Traumatic Brain Injury Classification Workshop

Rethinking TBI Classification for Clinical Care and Research

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Steering Committee

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Conclusions

- TBI care in the United States often fails to meet the needs of individuals, families, and communities affected by this condition.
- High-quality care for TBI requires that it be managed as a condition with both acute and long-term phases.
- Public and professional misunderstandings are widespread with respect to the frequency; manifestations; long-term consequences; and proper detection, treatment, and rehabilitation of TBI.
- The United States lacks a comprehensive framework for addressing TBI.
RECOMMENDATIONS

1. **Create** and implement an updated classification system for TBI.

2. **Integrate** acute and long-term person- and family-centered management of TBI.

3. **Reduce** unwarranted variability and gaps in administrative and clinical care guidance to assure high quality care for TBI.

4. **Enhance** awareness and identification of TBI by healthcare providers and the public.

5. **Establish** and reinforce local and regional integrated care delivery systems for TBI.

6. **Integrate** the TBI system of care with TBI research into a learning system.

7. **Improve** the quality and expand the range of TBI studies and study designs.

8. **Create and promulgate** a national framework and plan for improvement of TBI care.
What is wrong with Mild, Moderate, and Severe TBI?

• No modern TREATABLE disease uses such a crude, imprecise classification
• Mild TBI is not always mild
• What is Moderate TBI? Complex Mild TBI, Severe TBI?
• Limited association with pathophysiology and mechanism
• No effective targeted treatments for mild, moderate, severe
• These terms lead to treatment bias – nihilism in Severe, disregard for Mild
• Patients and families do not want us using these terms
Bio-Psycho-Socio-Ecological Model

Acute Sub-Acute Chronic TBI Classification

Develop Acute, Sub-Acute, Chronic TBI Classification
Classification of TBI Workshop - 2024

Refining Acute TBI Classification

Use of the full GCS instead of mild, moderate and severe

Acute TBI Classification
Classification of TBI Workshop - 2024

Refining Acute TBI Classification

Simplifying the use of prognostic information in traumatic brain injury. Part 1: The GCS-Pupils score: an extended index of clinical severity

Paul M. Brennan, MBChir, FRCS, PhD,1 Gordon D. Murray, MA, PhD,2 and Graham M. Teasdale, MBBS, FRCP, FRCS3

Expand the range of GCS: 1-15

Adding other characteristics and features – Imaging and Blood-Based Biomarkers
Progress: Imaging and Blood-Based Biomarkers

Diagnostic and Prognostic Across the GCS 3-15 Spectrum
Progress: Imaging and Blood-Based Biomarkers

**Acute Biomarkers**
(GFAP, UCHL1, S100, NSE)

**Subacute/Chronic Biomarkers**
(Neurofilament Light (NFL), Tau, pTau, autoantibodies)

Diagnostic and Prognostic Across the GCS 3-15 Spectrum
What would be more precise than Mild, Moderate, or Severe for acute classification?

GCS

Imaging

Blood-Based Biomarker
28 yo s/p fall +LOC/PTA

“Mild” TBI versus

GCS 14, SAH, GFAP 200
28 yo s/p fall +LOC/PTA

“Mild” TBI versus

GCS 14, SAH/Contusion, GFAP 3,200
Classify TBI patients based on their actual Glasgow Coma Scale (GCS) sum score (e.g., GCS 14) rather than the inaccurate and misleading three category shorthand mild, moderate, or severe. Optimally, clinicians should also use results from neuroimaging and blood-based biomarkers, when available and clinically indicated, to classify patients. **TBI classification may change for each patient as the person’s condition evolves over time.**
Bio-Psycho-Socio-Ecological Model

Trajectory after TBI

Bio-psycho-socio-ecological (BPSE) prism

Health care system lens

Influence of BPSE prism may continue to affect trajectory, requiring further engagement with health care system

Acute  Sub-Acute  Chronic

Deviation from Optimal Path

OptIMAL PATH

Deviation from Optimal Path
Aims of the Workshop

This is the next step to leverage the findings over the past decade to move beyond mild, moderate, and severe TBI

- Produce a beta version for a new TBI Classification/s, which will be pilot-tested, refined, validated, and disseminated
- Identify current gaps and research topics that may inform refinement and updating of the new TBI Classification/s
TBI Patient and Family Advisory Group
Classification of TBI Workshop – Working Groups

• Clinical/Symptoms – Acute (Day 1), Subacute (Day 14), chronic (months/years)
  • Chair: David Menon
  • Co-Chairs: Noah Silverberg and Adam Ferguson
• Imaging Biomarkers – Acute (Day 1), Subacute (Day 14), chronic (months/years)
  • Chair: Christine MacDonald
  • Co-Chair: Esther Yuh
• Blood-Based Biomarkers – Acute (Day 1), Subacute (Day 14), chronic (months/years)
  • Chair: Jeff Bazarian
  • Co-Chair: Henrik Zetterberg
• Psycho-Social and Environmental Modifiers
  • Chair: Lindsay Nelson
  • Co-Chair: Lindsay Wilson
• Retrospective Classification
  • Chair: John Corrigan
  • Co-Chairs: Mike Alosco, Joukje van der Naalt
• Knowledge to Practice
  • Chair: Peter Bragge
  • Co-Chair: Molly McNett
Objectives:

1. To summarize existing approaches to TBI classification that include clinical signs and symptoms obtained up to 2-3 weeks after injury.

2. To identify which major clinical decisions/care paths warrant exploration of features that inform such decisions.

3. To explore what features inform decisions/care paths identified under 2).

4. To identify existing prognostic models for TBI across or differentiated by initial injury severity, and to summarize the main features contained in these models.
Clinical/Symptoms – Acute (Day 1), Subacute (Day 14), chronic (months/years)

Objectives (continued):

5. To explore common denominators of features identified under 3) and 4).

6. To develop proposals for refined approaches to characterization/classification of TBI either applicable to all severities or differentiated by subgroups.

7. To provide recommendations for validating and implementing the proposals developed under 6).
The overarching aims of this WG are to:

1. Identify which Imaging CDEs have the greatest relevance for informing treatment decisions and outcome

2. Define the role of CT and MRI in the different time phases of TBI (e.g. acute/post-acute/long term)

3. Provide recommendations for incorporation of neuro-imaging features in a novel classification for TBI.
The overarching objectives of this WG are to:

1. Summarize current knowledge on the diagnostic and prognostic use of blood-based biomarkers in TBI

2. Identify barriers to clinical implementation of biomarkers

3. Provide recommendations on what actions (including further research) are needed to facilitate implementation of blood-based biomarkers into the classification of TBI.
Psychosocial & Environmental Modifiers

Objectives:

1. To summarize existing evidence to identify candidate psychosocial and environmental modifiers of clinical injury severity that informs a comprehensive, bio-psycho-social-ecological (BPSE) model of TBI
2. To determine whether sufficient evidence exists to support the use of psychosocial and environmental information in acute clinical decision-making and/or care triaging
3. To provide recommendations for developing and validating clinical support tools that optimize acute care?
4. To provide recommendations for incorporating select psychosocial and environmental into TBI severity classification framework.
Retrospective Classification of TBI severity

Objectives:

1. Describe the theoretical and practical utility of retrospective identification of remote histories of TBI exposure.

2. For each possible means of detecting past exposure to TBI (self-report, medical record extraction, imaging, cognitive performance testing) develop a framework for (1) classifying the degree of exposure and (2) making inferences about the potential for persistent consequences arising from that past exposure.
Retrospective Classification of TBI severity

**Objectives** (cont’d):

3. Review methods of detection that would allow identification of repeated head injuries.

4. Identify gaps in knowledge requiring further research and validation.

5. Propose a 2-5 year workplan refining the rationale, framework and generating supporting evidence.
Overarching Objectives:

1. Foster a shared understanding between all elements of the program of key principles of the science of translating research into policy and practice.
2. Identify areas in which the research team would like to build capacity to extend their knowledge of this science.
3. Determine ‘upstream’ needs – areas of the program in which research translation science could meaningfully impact program design, data collection and other processes.
4. Identify and prioritize program elements that could become the focus of active implementation efforts (as opposed to routine passive dissemination of reports, presentations, and academic manuscripts).