

# Comorbidities in Traumatic Brain Injury Rehabilitation



John D. Corrigan, PhD

Professor

Department of Physical Medicine and  
Rehabilitation

The Ohio State University

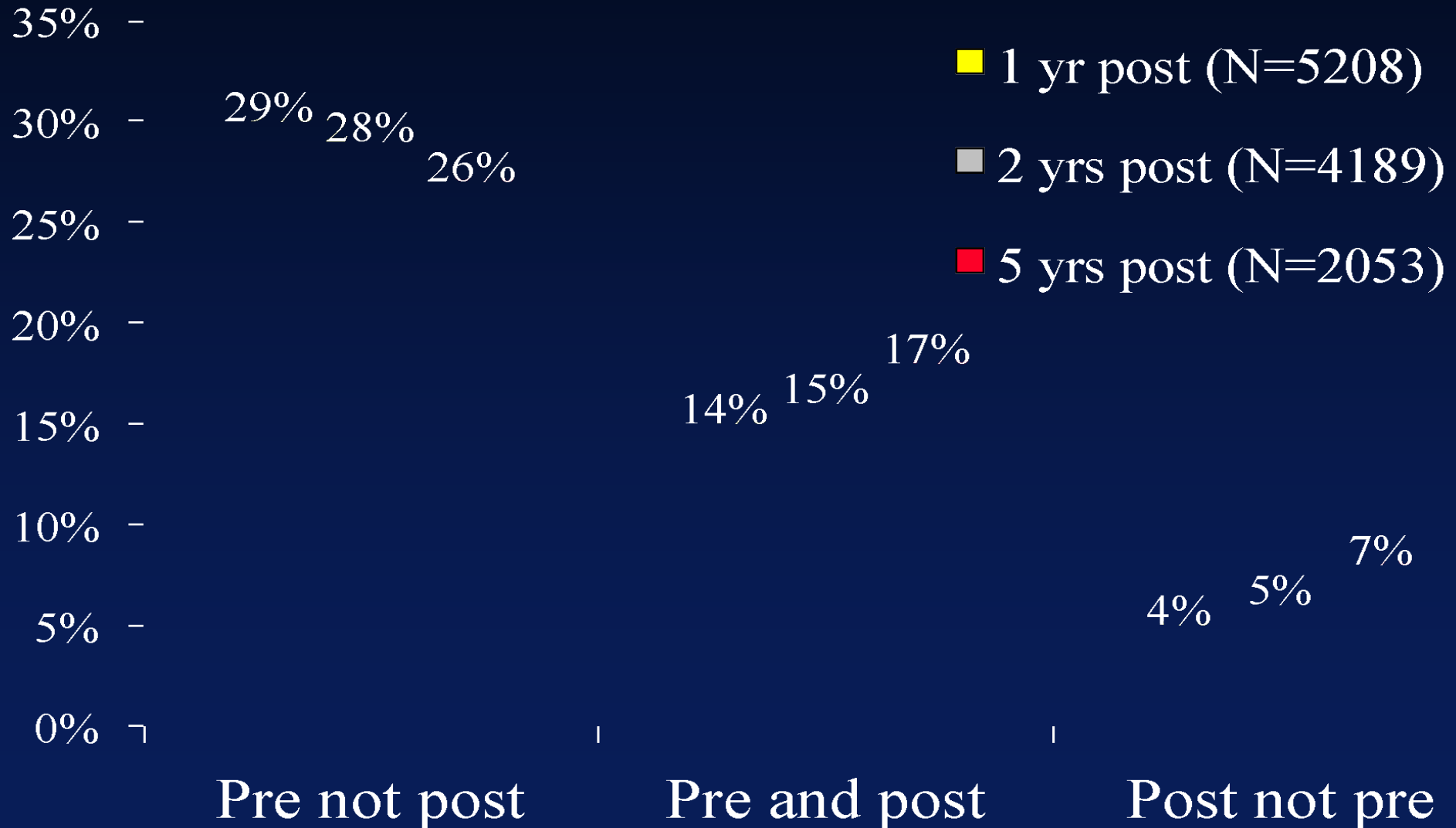
Director

Ohio Valley Center for Brain Injury  
Prevention and Rehabilitation

## 2 Issues Addressed Today

1. TBI normally presents with co-occurring injuries and behavioral health disorders requiring an integrated approach.
2. TBI is a chronic health condition with both persistent and late developing co-morbidities.

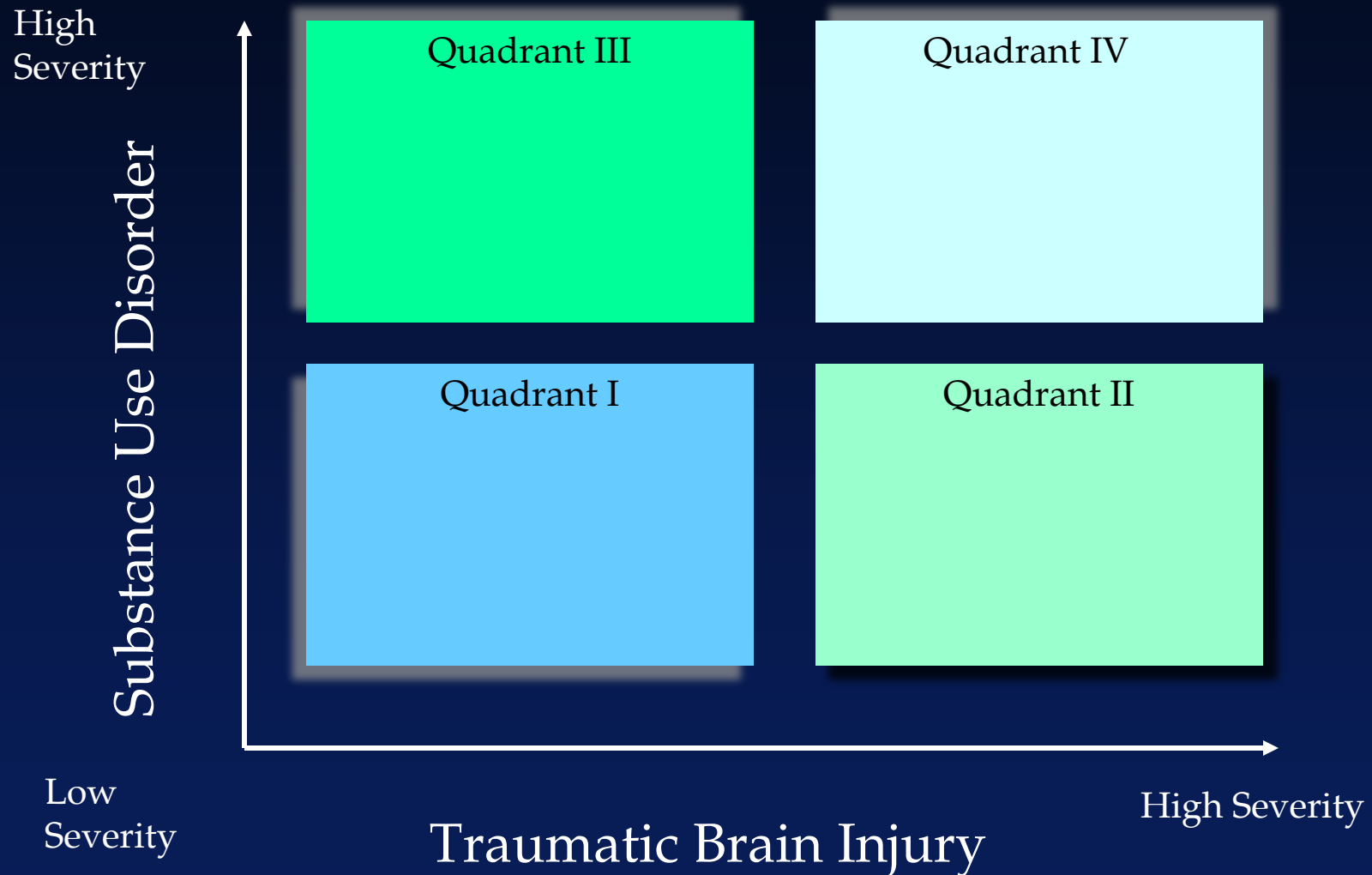
# Problem Substance Use Before and After Moderate and Severe TBI



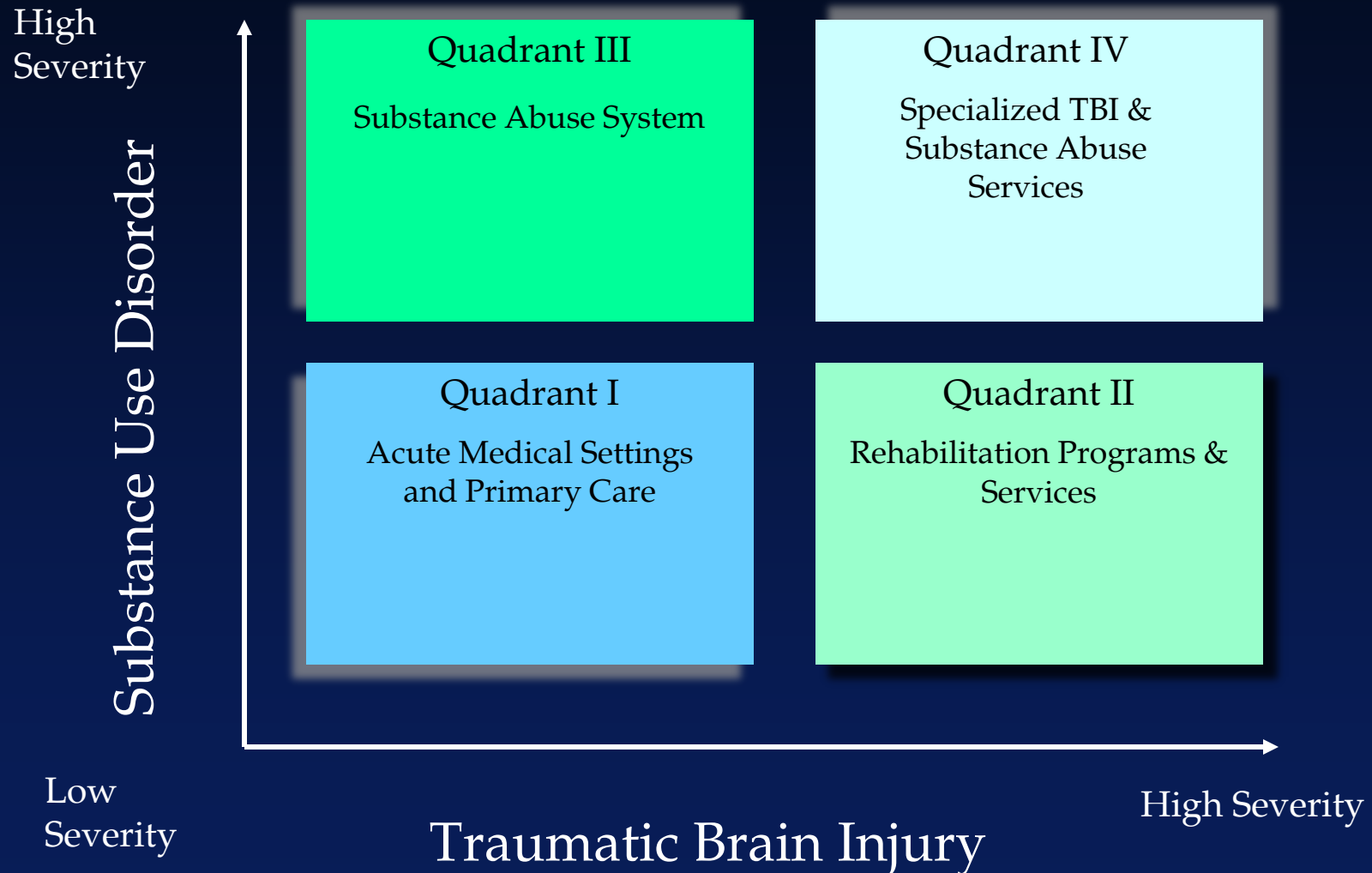
# Substance Use Disorders and Negative Outcomes After TBI

- Gets worse as time post-discharge increases (Corrigan, Smith-Knapp & Granger, 1998; Kreutzer et al., 1996; Kreutzer, Witol & Marwitz, 1996; Corrigan, Rust & Lamb-Hart, 1995)
- Is associated with unemployment, criminal activity, depression and overall lower subjective well-being (Sherer et al., 1999; Corrigan et al., 1997; Kreutzer et al., 1996; Kreutzer et al., 1991)
- Interactive effect for indicators of brain function and structure (Barker et al., 1999; Baguley et al., 1997; Bigler et al., 1996)
- **Both brain injury rehabilitation and substance abuse treatment professionals need to address co-occurring TBI and SUD.**

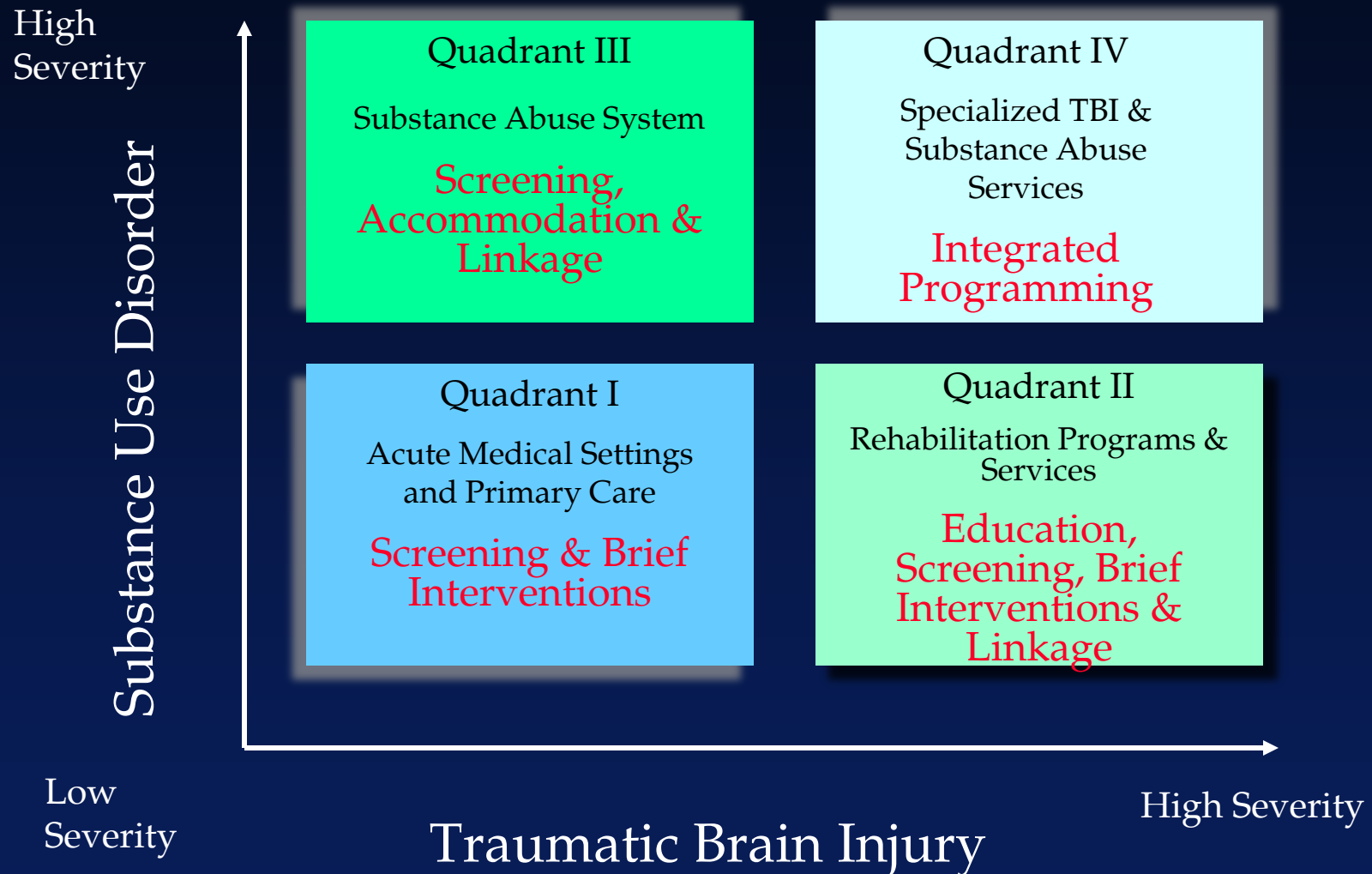
# 4 Quadrant Model of Services



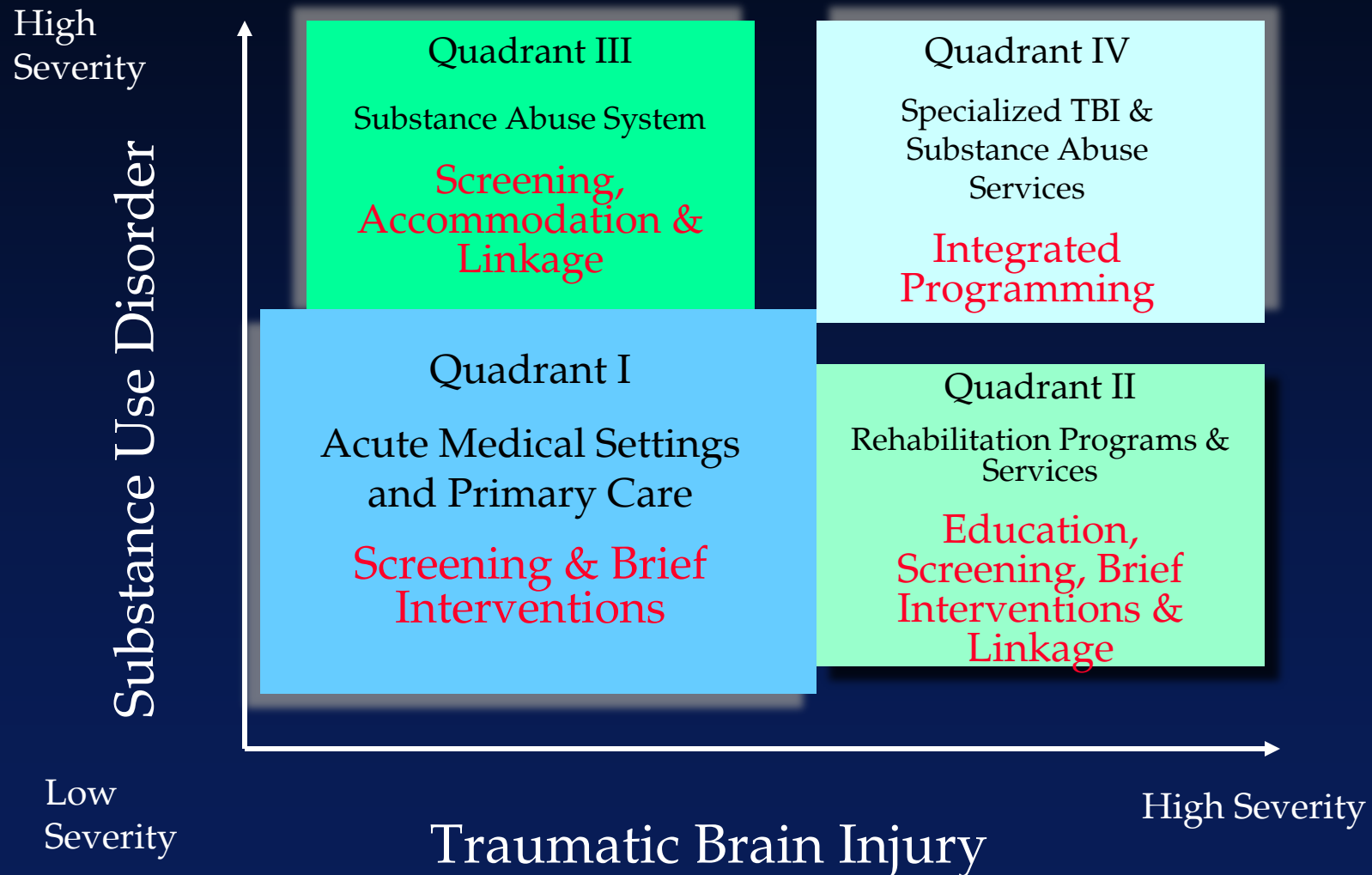
# 4 Quadrant Model: Place of Service Provision



# 4 Quadrant Model: Types of Services



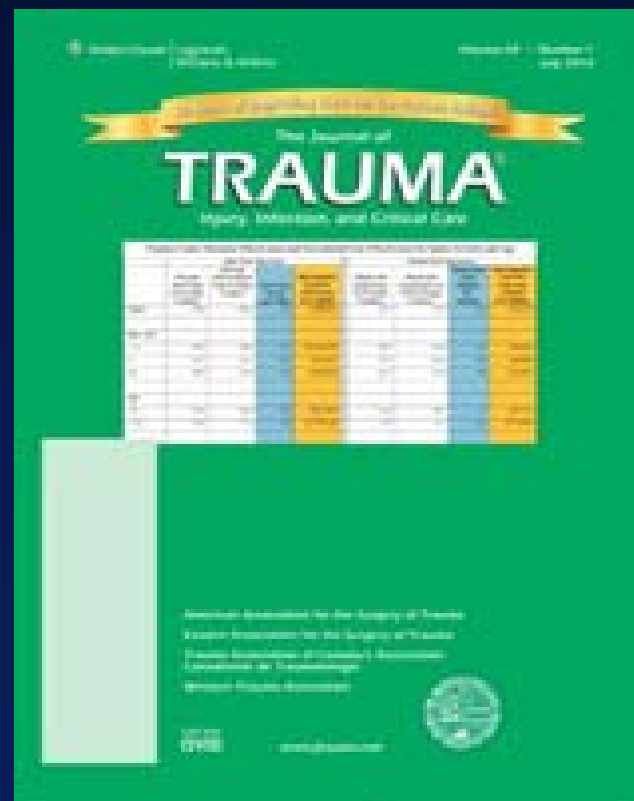
# 4 Quadrant Model of Services



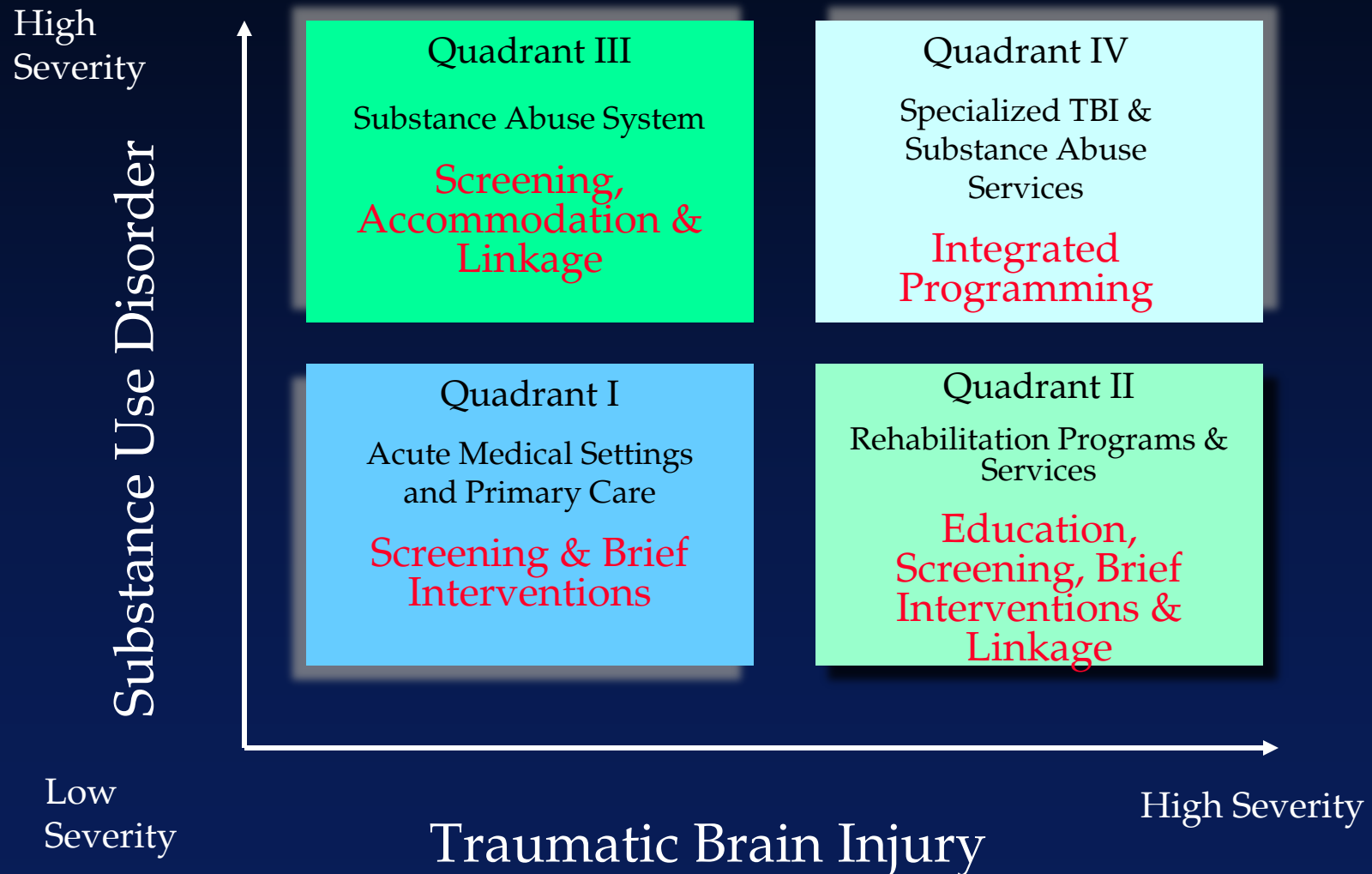


# Screening and Brief Intervention for Substance Misuse Among Patients With Traumatic Brain Injury

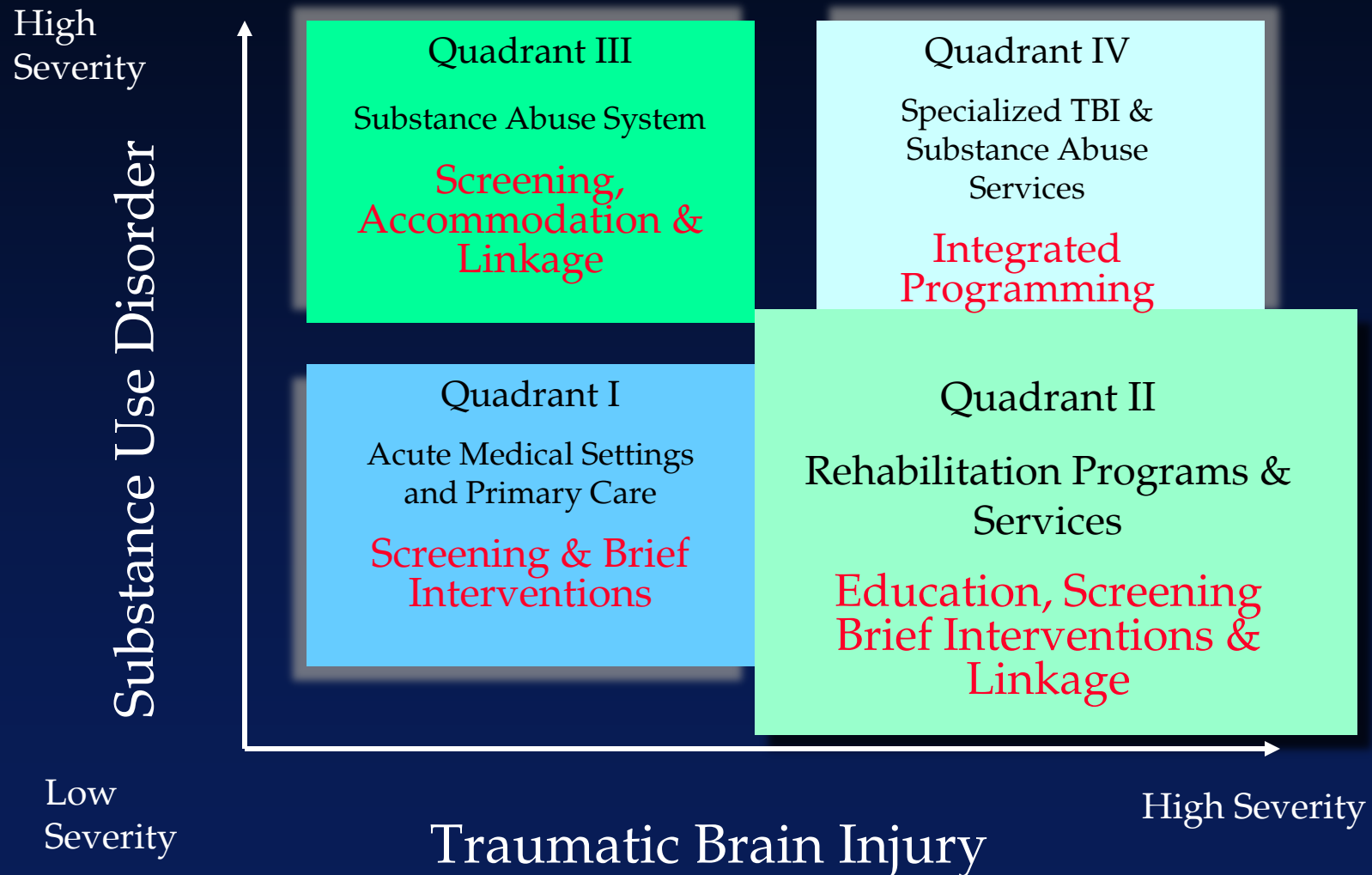
*John D. Corrigan, PhD, Jennifer Bogner, PhD, Daniel W. Hungerford, DrPH, and Katherine Schomer, MA*



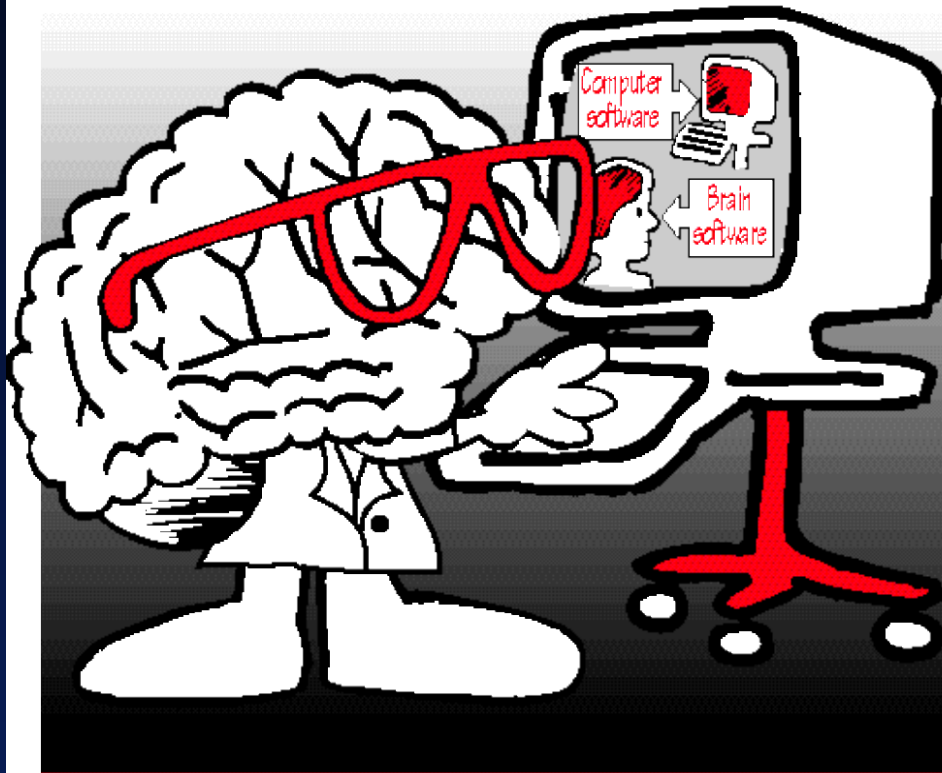
# 4 Quadrant Model: Types of Services



# 4 Quadrant Model of Services



# Substance Use and Abuse After Brain Injury:



## A Programmer's Guide



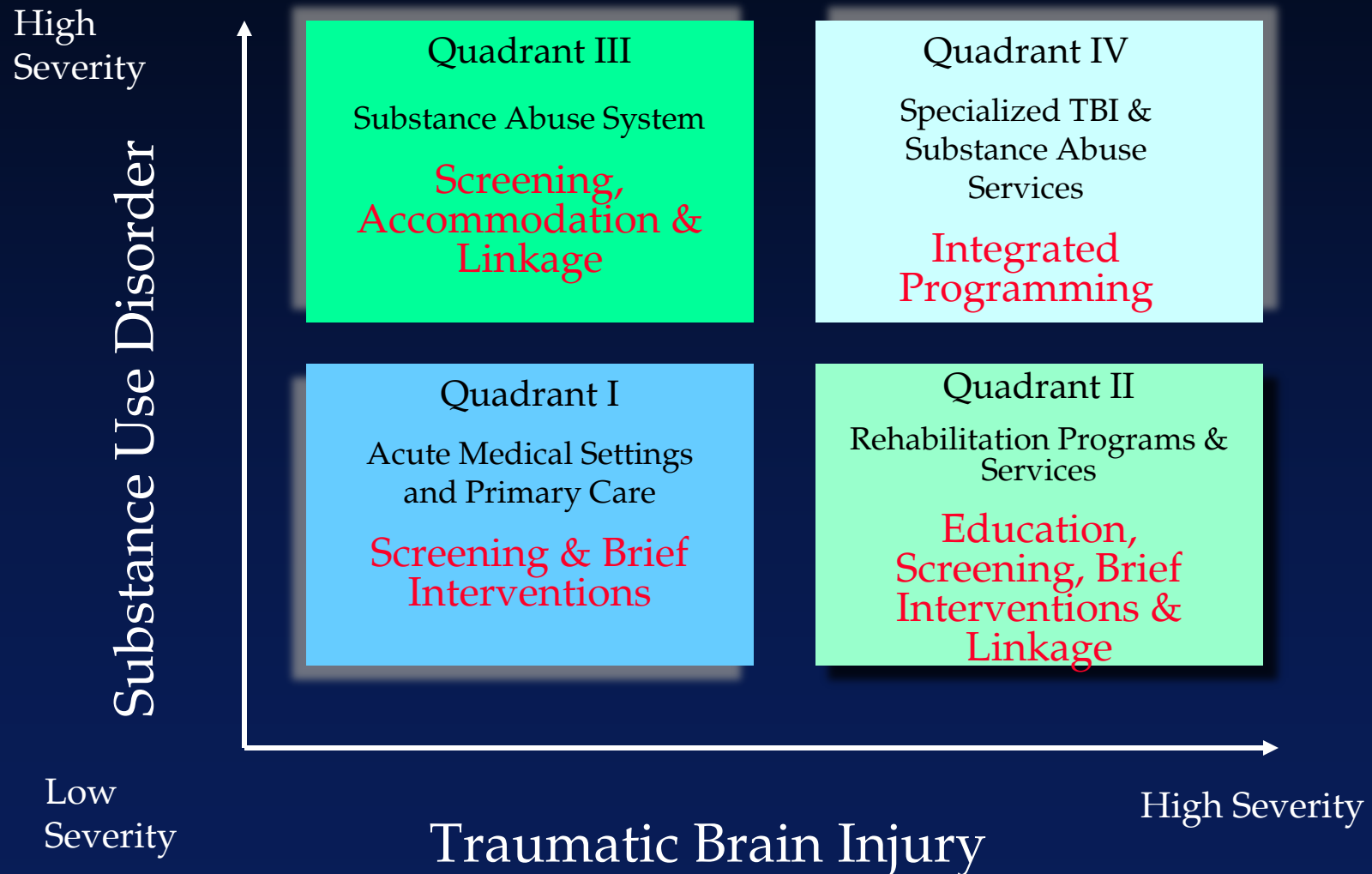
OHIO  
VALLEY  
CENTER

FOR HEAD INJURY PREVENTION  
AND REHABILITATION

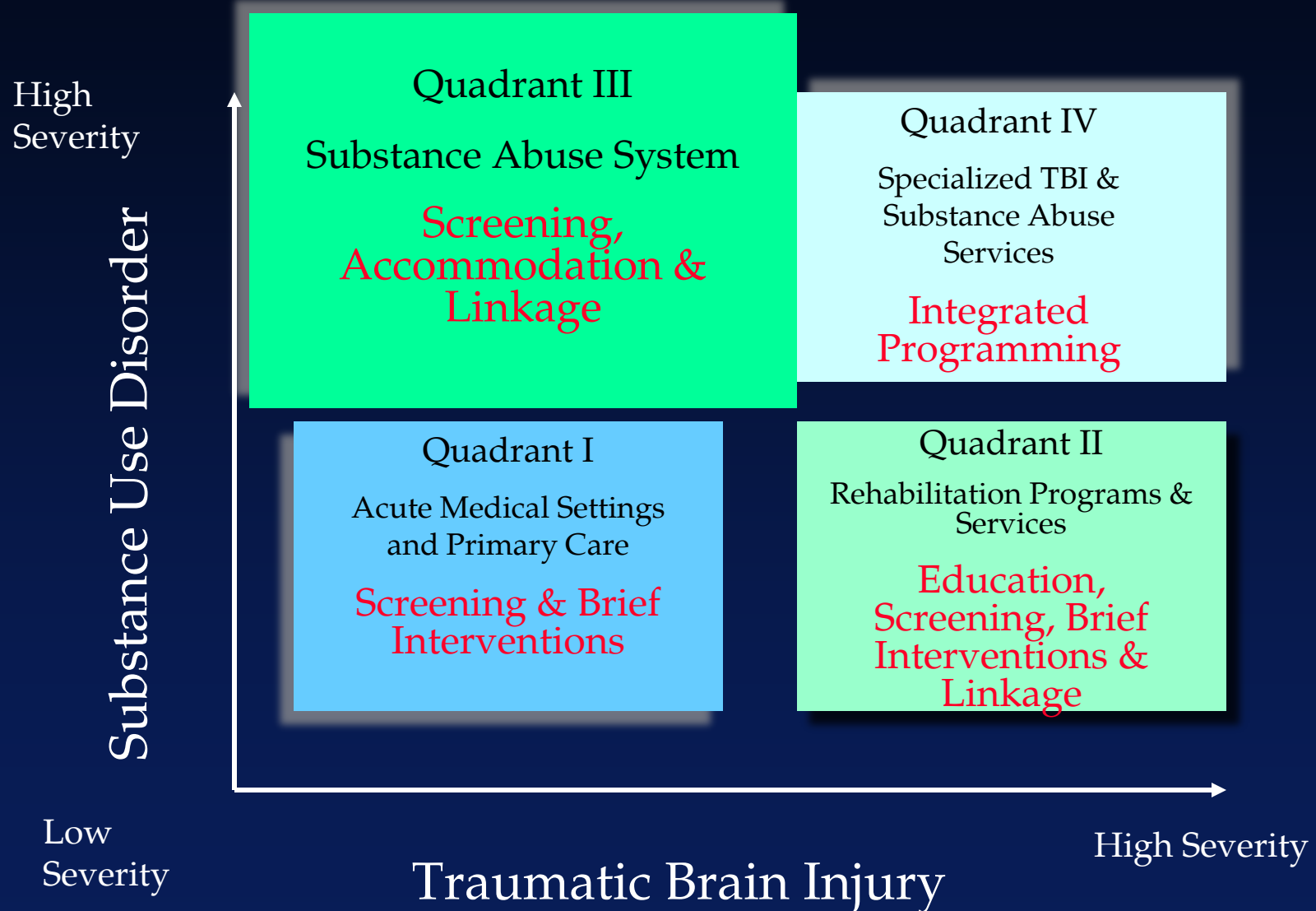
Substance Abuse Information Series

# A Programmer's Guide

# 4 Quadrant Model: Types of Services



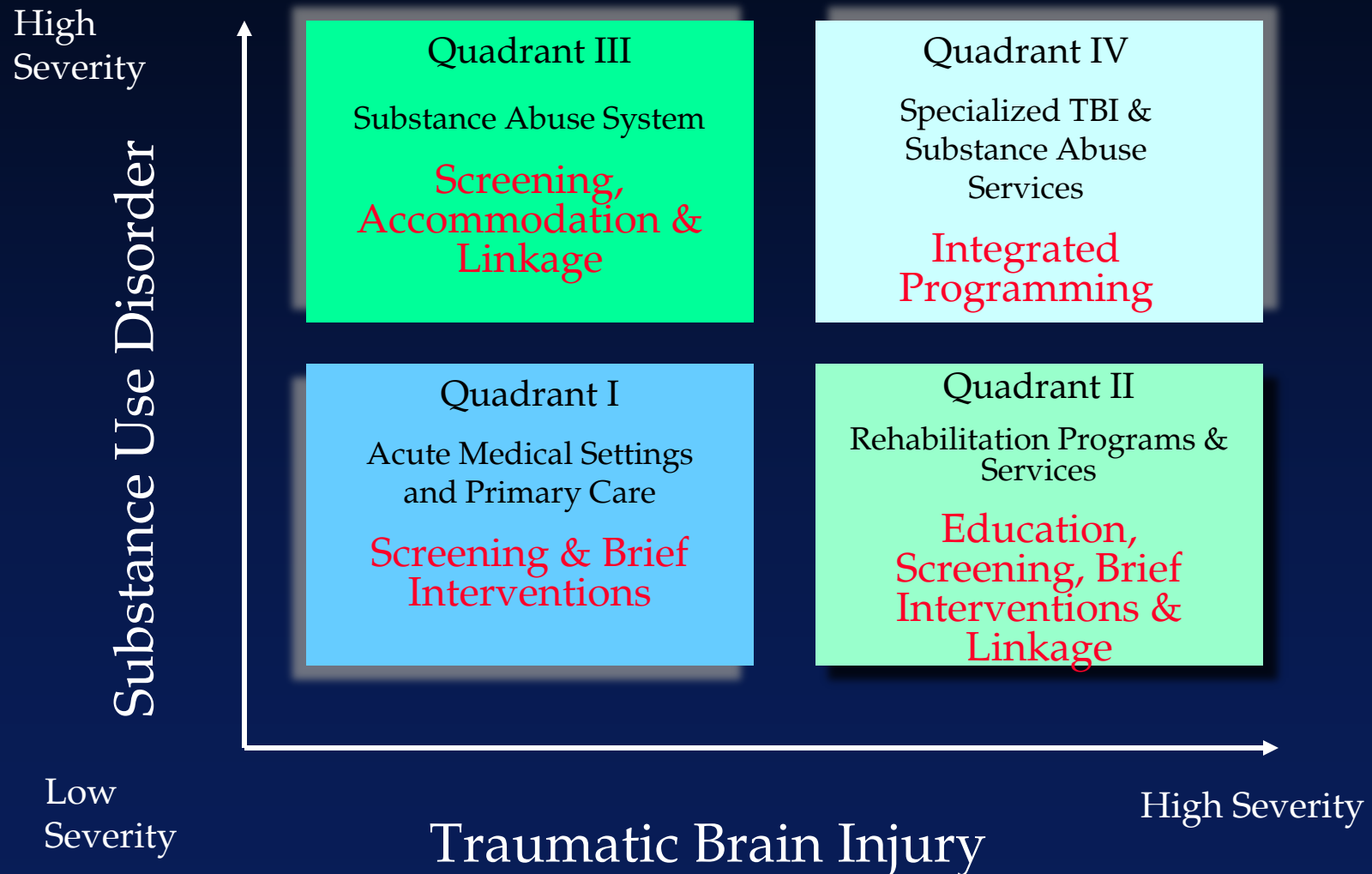
# 4 Quadrant Model of Services



# Recommendations for Substance Abuse Treatment Providers

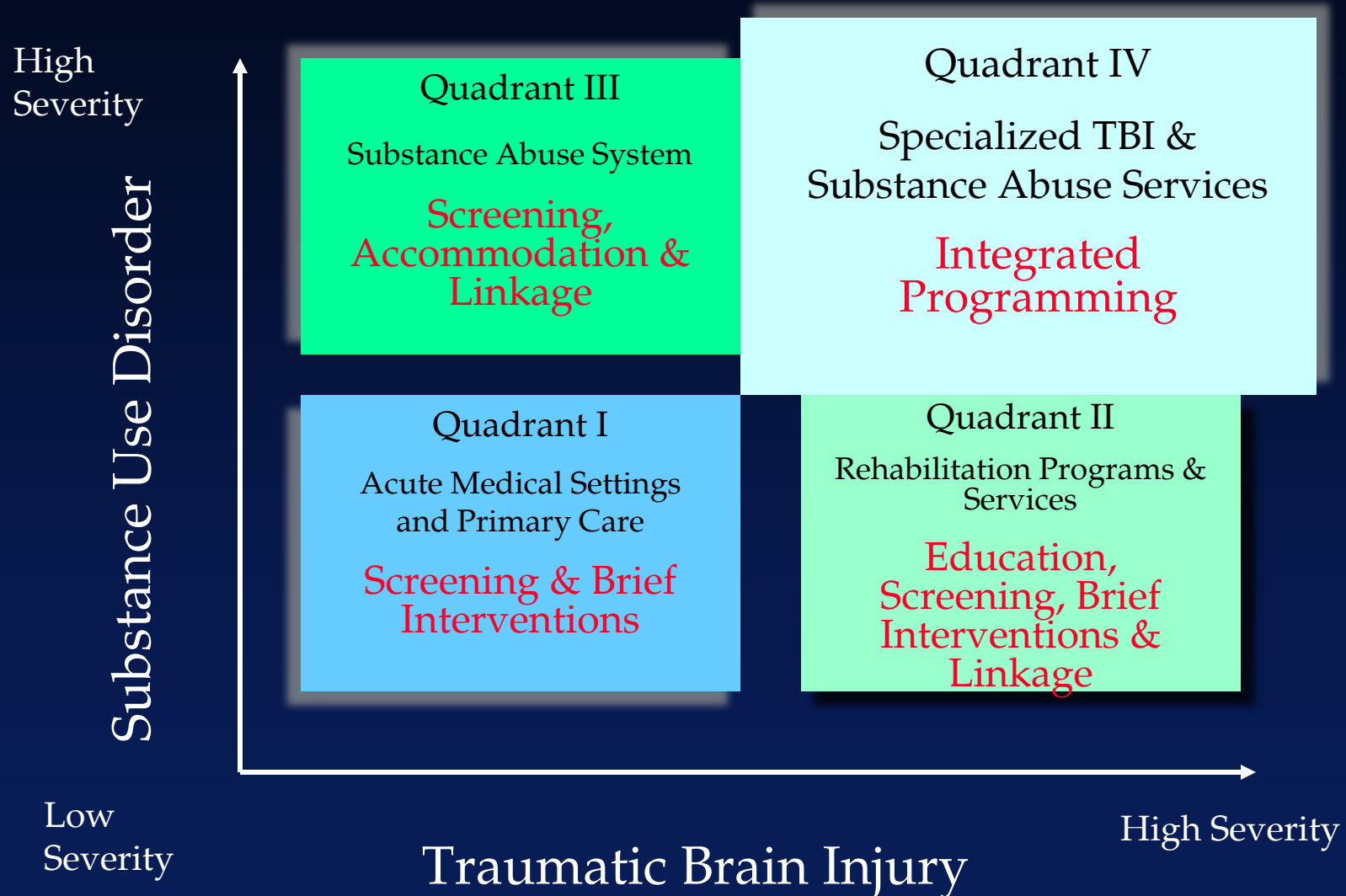
- Treatment providers need to know TBI history is present and consider implications of onset and severity
- Treatment planning needs to incorporate:
  - Accommodations for neurobehavioral deficits
  - Co-morbid interactions (e.g., depression, anxiety, pain)
  - Formal and/or informal supports needed during and after treatment completion.

# 4 Quadrant Model: Types of Services





# 4 Quadrant Model: Types of Services

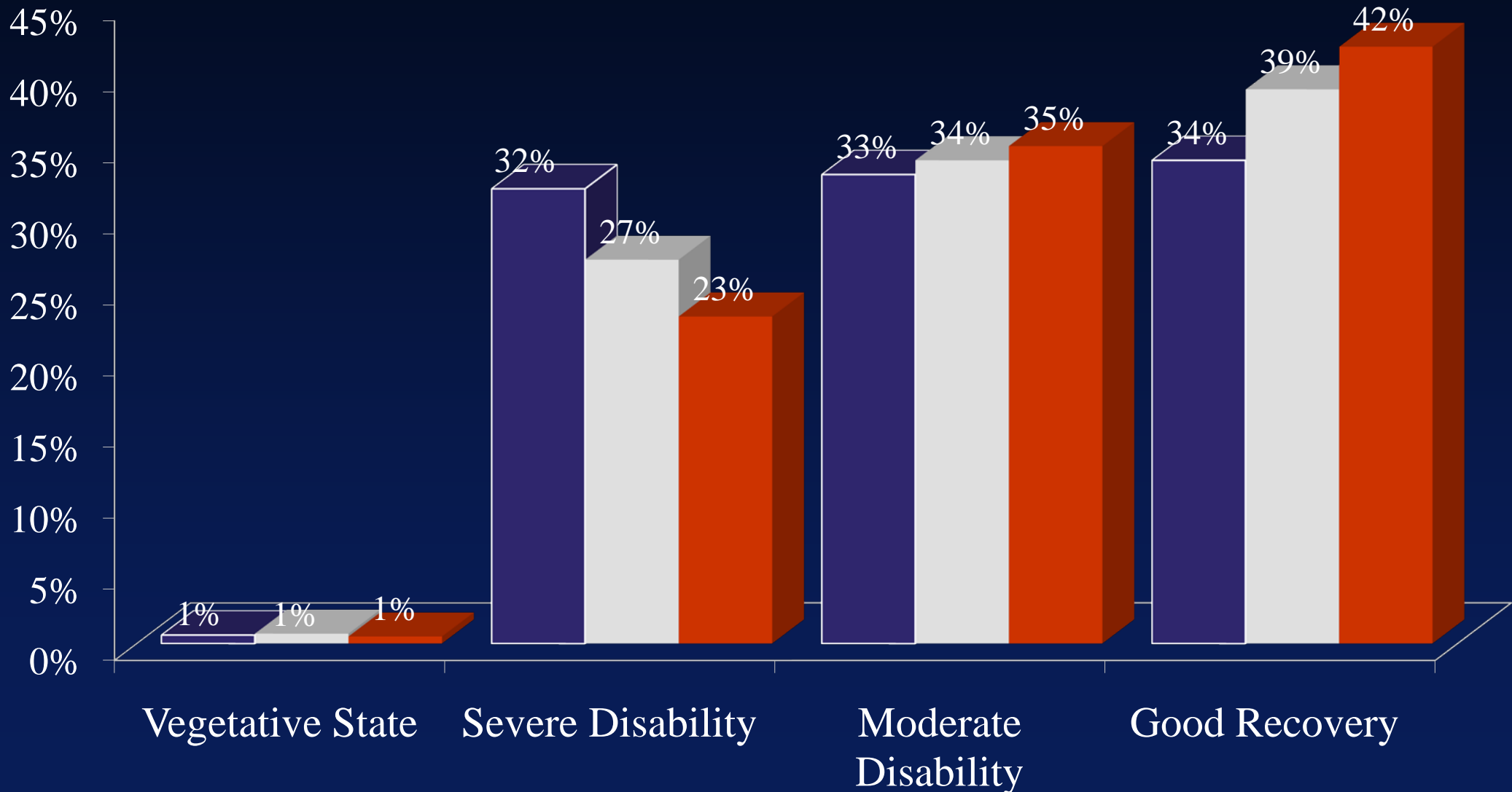


# Glasgow Outcome Scale

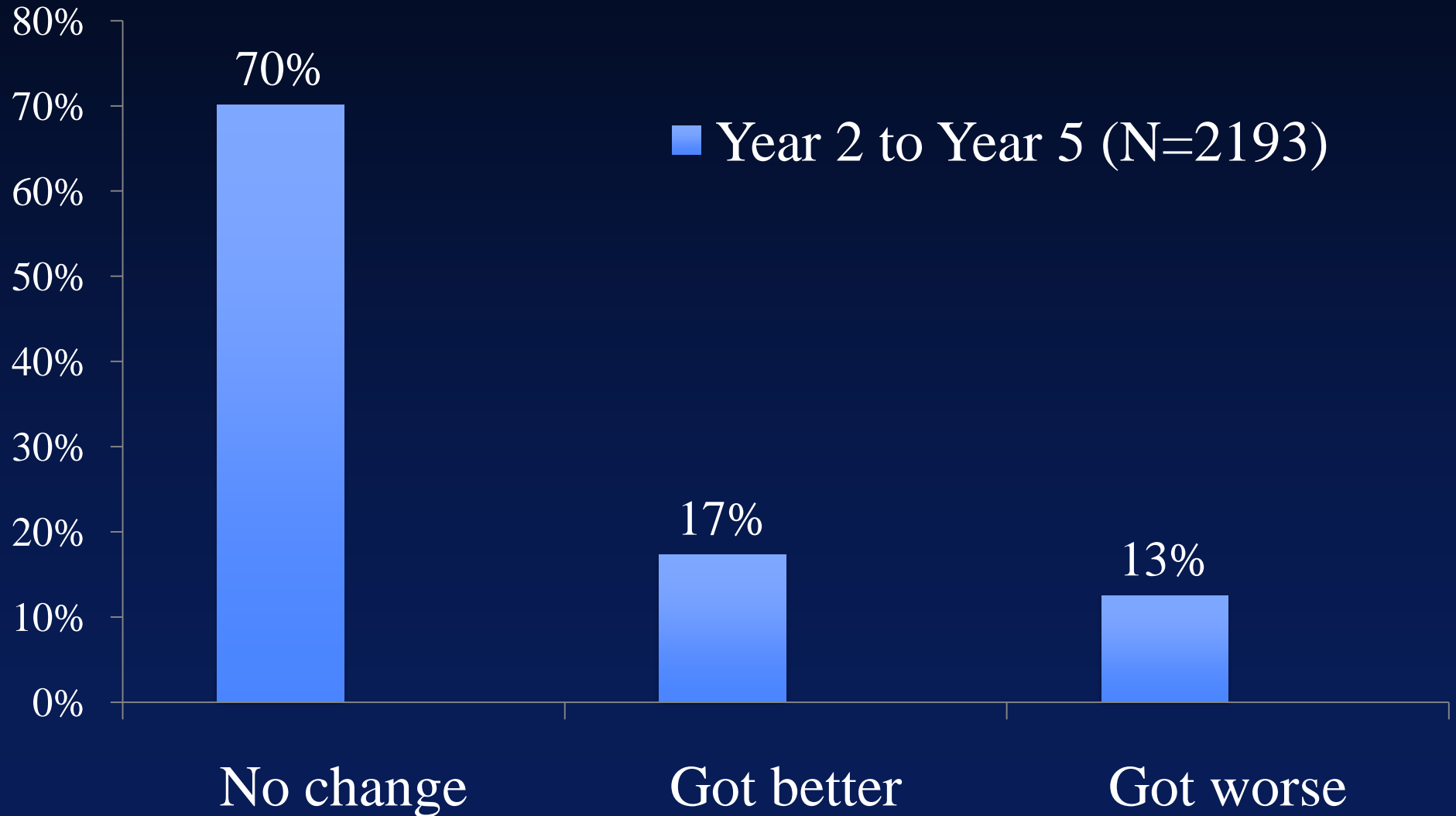
■ Year 1 (n=5289)

■ Year 2 (n=4347)

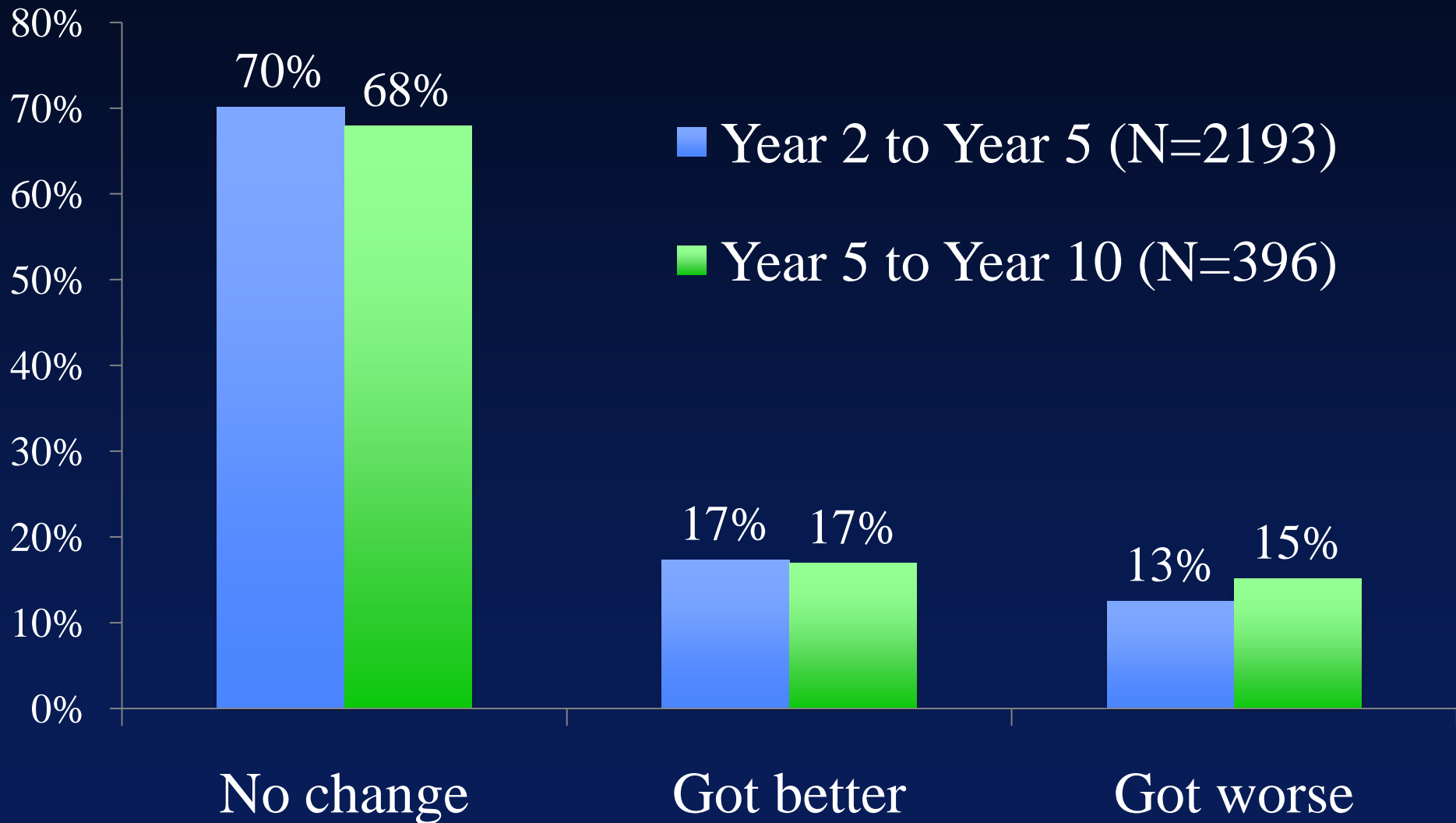
■ Year 5 (n=2312)



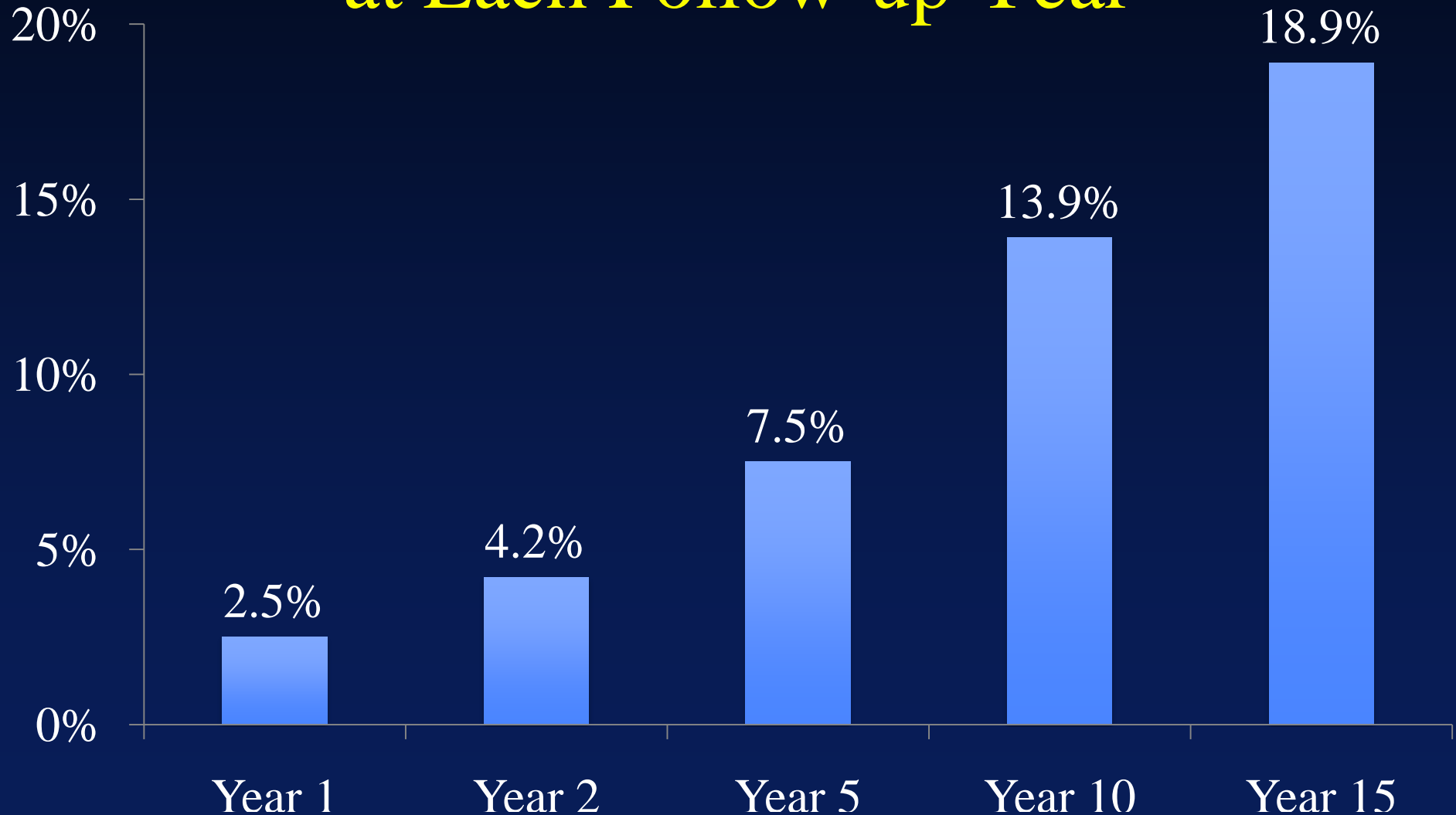
# Improvement and Decline (GOS)



# Improvement and Decline (GOS)



# TBI Model Systems Subjects Deceased at Each Follow-up Year



# TBI and Premature Mortality

(Harrison-Felix et al., 2004)

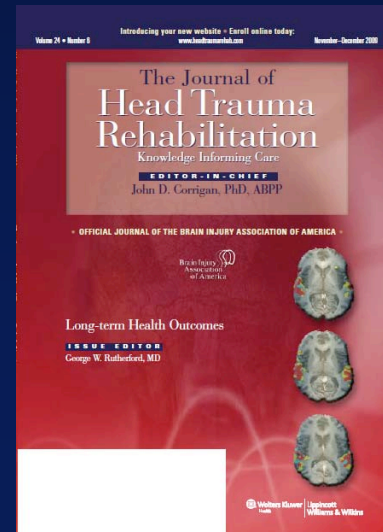
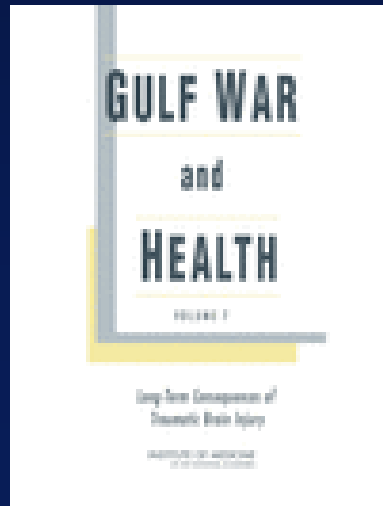
- TBI Models Systems National Dataset subjects (i.e., moderate or severe TBI requiring rehabilitation)
- In first 10 years post-injury, twice as likely to die compared to age, gender and race population rates
- reduced life expectancy by 7 years
- after 1 year, risk for death increased with age, disability and pre-morbid unemployment

## Causes of death (Harrison-Felix et al., 2006)

- 2,140 TBI Model Systems subjects who survived to 1 year post-injury
- compared to the general population matched for age, gender and race, persons who required rehab for TBI:
  - 37 times more likely to die of **seizures**
  - 12 times more likely to die of **septicemia**
  - 4 times more likely to die of **pneumonia**
  - 3 times more likely to die of **other respiratory conditions** (excluding pneumonia)
  - 3 times more likely to die of **digestive conditions**
  - 3 times more likely to die from **injury/poisoning**

# 2009 Institute of Medicine Report

## *Gulf War and Health Volume 7: Long-Term Consequences of Traumatic Brain Injury*





# Consequences of TBI Persisting or Developing 6 or More Months Post-injury

- Seizures
- Cognitive deficits
- PCS
- Depression
- Suicide
- Unemployment
- Social isolation
- Psychosis
- Premature death
- Progressive dementia
- Parkinsonism
- Diabetes insipidous
- Endocrine dysfunction
- Hypopituitarism

# Consequences of TBI Emerging or Re-Emerging Later in Life

- Cognitive deficits
- Depression
- Suicide
- Premature death
- Progressive dementia
- Parkinsonism

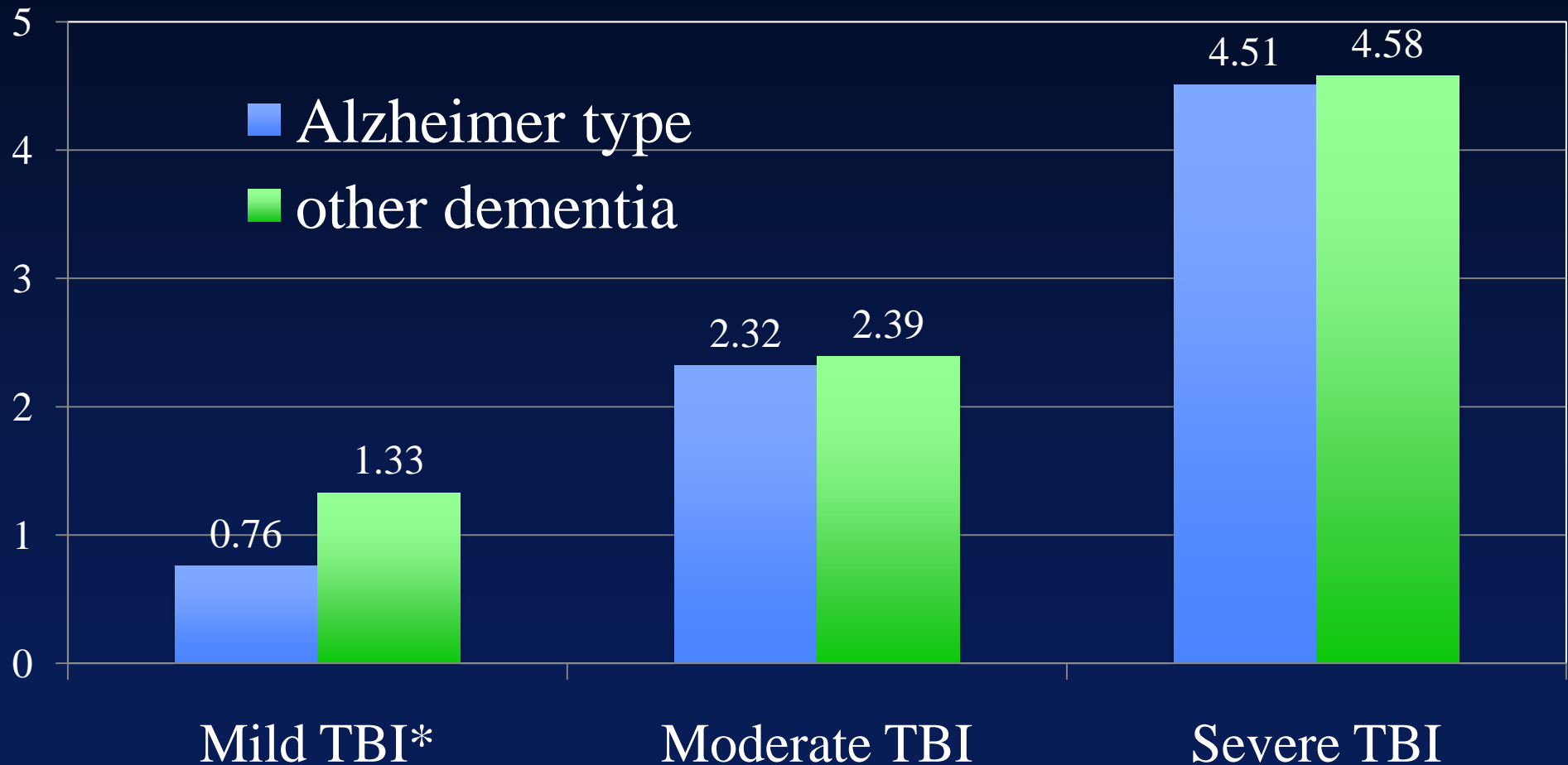
Most consequences have not been studied in later life (e.g., endocrine disorders studied 2 years post-injury only).

# TBI and Depression

(Holsinger et al., 2002)

- 520 WWII cases of non-penetrating TBI with no significant cognitive impairment 3 months post-injury compared to hospitalized controls
- current and lifetime history of major depression assessed 50 years later
- both lifetime (OR 1.54) and current (OR 1.63) major depression significantly associated with TBI history 50 yrs prior
- More likely with more severe TBI or older current age

Hazard Ratio for likelihood of developing dementia 50+ years after combat-related non-penetrating TBI (n=548) vs. age and education matched, uninjured controls (n=1,228) [Plassman et al. 2000]



\* Not significantly different from controls

# Managing TBI as a Chronic Health Condition

- Prospective clinical surveillance to allow **early detection and intervention** for health complications;
- Protocols for **preventive interventions** that target high incidence or high risk complications;
- Protocols for training in **self-management** aimed at improving health and well-being;
- Access to medical care to **treat complications**; and
- Access to rehabilitation services to **re-optimize functional abilities**.

# THANK YOU

1. TBI normally presents with co-occurring injuries and behavioral health disorders requiring an integrated approach.
2. TBI is a chronic health condition with both persistent and late developing co-morbidities.