Cognitive challenges beyond IDD: traumatic brain injury, substance use, and treatment disparities – additional support for the perfect storm theory

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Learning Objectives

- Describe the 3-phase model for the "perfect storm" of cascading vulnerabilities that can make people with TBI uniquely susceptible to devastating consequences from opioid use
- List recommendations for substance use treatment providers working with people with a history of TBI to make treatment more accessible and to improve the quality of treatment received

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People with disabilities may face substance use treatment inequities

- People with disabilities are an overlooked health disparity population
  - NIH included people with disabilities as a health disparity population recently
- Emerging studies have found that people with disabilities are at increased risk for opioid receipt and OUD and may experience barriers accessing treatment including MOUD
- No clinical reasons for people with disabilities to be less likely to receive or stay on MOUD
- Additional barriers to MOUD may include stigma, inaccessible materials, and provider hesitance to treat people with disabilities

References: Iezzoni et al 2021; Reif et al 2021; Thomas et al 2023

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Traumatic brain injury (TBI)

- TBI occurs when an external force causes an alteration or loss in consciousness
- Severity ranges from mild to severe
  - A concussion is a mild TBI
- 23-43% of US adults have experienced at least one TBI in their lifetime
- Effects can be temporary or long-term
- Because TBI occurs during a traumatic event, people with TBI may have comorbid mental health conditions

Source photo: Peterschreiber.Media/Getty Images

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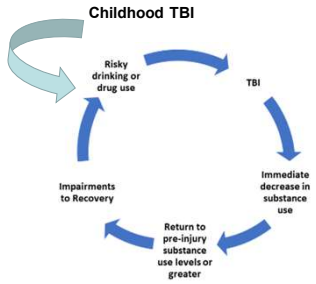
Substance use and TBI are often intertwined



McKinlay et al. 2002; Corrigan et al. 2013; Kennedy et al, 2017; Adams, Campbell-Sills et al., 2019; Weil, Karelina, and Corrigan, 2019 Weil et al, 2016; Corrigan & Cole 2008

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"Perfect Storm" model of cascading vulnerabilities for people with TBI

PERSONS WITH TBI MAY HAVE:

Phase I: Greater exposure to opioids due to secondary conditions common after TBI (e.g., pain)

Phase II: Greater likelihood of progression to LTOT, opioid misuse, or OUD

Phase III: Greater barriers to successful OUD treatment

Potential Consequences: Increased risk for overdose and suicide

Adams, 2021, *JHTR*, Preface

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Acute and chronic pain are common following TBI

- Prevalence of chronic pain following TBI estimated to be over 50%
- Chronic pain following TBI is associated with functional disability and mood disorders
- ➢ **Acute and chronic pain have been drivers of prescription opioid receipt in the US**

Nampiaparampil 2008; Dams-O'Connor et al 2018; Adams, Corrigan, Dams-O'Connor 2019; Hong et al, 2019; Gomes et al. 2018

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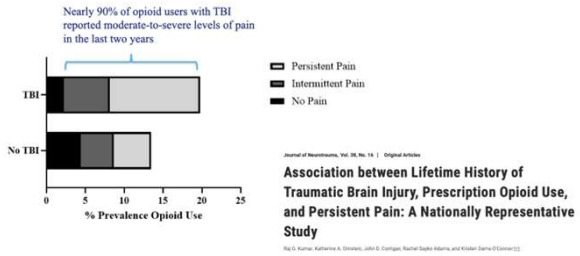
Persistent moderate-severe pain and opioid use more common among adults 50+ with TBI



Association between Lifetime History of Traumatic Brain Injury, Prescription Opioid Use, and Persistent Pain: A Nationally Representative Study

- ➢ Suggests people with TBI may be more likely to be using opioids because of a greater burden of pain

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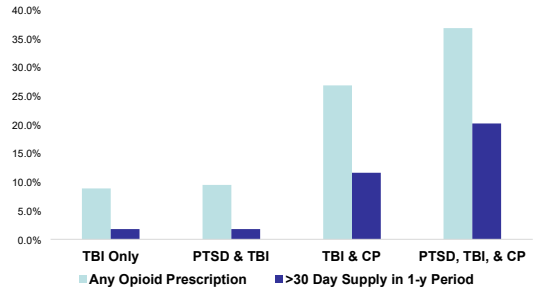
TBI rarely occurs in isolation in military populations



Adams et al., *Journal of Head Trauma Rehabilitation*, 2019

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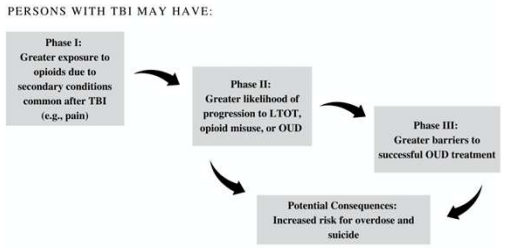
Phase II of the "Perfect Storm"



Adams, 2021, *JHTR*, Preface

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Neurobehavioral changes may contribute to risk for substance use problems

- Cognitive deficits (e.g., memory problems, executive functioning limitations)
  - Medication mismanagement and poor adherence to prescribed dosing
- Mood disorders (e.g., depression, anxiety), sleep disturbance, traumatic stress
  - Risk factors for at-risk substance use
- Prefrontal cortex damage may increase impulsive behavior
  - More difficult to self-regulate substance use

➢ **Neurobehavioral changes may converge post-TBI to increase risk for opioid misuse or OUD**

Dams-O'Connor et al. 2018; Ashman et al, 2008; Adams et al., 2019

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Adults with lifetime history of TBI at increased risk for prescription opioid use and misuse (2018 BRFSS)

J Head Trauma Rehabil
Vol. 36, No. 5, pp. 328–337

Association of Lifetime History of Traumatic Brain Injury With Prescription Opioid Use and Misuse Among Adults

Rachel Sayko Adams, PhD, MPH; John D. Corrigan, PhD; Grant A. Ritter, PhD; Abby Hagemeyer, PhD, MPH; Madeline B. Pliskin; Sharon Reif, PhD

➢ Adults with a lifetime history of TBI had 1.5 times the odds of past year prescription opioid use and 1.7 times the odds of past year prescription opioid misuse, compared to adults without a TBI

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Adolescents with TBI at increased risk for prescription opioid misuse (2019 Youth Risk Behaviors Survey)

J Head Trauma Rehabil
Vol. 36, No. 5, pp. 338-344

Prescription Opioid Misuse and Sports-Related Concussion Among High School Students in the United States

See Wan Tham, MBBS; Tonya M. Palermo, PhD; Sara P. D. Chrisman, MD; Cornelius B. Groenewald, MB ChB

- The odds of prescription opioid misuse were 1.5 times higher for adolescents with a past-year sports-related concussion compared to those without a past year concussion

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Combat Veterans with TBI more likely to be prescribed opioids and use opioids long-term

MILITARY MEDICINE, 184, 1/2:e101, 2019

Predictors of Postdeployment Prescription Opioid Receipt and Long-term Prescription Opioid Utilization Among Army Active Duty Soldiers

Rachel Sayko Adams, PhD; Cindy Parks Thomas, PhD†; Grant A. Ritter, PhD*; Sue Lee, MS*; Mayada Saadoun, MD*; LTC Thomas V. Williams, (Ret.)‡; Mary Jo Larson, PhD**

- Soldiers with a TBI diagnosis were significantly more likely to receive a prescription opioid in the postdeployment year than those without a TBI diagnosis (58% compared to 35%).
- Soldiers with a TBI were more likely to progress to long-term opioid therapy, a risk factor for numerous adverse opioid outcomes (overdose, OUD).

Adams et al., *Military Medicine*, 2018

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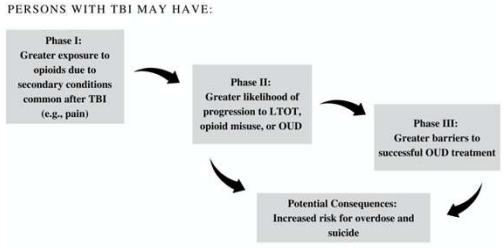
Phase III of the "Perfect Storm"



Adams, 2021, *JHTR*, Preface

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Potential reasons for less successful SUD treatment outcomes among people with TBI

- Neurobehavioral impairments undermine ability to participate "conventionally" in treatment
  - Challenges participating in didactic training or group interventions
  - SUD treatment providers may view behavior as disruptive, especially if they don't know about history of TBI
- Greater co-occurring psychiatric disorders for those with TBI

Medicaid beneficiaries with TBI and OUD less likely to receive and continue MOUD than people without

Table 4. Adjusted Multivariable Analyses of MOUD Use and Continuity Among Washington State Medicaid Enrollees With OUD

	MOUD use, 2016-2019 (n = 159 238 person-years)		MOUD 6-mo continuity, 2017-2018 (n = 40 466 person-years)	
Model[a]	AOR (95% CI)	*P* value	AOR (95% CI)	*P* value
Model 1, disability status				
Any disability (reference, no disability)	0.60 (0.58-0.61)	<.001	0.87 (0.82-.93)	<.001
Model 2, disability type				
Physical (reference, no physical disability)	0.58 (0.55-0.61)	<.001	0.85 (0.74-0.96)	.009
Sensory (reference, no sensory disability)	0.61 (0.58-0.65)	<.001	0.94 (0.83-1.07)	.34
Developmental (reference, no developmental disability)	0.50 (0.46-0.55)	<.001	1.13 (0.94-1.35)	.21
Cognitive (reference, no cognitive disability)	0.77 (0.74-0.80)	<.001	0.89 (0.82-0.97)	.006

- People with TBI were 23% less likely to access MOUD, and 11% less likely to continue MOUD

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Original Investigation | Equity, Diversity, and Inclusion

Quality of Opioid Use Disorder Treatment for Persons With and Without Disabling Conditions

Cindy Parks Thomas, PhD; Maureen T. Stewart, PhD; Emily Ledingham, MA, MPH; Rachel Sayko Adams, PhD, MPH; Lee Panas, MS; Sharon Reif, PhD

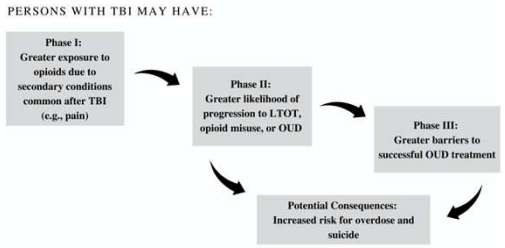
Reduced retention on MOUD found among adults with a TBI with employer-based insurance

- Individuals with TBI were 14% more likely to discontinue MOUD at a given time, compared to those without TBI
- Results consistent with our recent Medicaid study that found that people with a TBI diagnosis were 11% less likely to continue MOUD for 6 months (Thomas et al, 2023)
- Differences in MOUD retention may reflect barriers or challenges faced by people with TBI in the treatment system
  - There are no medical contraindications to using MOUD for people with TBI or other disabilities

Characterizing the Association Between Traumatic Brain Injury and Discontinuation of Medications for Opioid Use Disorder in a Commercially Insured Adult Population

Julie R. Morgan, PhD; Sharon Reif, PhD; Maureen T. Stewart, PhD; Marc R. Laramie, MD, MPH; Rachel Sayko Adams, PhD, MPH

Consequences of the "Perfect Storm"



Adams, 2021, *JHTR*, Preface

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TBI is associated with increased risk for non-fatal and fatal overdose

- Among post-9/11 Veterans using the VHA who were receiving long-term opioid therapy, those with TBI had more than a 3-fold increase in opioid overdose compared to those without TBI (Fonda et al, 2019)
- A study using TBI model systems data, found persons with TBI were 11 times more likely to die from accidental overdose (Hammond et al, 2020)
- A study of Veterans using the VHA, found that those with a TBI were at increased risk for death by drug overdose (Byers et al, 2019)

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TBI increases risk for death by suicide, and opioids may confer additional risk

- Studies have found an association between TBI and increased risk for death by suicide
- Long-term opioid therapy and OUD increase risk for suicide
- Among Veterans prescribed long-term opioid therapy in the VHA to treat chronic pain, those with TBI were at increased risk for suicide attempt compared to those without TBI

Hostetter et al., 2019; Madsen et al., 2019; Adams, Corrigan and Dams-O'Conner, 2020; Im et al., 2015

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Original Investigation | Psychiatry

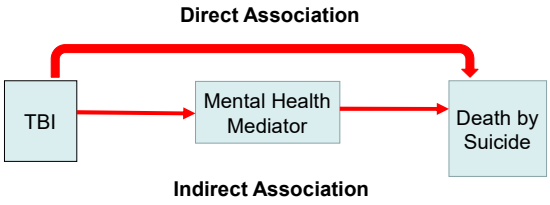
Associations of Military-Related Traumatic Brain Injury With New-Onset Mental Health Conditions and Suicide Risk

Lisa A. Brenner, PhD; Jeri E. Forster, PhD; Jaimie L. Gradus, DMSc, DSc, MPH; Trisha A. Hostetter, MPH; Claire A. Hoffmire, PhD; Colin G. Walsh, MD, MA; Mary Jo Larson, PhD, MPA; Kelly A. Stearns-Yoder, MA; Rachel Sayko Adams, PhD, MPH

Study aims among 860,892 soldiers:

1) Identify differences in rates of new onset MH conditions (anxiety, mood, posttraumatic stress, adjustment, alcohol use, and substance use disorders) among those with and without a history of military related TBI
2) Explore the direct and indirect effects (through new onset MH disorders) of TBI on suicide

Mediation Models



Mediation Model Results

New Onset Mental Health Category-Mediator	Direct Effect of TBI on Suicide (95% CI)		Indirect Effect of TBI through New Onset Mental Health Diagnoses (95% CI)	
Anxiety	0.834 (0.756, 0.920)	16.6% (8.0%, 24.4%)	0.735 (0.670, 0.814)	26.5% (19.6%, 33.0%)
Mood	0.874 (0.792, 0.964)	12.6% (3.6%, 20.8%)	0.566 (0.518, 0.622)	43.4% (37.8%, 48.2%)
PTSD	0.863 (0.781, 0.953)	13.7% (4.7%, 21.9%)	0.563 (0.485, 0.653)	43.7% (44.7%, 61.5%)
Adjustment	0.833 (0.756, 0.918)	16.7% (8.2%, 24.4%)	0.750 (0.700, 0.810)	25.0% (19.0%, 30.0%)
Alcohol	0.852 (0.773, 0.938)	14.8% (6.2%, 22.7%)	0.504 (0.460, 0.551)	49.6% (44.9%, 54.0%)
Substance	0.848 (0.769, 0.935)	15.2% (6.5%, 23.1%)	0.372 (0.322, 0.433)	62.8% (56.7%, 67.8%)

Note. Point estimates for the direct effect and the indirect effect were taken from the AFT models including TBI and the mediator of interest, and controlling for age category (18-24, 25-29, 30-34, 35-39, 40+), race and ethnicity (American Indian/Alaskan Native, Asian American or Pacific Islander, WNH, BNH, Hispanic, other/unknown), gender, and FY of return from index deployment (2008-9, 20010-11, 2012-14). All estimates are statistically significant at the p<0.05 level.

Discussion and Implications

Veterans Crisis Line DIAL 988 then PRESS 1

- Risk for suicide was both directly and indirectly related to history of TBI
- The largest effect was through new onset substance use disorder, with a time to suicide 62.8% times faster for soldiers with a history of TBI
- **Suicide prevention efforts and lethal means safety** needed for subgroups at high risk for substance use problems

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Opioid overdose may lead to brain injury

- Overdose suppresses or stops respiration, denying oxygen to the brain
  - Can lead to anoxic brain damage if completely denied, or hypoxic damage if reduced
- Similar to TBI, anoxic or hypoxic damage may inhibit executive functioning and self-regulation
- Overdose may also result in falls, increasing risk for TBI

The frontal lobe is highly susceptible to brain oxygen loss, and damage leads to potential loss of executive function.

Corrigan & Adams, 2019; Schirmer & Seale, 2018; NASHIA FactSheet; BIAAA Position Statement

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Prescription opioid receipt increased risk for TBI among Medicare beneficiaries

J Head Trauma Rehabil
Vol. 36, No. 5, pp. 388–395

Effects of Prescription Opioid Use on Traumatic Brain Injury Risk in Older Adults

Anthony V. Herrera, MS; Linda Wastila, PhD; Jessica P. Brown, PhD; Hegang Chen, PhD; Steven R. Gambert, MD; Jennifer S. Albrecht, PhD

- Prescription opioid use independently increased the odds of TBI by 30%, compared to non-users

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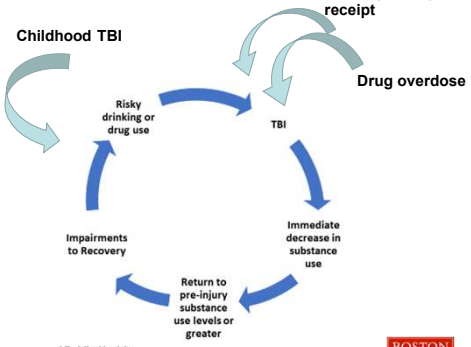
The cycle may have more entry points



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Summary of the "perfect storm"

- People with a history of TBI are:
  - receiving more exposure to opioids than people without,
  - more likely to use opioids long-term, to misuse opioids, and to develop addiction, and
  - less likely to access and receive quality substance use disorder treatment
- The potential consequences of this "perfect storm" are dire, and include increased morbidity and mortality

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The Journal of Head Trauma Rehabilitation
Knowledge Informing Care

J Head Trauma Rehabil
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Preface

Traumatic Brain Injury and Opioid Use: Additional Evidence Supporting the "Perfect Storm" of Cascading Vulnerabilities

Rachel Sayko Adams, PhD, MPH

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Recommendations for SUD treatment providers

- Screen for lifetime history of TBI
- Several reliable and validated screeners
  - Ohio State University TBI Identification Method (OSU TBI-ID)
  - Self-report version available - used on several national surveys
- Two-tiered elicitation
  - 1st identify events that may have resulted in an external force applied to the brain
  - 2nd elicit nature of altered brain function
  - Strongly recommend against self-diagnose by using terms like "concussion" or "traumatic brain injury" in elicitation - prone to bias due to understanding of the terms

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Recommendations for SUD treatment providers

- Clinicians considering initiation of opioids for pain should complete an evaluation of a patient's lifetime history of TBI and follow existing clinical practice guidelines to use caution when prescribing opioids to individuals with TBI
- Identify and accommodate neurobehavioral deficits
- Address co-morbid interactions (e.g., depression, anxiety, pain, sleep, sensory/motor deficits)
- Create formal and/or informal supports needed during and after treatment completion
- Medication-based treatments are safe and effective and there are no general contraindications for people with TBI

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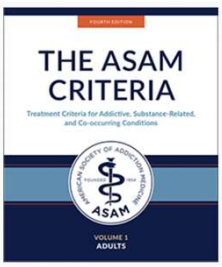
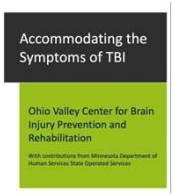
Additional Resources



New chapter on **addressing cognitive impairment in substance use treatment** which proposes the concepts of neurologic-informed, neurologic-responsive care, and neurologic-specific care



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Key References

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