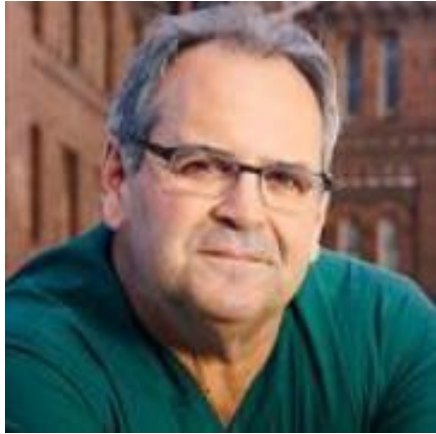


Traumatic Brain Injury Classification Workshop

Rethinking TBI Classification for Clinical Care and Research



Steering Committee



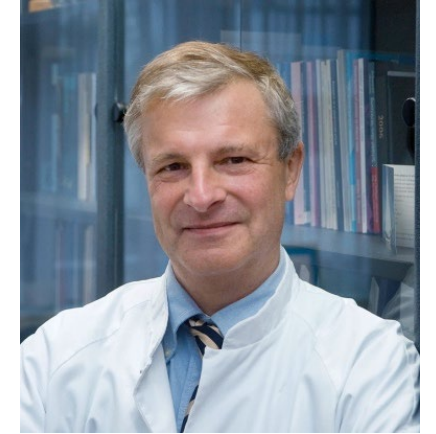
Geoffrey Manley



Michael McCrea



Kristen Dams O'Connor



Andrew Maas



Nsini Umoh



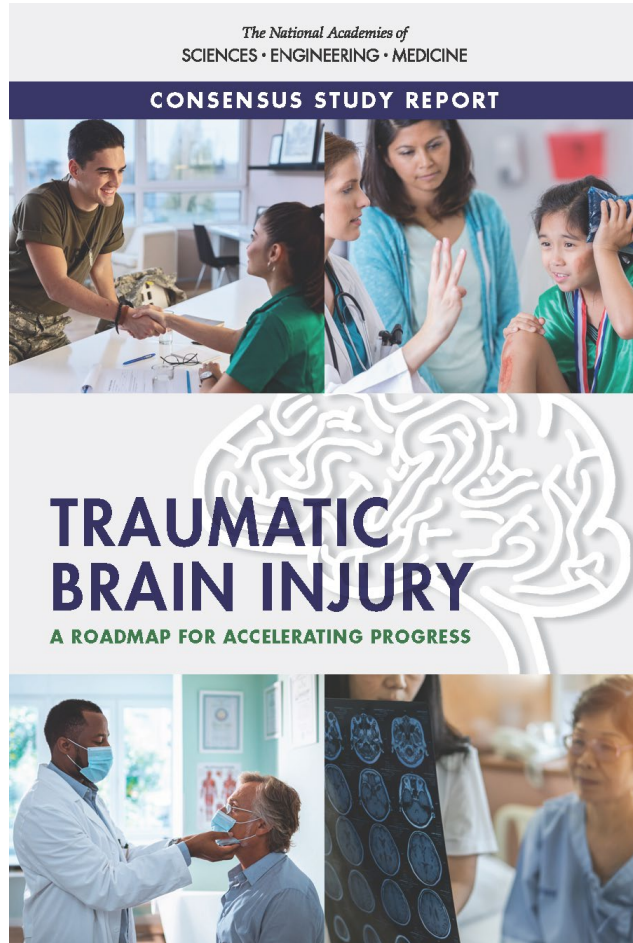
Hibah Awwad



Adele Doperalski

Traumatic Brain Injury

A Roadmap for Accelerating Progress



Committee on Accelerating Progress in Traumatic Brain Injury Research and Care

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**.

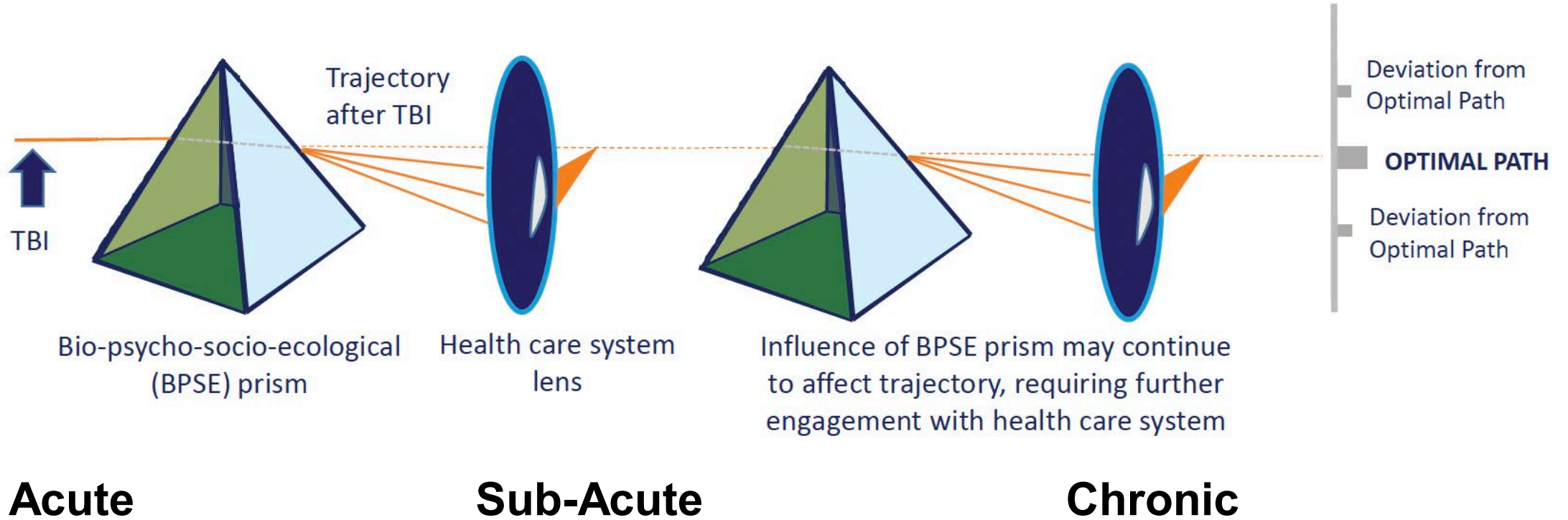
8

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**

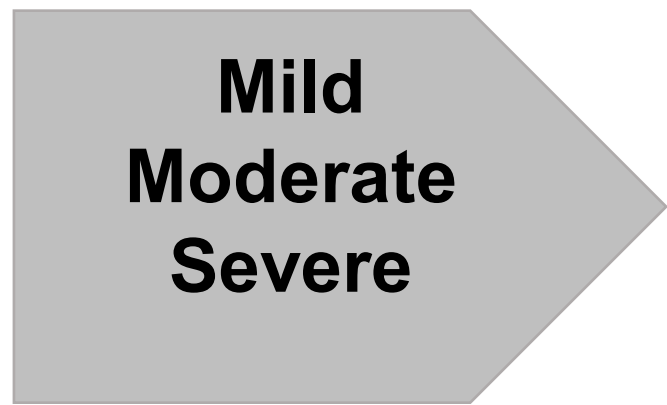
Bio-Psycho-Socio-Ecological Model



Develop Acute, Sub-Acute, Chronic TBI Classification

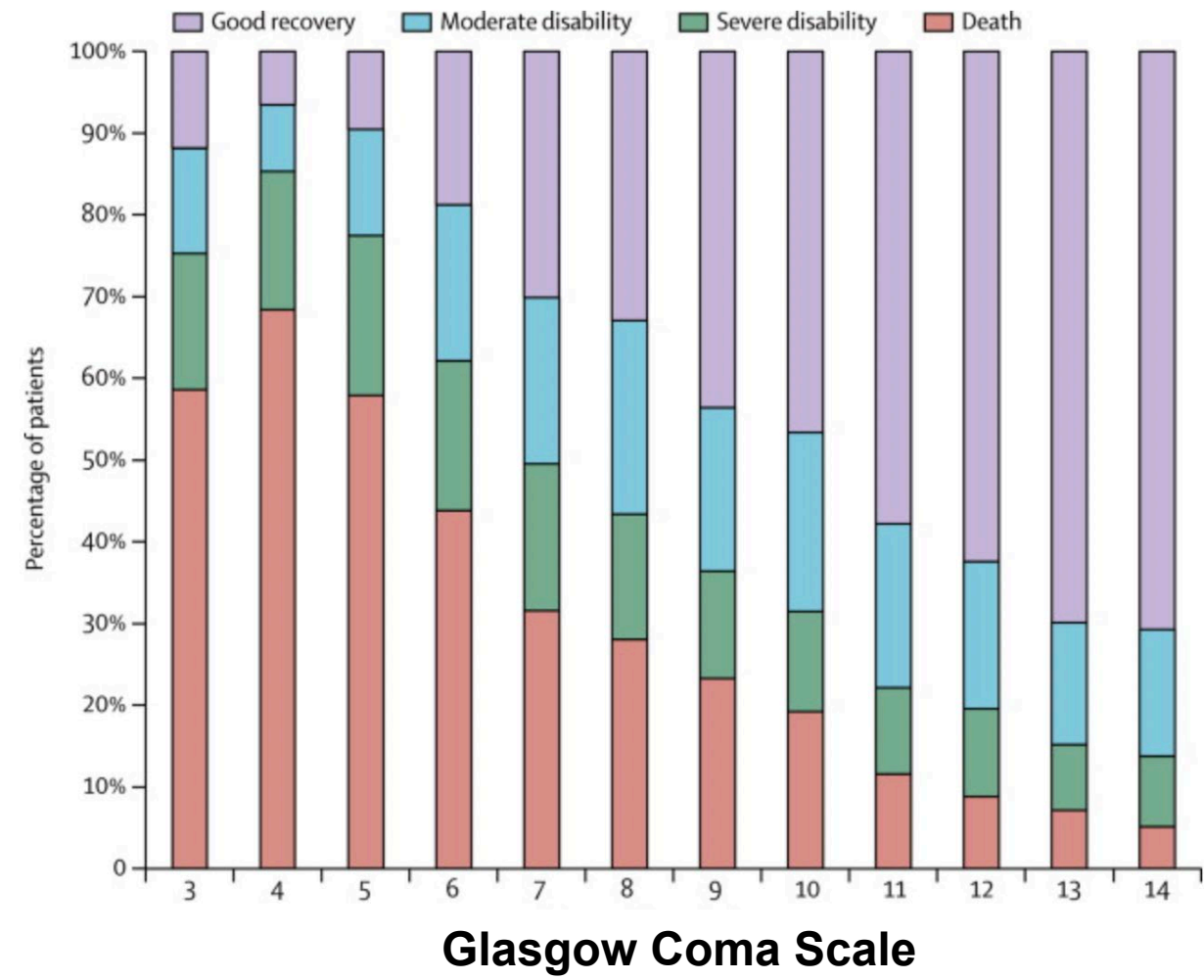
Classification of TBI Workshop - 2024

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

JNS

CLINICAL ARTICLE

J Neurosurg 128:1612–1620, 2018

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

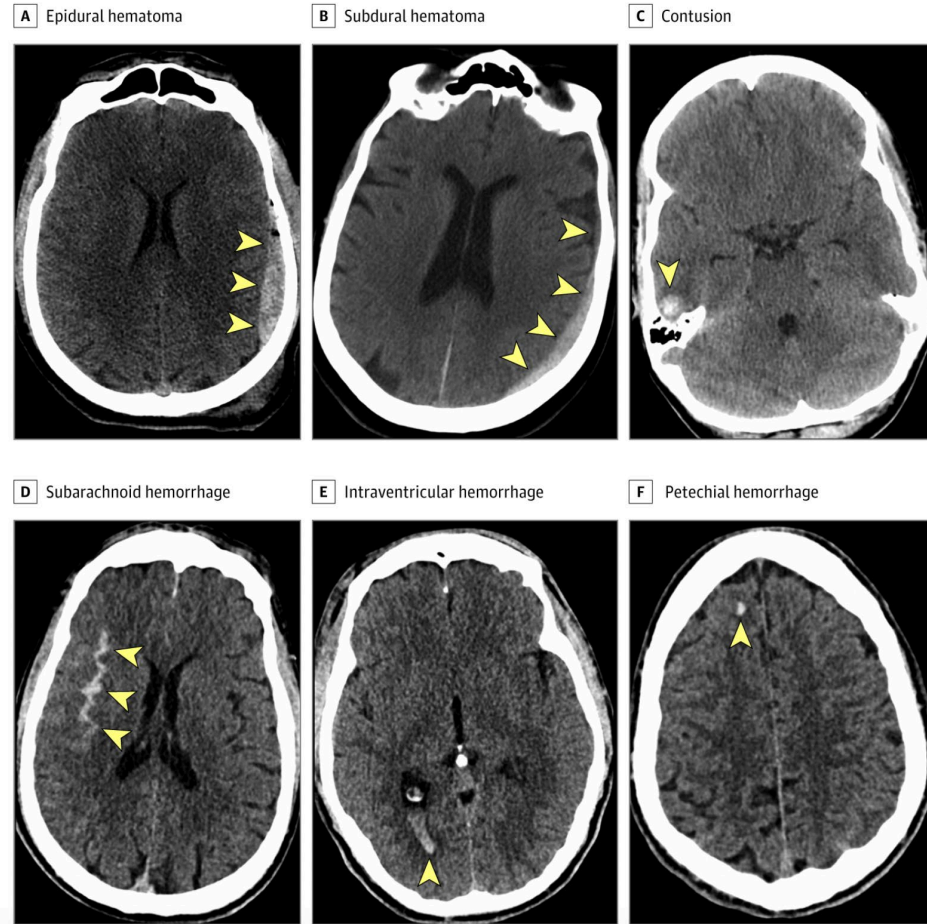
Paul M. Brennan, MBBChir, FRCS, PhD,¹ Gordon D. Murray, MA, PhD,² and
Graham M. Teasdale, MBBS, FRCP, FRCS³

Expand the of Range GCS: 1-15

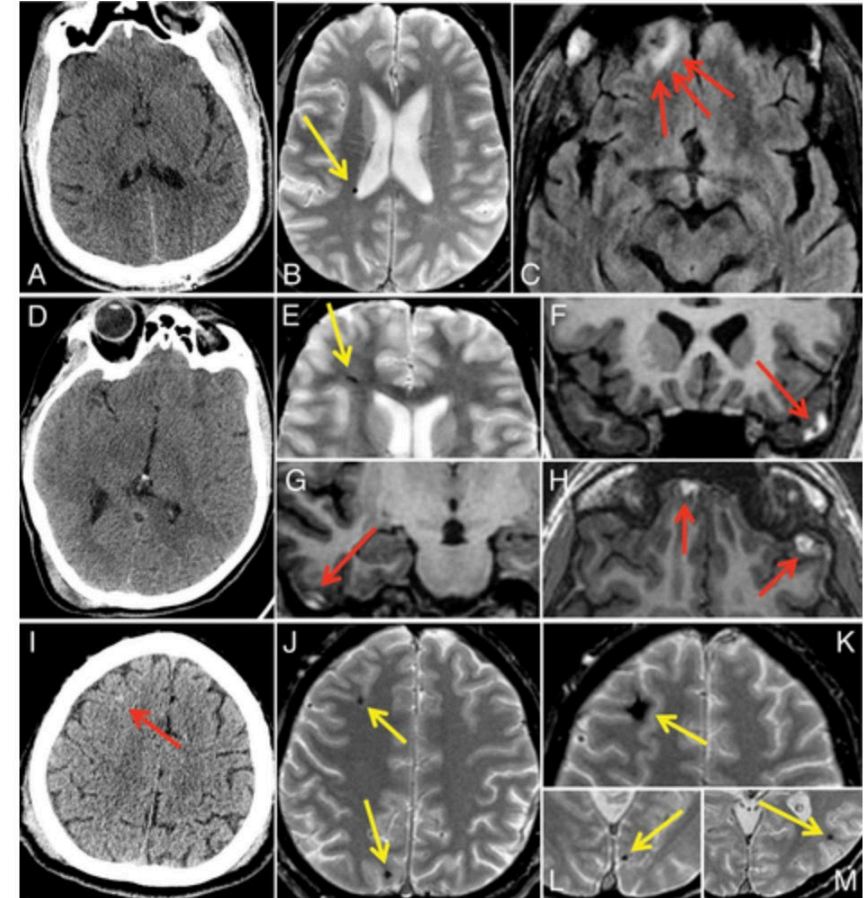
**Adding other characteristics and features –
Imaging and Blood-Based Biomarkers**

Progress: Imaging and Blood-Based Biomarkers

CT

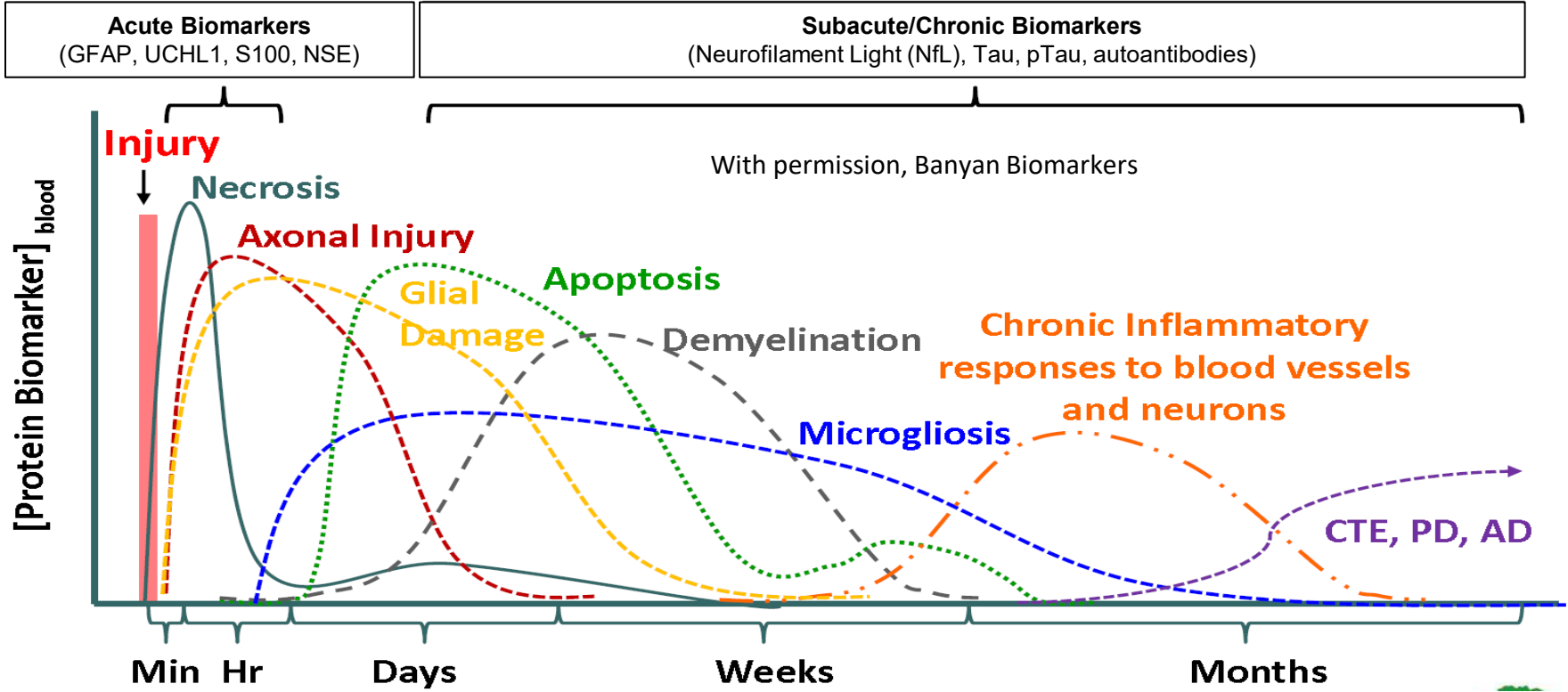


MRI



Diagnostic and Prognostic Across the GCS 3-15 Spectrum

Progress: Imaging and Blood-Based Biomarkers



Diagnostic and Prognostic Across the GCS 3-15 Spectrum

***What would be more precise than
Mild, Moderate, or Severe for acute classification ?***

GCS

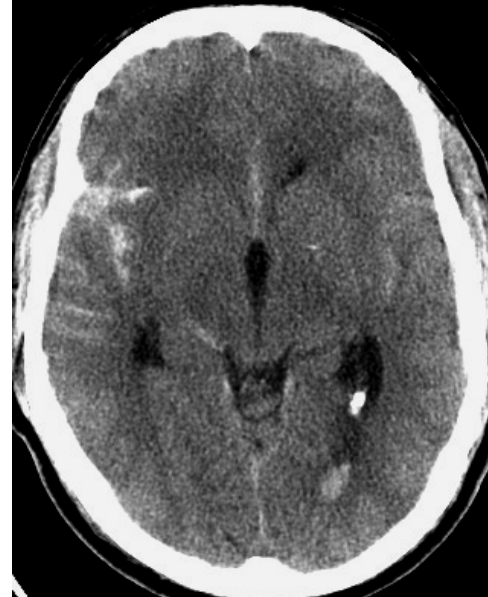
Imaging

Blood-Based Biomarker

28 yo s/p fall +LOC/PTA

“Mild” TBI versus

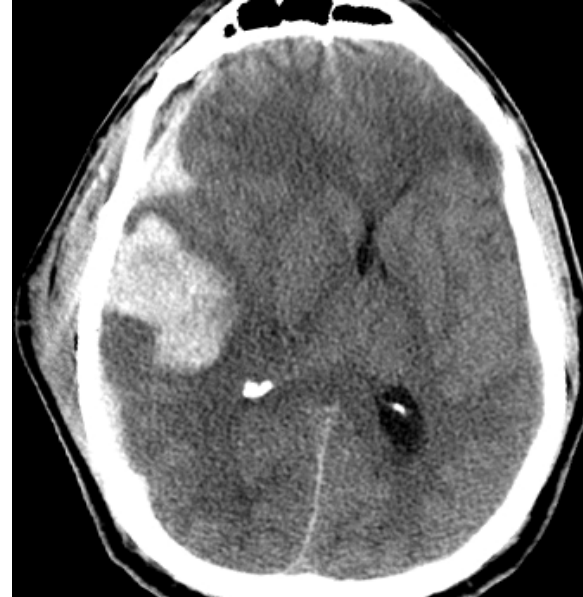
GCS 14, SAH, GFAP 200



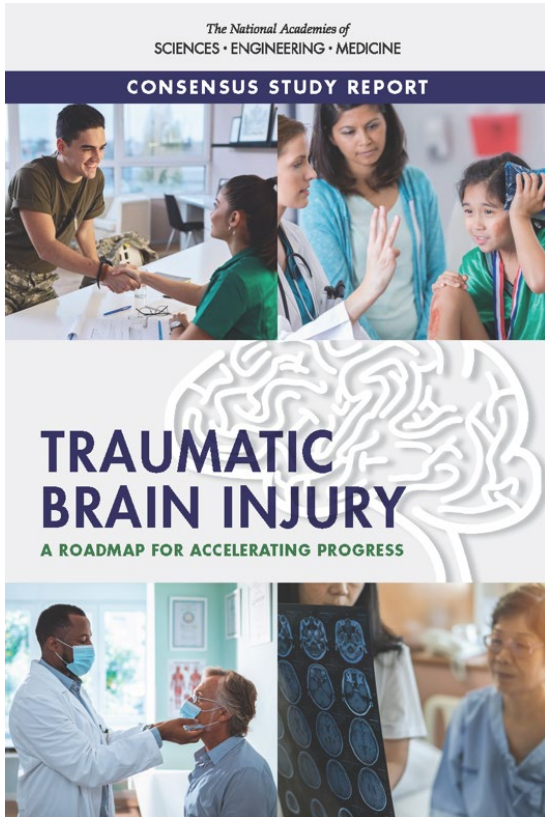
28 yo s/p fall +LOC/PTA

“Mild” TBI versus

GCS 14, SAH/Contusion, GFAP 3,200

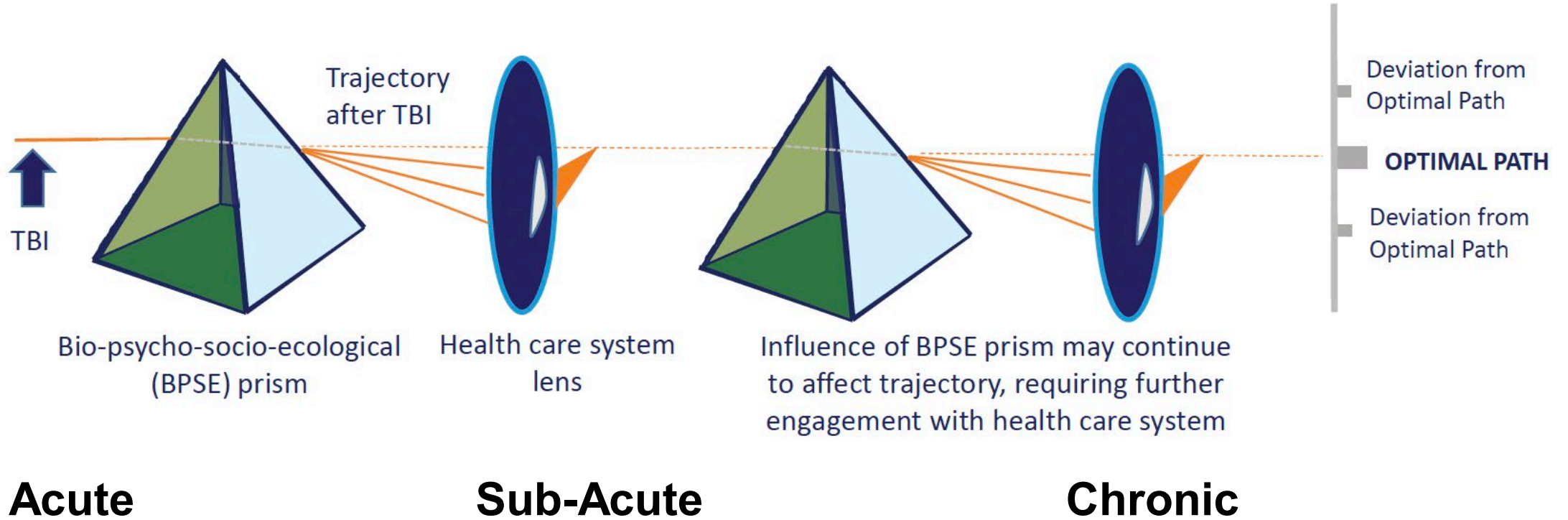


Classification of TBI Workshop - 2024



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



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

Clinical/Symptoms – Acute (Day 1), Subacute (Day 14), chronic (months/years)

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).

Imaging Biomarkers – Acute (Day 1), Subacute (Day 14), chronic (months/years)

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.

Blood-Based Biomarkers – Acute (Day 1), Subacute (Day 14), chronic (months/years)

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.

Knowledge to Practice

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).

