Intervention- more can facilitate recovery

Greater time may be associated with...

- Improved self-care, continence, mobility transfers, locomotion, communication, psychosocial functioning, and cognition at discharge from rehabilitation
- Greater likelihood of return to work at 24 months
- Better community integration after 16 weeks (20 v. 15 hours of therapy)

But might be an increase in RATE v. extent of recovery (some differences exist only in first few months)
Pharmacological management of severe TBI

- Fluid and electrolyte management
- Osmotic diuretic
- Pain control and sedation
- Pentobarbital coma
- Seizure prophylaxis
- Neuromuscular blocking agents
- Antithrombotic agents
- Antimicrobial agents
- Stress ulcer prophylaxis

Role of the SLP

- Observe and document adverse effects (e.g., decreased arousal)
- Communicate any observed status changes (e.g., increase in frequency of seizures)
- Provide cognitive training related to medication management

Rivera, 2014
### Rancho Los Amigos Levels of Cognitive Functioning Scale

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
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<tbody>
<tr>
<td>Level 1</td>
<td>No Response</td>
</tr>
<tr>
<td>Level 2</td>
<td>Generalized Response</td>
</tr>
<tr>
<td>Level 3</td>
<td>Localized Response</td>
</tr>
<tr>
<td>Level 4</td>
<td>Confused-Agitated</td>
</tr>
<tr>
<td>Level 5</td>
<td>Confused-Inappropriate</td>
</tr>
<tr>
<td>Level 6</td>
<td>Confused-Appropriate</td>
</tr>
<tr>
<td>Level 7</td>
<td>Automatic-Appropriate</td>
</tr>
<tr>
<td>Level 8</td>
<td>Purposeful-Appropriate</td>
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#### Key tool for family education

#### Guides general treatment goals
- Stimulate
- Structure
- Compensate/Remediate

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Sander, 2002
Assessment of disorders of consciousness

Standardized assessments should be used for serial assessment
  e.g., Coma Recovery Scale–Revised (CRS-R), looks at auditory, visual, motor, orometer/verbal, communication, arousal

Signs of emerging consciousness
  Visual tracking, non-stereotypic motor responses, emotional responses

Spaulding Rehabilitation Network is an excellent source of resources!

Persistent, then chronic v. permanent vegetative state

Figure 2. Arousal and awareness, the two components of consciousness in coma, vegetative state, minimally conscious state, and locked-in syndrome.

From Laureys, Owen, & Schiff, 2004

Giacino, et al., 2018
Treatment principles for DOC

Multisensory stimulation
Environmental management
Family education and inclusion

Klingshirn et al., 2015
After emergence from coma

Focus on informal, functional assessment of skills

Track amnesia, orientation, and attention

Monitor quality of language output, self-awareness

Engage in desired activities

Decrease task demands and attentional load

Address behavior through environmental change and redirection v. confrontation

Develop consistent routines (which requires family training!)

Monitor own rate and complexity when providing information/requesting information

External aids may be useful, but will require extensive support from therapist-staff-family
After behavior becomes appropriate...
Assessment

READY FOR FORMAL ASSESSMENT?
✓ Needs to be able to sustain attention
✓ Needs to be able to offer a reliable response
✓ Needs to not be extremely confused or agitated

IMPORTANT TAKE-AWAYS
Scores not as important as what you observe during the assessment
◦ Use of strategies (spontaneous and prompted)
◦ Response to cues
◦ Frustration tolerance, fatigue
◦ Ability to follow instructions, attend to task
Attention assessment

- Examples of formal assessment
  - Rating Scale: Moss Attention Rating Scale
  - Battery: Test of Everyday Attention
    - BUT...challenging with this population
- Additional tasks for assessment
  - Forward digit span
  - Digit symbol coding
  - Trail Making Test
  - Conners’ CPT
  - PASAT
Attention treatment

- Metacognitive strategy training
  - More evidence for mild-mod, but some small studies that show benefit in the severe population
  - More detail on the specifics of MST in talk later today on executive function
- Dual task training
  - Focus on individual tasks first
  - Then, incorporate simultaneous performance
  - Do NOT expect distant generalization
- Address comorbid issues through referral
  - Depression, pain, sleep
- Environmental supports/modifications
  - Pacing, reducing distractors
  - Using ATC
- Computerized attention training (?)
  - If used, consider compensation as remediation as the mechanism
- Cognitive behavioral therapy (?)

Ponsford et al., 2014
Memory assessment

Common sample tools:
- Wechsler Memory Scale
- Rivermead Behavioural Memory Test
- California Verbal Learning Test
- Memory for Intentions Test

Consider the type of memory that you are assessing:
- Encoding
- Retention of information
- Recognition

Remember that memory relies on attention and executive skills!

Remember to watch for patterns:
- Primacy v. recency
- Verbal v. nonverbal
- Semantic v. episodic

Velikonja, et al., 2014
Memory treatment

Focus is on COMPENSATION, and not remediation

Internal compensatory strategies
- Awareness and intention added to the encoding phase of memory
- Relies on those with relatively intact executive function skills
- Often unsuccessful for those with a more severe disorder

External compensatory strategies
- Environmental supports and reminders
- Must consider preferences/premorbid experiences with similar devices, other comorbidities
- TRAIN the use of these strategies
  - Distributed practice
  - Multiple exemplars
  - Don’t expect generalization to occur
  - Use errorless learning, spaced retrieval

NOTE:
Spaced retrieval can be successful in learning specific information (but not with generally improving memory)!
EXECUTIVE FUNCTION

We will explore this in depth this afternoon.

Specifically for severe TBI:

- Get report from family and patient (e.g., BRIEF-A)
- Consider how awareness will have impact on other interventions
- Heavier reliance on external cues and ATC as compared to metacognitive interventions
Cognitive-communication

ASSESSMENT

We know that these deficits can have widespread effects on an individual post-onset

We know that cog-comm skills can be situationally dependent!

Largely informal assessment
  • Monologic and conversational discourse

Rating scale example:
  • LaTrobe Communication Questionnaire
    • Conversational tone, effectiveness, flow, engagement, partner sensitivity, and conversational attention/focus
    • Both self and other-report

TREATMENT

• Common features of good interventions
  • Individualized, meaningful goals
  • Instructional methods that are appropriate
  • Planned generalization
  • Communication partner inclusion
  • Measuring functional outcomes

• Group training can be beneficial

• Sample curriculum
  • TBI Connect/TBI express
  • Togher et al., 2013; Togher et al., 2016

Togher et al., 2014; Steel & Togher, 2019; Coehlo et al., 2005
Behavioral concerns

Due to....

“Preinjury adjustment problems
Impairments tied directly to the injury
Post-injury evolution of symptoms and adjustment
Poorly conceived interventions (e.g., overly restrictive settings and procedures against which individuals may choose to react)”

Common intervention strategies:
◦ ABA
◦ PBIS
◦ CBT

Feeney, 2010, p. 146
Positive behavior interventions and supports: Principles

1. The person is the core of all intervention and support efforts
2. Interventions and supports are organized around personally meaningful activities
3. Contextual supports are critical to success
4. Reduction of supports is part of the plan
5. Positive everyday routines are the context for pursuit of meaningful goals
6. Components of life must be integrated
7. Assessment is ongoing and context-sensitive
8. Feedback must be context-sensitive and meaningful
9. Behavioral supports are positive and proactive
10. The ultimate goal for participants is effective self-regulation within a meaningful life

Feeney, 2010, p. 147-148
Other considerations

Glasgow Outcome Scale-Extended
Disability Rating Scale
Mayo-Portland Adaptability Inventory
Community Integration Questionnaire
Craig Handicap Assessment and Reporting Technique (SF)
QOLIBRI

Many available here: http://tbims.org/combi/list.html

Address family concerns
- Family needs questionnaire
- Support groups and resources
  - https://www.biausa.org/
  - http://biaks.org/
  - https://msktc.org/tbi
  - https://usbia.org/
  - http://www.mindsmatterllc.com/

Address return to employment and leisure activities
References


References


Togher, L., McDonald, S., Tate, R., Rietdijk, R., & Power, E. (2016). The effectiveness of social communication partner training for adults with severe chronic TBI and their families using a measure of perceived communication ability. NeuroRehabilitation, 38, 243-255.