

# Substance Use and Traumatic Brain Injury

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# Overview

- ▶ Alcohol and TBI
  - ▶ Prevalence
  - ▶ Relationship to outcomes
  - ▶ Rationale for non-specialist interventions
  - ▶ Psychological Interventions
  - ▶ Medical Treatments
  - ▶ Discussion

## Alcohol Use and TBI

- ▶ 30-50% intoxicated at time of TBI
- ▶ 36% met criteria for abuse or dependence
- ▶ Alcohol stops or declines during the first year
- ▶ About 25-50% resume problem drinking
- ▶ Few new cases of alcohol use problems
- ▶ However, childhood TBI confers 3.6-6.0-fold greater risk of alcohol problems as adults

# Pre-TBI Alcohol Abuse and Outcomes

Meta-analysis of 16 studies

- ▶ Neuroradiological findings
  - ▶ Greater gray matter volume loss
  - ▶ Enlarged cerebral ventricles
- ▶ Neurocognitive findings
  - ▶ Worse executive functioning
  - ▶ Worse memory
- ▶ Worse post-TBI alcohol and substance use
- ▶ Worse emotional functioning

# Alcohol Intoxication and Recurrent TBI

- Finnish population study
- 236 survivors of TBI
- 21-year follow-up
- Those with alcohol related index TBI were ~4 times as likely to have recurrent TBI compared to those with index TBI not alcohol-related
- 6% vs. 25% (RR 4.41, 95% CI=1.53-12.70)

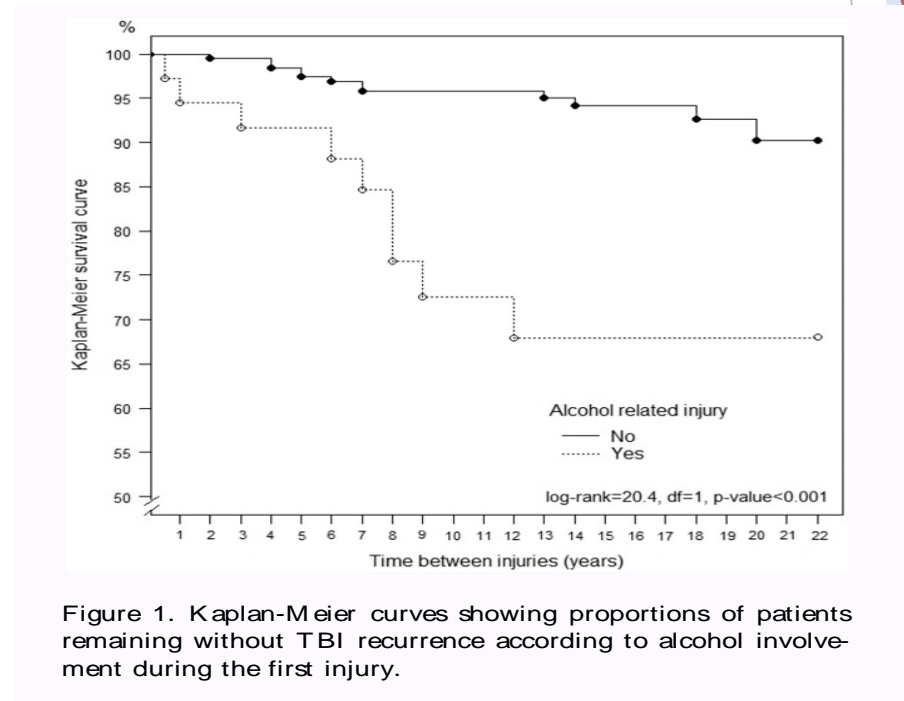


Figure 1. Kaplan-Meier curves showing proportions of patients remaining without TBI recurrence according to alcohol involvement during the first injury.

# Adverse Effects of Alcohol Use After TBI

- ▶ Alcohol use can increase risk for seizures directly via lowered seizure threshold or indirectly via interfering with efficacy of antiseizure medications
- ▶ People who drank at “heavy social” levels had impaired event-related potentials and greater cognitive deficits relative to abstainers
- ▶ Drinking 6-9 months post-TBI is associated with poorer executive functioning after controlling for pre-injury alcohol consumption

Weil et al Alch Res Curr Rev 2018; Baugley et al., APMR 1997  
Ponsford et al., J Clin Exp Neuropsychol 2013

# Predictors of Heavy Drinking After TBI

- ▶ Male
- ▶ Younger age
- ▶ History of heavy drinking or problems\*
- ▶ Diagnosis of depression after TBI
- ▶ Better physical functioning
- ▶ Employed

\*Only 5-7% of those without prior history will drink heavily after TBI  
Horner, Ferguson et al., J Int Neuropsych Soc; 2005; Kreutzer et al., 1996  
Ponsford et al Brain Inj 2007, Bombardier et al., 2003

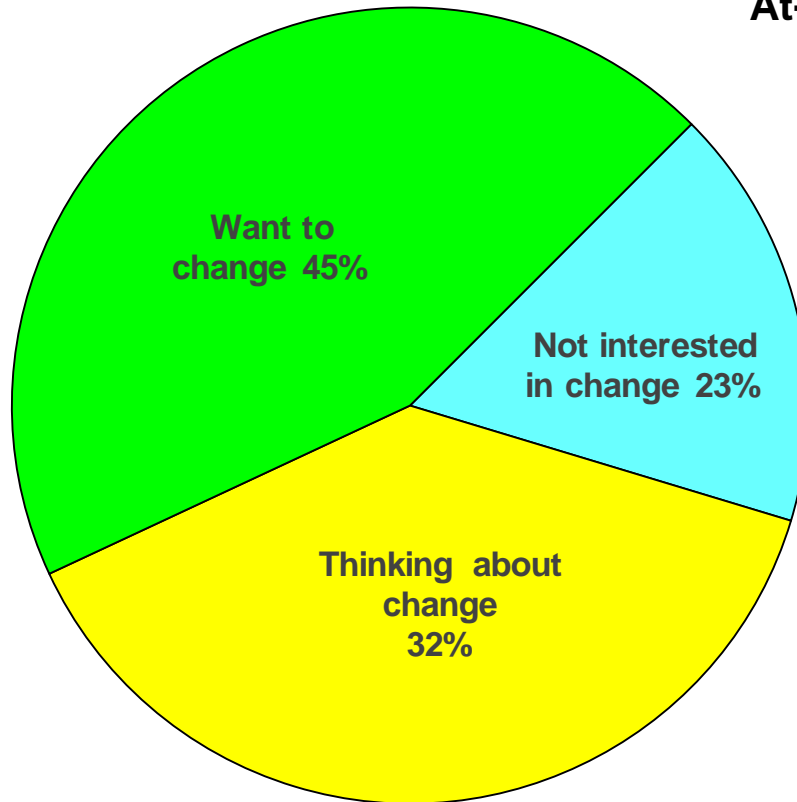
## Why Intervene Within Your Setting?

- ▶ Only 1 in 10 with SUD will get specialized treatment
- ▶ Since 1990 the IOM called for non-specialists to deliver brief interventions for SUD
- ▶ Treatment delivered by non-specialists can be effective, especially for less severe SUDs
- ▶ Brief treatment integrated into medical and surgical settings can be effective for mild-to-moderate SUD
- ▶ Brief interventions can be Step 1 of a stepped-care approach and increase readiness for more intensive treatment

Institute of Medicine. Broadening the base of treatment for alcohol problems. Washington, DC: National Academy Press; 1990.



# Window of Opportunity After TBI



**At-risk drinkers  
n = 84**

Bombardier et al., APM&R 2002

# Multiple Brief Screening Options

**Table 10. Clinical Utility of Substance Use Disorder Screeners Compared with Diagnostic Assessment**

| Study                                  | Screening Measure   | Cut Point | Sensitivity %             | Specificity %             | PPV                             | NPV                            | Prevalence %     | N               |
|--|---|-----------|---------------------------|---------------------------|---------------------------------|--------------------------------|------------------|-----------------|
| Smith et al., 2009 <sup>171</sup>      | Single-question alcohol screening test  | ≥1        | 0.82                      | 0.79                      |                                 |                                | 11.5             | 286             |
| Smith et al., 2010 <sup>172</sup>      | Single-question screening test for drug use and drug use disorders (illicit and nonmedical use of prescription drugs) | ≥1        | 1.00                      | 0.74                      |                                 |                                | 11.9             | 286             |
| Brown and Rounds, 1995 <sup>174</sup>  | CAGE-AID  | ≥1<br>≥2  | 0.79,<br>0.77             | 0.77,<br>0.85             |                                 |                                |                  |                 |
| Brown et al., 2001 <sup>175</sup>      | TICS  |           | 0.79                      | 0.78                      |                                 |                                | 23               | 434,<br>702     |
| Bradley et al., 2007 <sup>176</sup>    | AUDIT-C for men and women   |           | 0.86,<br>0.73             | 0.89,<br>0.91             |                                 |                                |                  |                 |
| Gryczynski et al., 2017 <sup>176</sup> | TAPS  |           | 0.80, 0.85,<br>0.91, 0.85 | 0.92, 0.71,<br>0.89, 0.93 | 0.60,<br>0.44,<br>0.25,<br>0.49 | 0.97,<br>0.95,<br>1.0,<br>0.99 | 25, 14,<br>4, 17 | 1,995-<br>2,000 |

*Abbreviations: PPV, positive predictive value; NPV, negative predictive value; CAGE-AID, CAGE Adapted to Include Drugs; TICS, Two-Item Conjoint Screening test; AUDIT-C, Alcohol Use Disorders Identification Test-Consumption; TAPS, Tobacco, Alcohol, Prescription Medication, and Other Substance use.*

# Education

The background features a series of overlapping, semi-transparent triangles in various shades of blue and red, creating a dynamic, abstract geometric pattern on the right side of the page.

# Alcohol Use After Traumatic Brain Injury

January 2021

[www.msktc.org/tbi/factsheets](http://www.msktc.org/tbi/factsheets)

TBI Factsheet

This factsheet describes negative effects that may occur from alcohol use after a TBI. See pages 3 & 4 for suggestions on how to reduce or stop drinking.

## Introduction

Alcohol and traumatic brain injury (TBI) are closely related. Up to 50% of adults with TBI were drinking more alcohol than is recommended before they were injured. People who were over age 60 when they had their TBI were less likely to drink too much before their injury, but those who did had worse outcomes. Although many people initially drink less after a TBI, starting to drink again increases their chances of having worse outcomes. By 2 years after injury, we find that more than 40% start drinking again.

After a TBI, many people are more sensitive to alcohol. Drinking raises their risk of getting injured again. It also makes cognitive (thinking) problems worse and increases the risk of emotional problems such as depression. Drinking can also get in the way of TBI recovery. For these reasons, doctors urge people with TBI not to drink. Not drinking can prevent further injury to the brain and promote healing.

## Facts about TBI and alcohol

### Alcohol and TBI recovery

- TBI recovery goes on for a lot longer than we used to think was possible. Most people see improvements for many years after injury.
- Drinking can slow down or stop TBI recovery.
- Not drinking gives the brain the best chance to heal.
- People's lives often continue to get better many years after TBI. Not drinking can increase the chance of improvement.



The Traumatic Brain Injury  
Model System (TBIMS)

### Alcohol, brain injury, and seizures

[https://msktc.org/sites/default/files/MSKTC-TBI-Alcohol-Use-508\\_0.pdf](https://msktc.org/sites/default/files/MSKTC-TBI-Alcohol-Use-508_0.pdf)

# Offering Advice

The background features abstract, overlapping geometric shapes in shades of blue and red, primarily concentrated on the right side of the frame. The shapes are semi-transparent, creating a layered effect. The overall aesthetic is clean and modern.

# Efficacy of Physician Advice

Table 2.

**Primary Outcome: Changes in Alcohol Use Between Groups After Brief Intervention (N = 226)**

| Alcohol Use                                   | Treatment n =<br>114 % (n) | Control n<br>=112 % (n)  | tScore | PValue |
|---|----------------------------|--------------------------|--------|--------|
| Consumes ≥3 drinks per day in previous 7 days |                            |                          |        |        |
| Baseline                                      | 39 (45)                    | 46 (51)                  | 0.92   | NS     |
| 6 mo  | 18 (20)                    | 30 (34)                  | 2.08   | .02    |
| 12 mo   | 17 (19)                    | 35 (39)                  | 2.98   | .002   |
| 24 mo   | 14 (16)                    | 30 (34)                  | 2.80   | .01    |
| 36 mo   | 14 (16)                    | 35 (39)                  | 3.53   | .001   |
| 48 mo   | 15 (17)                    | 20 (22)                  | 0.70   | NS     |
| Overall $P < .001^*$                          |                            |                          |        |        |
| Drinks consumed in<br>previous 7 days         | <b>Mean No. (SD)</b>       | <b>Mean No.<br/>(SD)</b> |        |        |
| Baseline                                      | 16.2 (11.2)                | 18.3 (12.1)              | 1.36   | NS     |
| 6 mo  | 9.4 (10.3)                 | 14.3 (11.1)              | 3.42   | .001   |

Grossberg et al., Ann Fam Med. 2004 2(5): 474–480

# How To Offer Advice

## ELICIT

- ▶ Find out what they know, have done or tried

## PROVIDE

- ▶ Provide information with permission
- ▶ Give an unambiguous recommendation
- ▶ Avoid threats or moralizing
- ▶ Use neutral, non-personal language “What usually happens to people is ...”

## ELICIT

- ▶ Ask for feedback “What do you make of all this?”

# Brief Motivational Interventions

The background features abstract, overlapping geometric shapes in shades of blue and red, primarily concentrated on the right side of the slide. The shapes are semi-transparent, creating a layered effect. The overall design is clean and modern.



# Efficacy of Brief Hospital Interventions

- ▶ Brief counseling interventions (1-3 sessions)
- ▶ 14 studies, 4041 mainly male participants
- ▶ BI resulted in greater reductions in alcohol consumption compared to controls at six months but not at one year.
- ▶ BI resulted in fewer deaths at six months
- ▶ Assessment alone may reduce drinking

McQueen J, Howe TE, Allan L, Mains D, Hardy V. Brief interventions for heavy alcohol users admitted to general hospital wards. *Cochrane Database Syst Rev.* 2011 Aug 10;(8):CD005191.

# Brief Treatment for AUD is Promising in TBI

- ▶ People with TBI respond to standard psychological treatments adapted for TBI
- ▶ 32% of those who received screening + education, + brief motivational intervention during inpatient rehabilitation resumed drinking within one year versus 62% who received screening + education and attention but no motivational interviewing

Bogner Corrigan et al Rehab Psychol 2021

# TBI-Related Accommodations

- ▶ Used multi-media educational component
- ▶ Connected intervention to “Brain health”
- ▶ Devised written brain health plan
- ▶ Kept it simple-choose three goal activities
- ▶ Used telephone or posted visual cues to trigger recall and implementation of the plan
- ▶ Provided a one-month booster session
- ▶ Referred for treatment of comorbid mental health diagnoses

Bogner Corrigan et al Rehab Psychol 2021

# MI Involves a Two-Step Process of Change

## 1. Elicit “Change Talk”

Desire

Ability

Reasons

Need

## 2. Elicit Commitment Language



Behavior Change

# Why MI Has Special Appeal In TBI

- ▶ People with TBI have difficulty delaying gratification and recalling/accessing personally relevant information when they need it
- ▶ fMRI studies show a key MI strategy, eliciting change talk engages reward and self-reflection circuits in the brain that are implicated in successful SUD treatment
  - ▶ Eliciting “change talk” supresses activation of reward circuits in response to alcohol cues compared to “sustain talk”
  - ▶ Exposure to person-specific “change talk” activates self-reflection brain circuits more than generic “change talk”

## More Intensive Interventions

- ▶ Cognitive Behavioral Therapy
- ▶ Relapse Prevention
- ▶ Alcoholics Anonymous (alone or supported)
- ▶ Contingency Management
- ▶ Behavioral Couples Therapy
- ▶ Etc.

# Option for Treatment Resistant Patients

- ▶ Community Reinforcement Approach Family Training (CRAFT)
- ▶ Train spouse or parents in behavioral techniques e.g. positive reinforcement, negative reinforcement, extinction, response cost, time out, response incompatibility to eliminate positive reinforcement for drinking and enhance positive reinforcement for sobriety
- ▶ CRAFT was superior to the confrontation approach to motivate treatment acceptance in two separate RCTs and improved drinking and spouse status before treatment

RJ Meyers et al., J Consult Clin Psychol 1999;67:688-697  
<http://pubs.niaaa.nih.gov/publications/arh23-2/116-121.pdf>

# Medical Treatments

- ▶ 4 FDA approved medications for AUD
  - ▶ Naltrexone
  - ▶ Extended-release IM Naltrexone
  - ▶ Disulfiram
  - ▶ Acamprosate
- ▶ Other medications commonly used for AUD
  - ▶ Gabapentin: withdrawal and relapse prevention
  - ▶ Topiramate: relapse prevention

Limited evidence in context of TBI



# Medical Treatments: Overview

- ▶ 2005, Beresford et al, Retrospective, Open label
  - ▶ N=18, VA, Specialty SUD clinic (significant beh tx provided)
  - ▶ Depakote and Carbamazepine
    - ▶ To help reduce affective liability→reduce drinking?
  - ▶ Results
    - ▶ 78%: improved affective symptoms
    - ▶ 89% (16): achieved alcohol abstinence at 6 weeks

## 2019 Jorge et al, RCT at VA, N=62, Mean age 47, all Men

- ▶ 24 with mild TBI, 13 with mod to sev TBI
- ▶ Valproate ER up to 1000mg qday vs Naltrexone 50mg qday
  - ▶ 74% in intensive outpatient program; 26% in weekly counseling
- ▶ Results
  - ▶ Non-significant trend for less alcohol use in Naltrexone
  - ▶ Med non-adherence: 20% Naltrexone vs 12.9% Valproate (not significant)
  - ▶ Mod-Sev TBI→more likely to relapse into heavy drinking
    - ▶ (HR 4.834 CI-1.103-21.194)

# Medical Treatments: Overview

2020 Pennington et al, VA, 12 weeks, RCT, N=32, Mean age 45-49yo, 2 females

- ▶ All with mild TBI, Blunt trauma, Blast trauma-mostly in placebo
- ▶ Topiramate (25-300mg qday) vs Placebo (tapered at week 12)
  - ▶ Light weekly counseling provided to all
  - ▶ 14 were in residential treatment program
- ▶ **Results**
  - ▶ No difference on post concussive symptoms
  - ▶ Cognitive effects mostly tolerated-exception: working memory worse and verbal fluency
  - ▶ No difference on alcohol consumption, cravings, drinking days vs placebo (intent to treat)
  - ▶ In those that completed the study
    - ▶ Topiramate reduced drinks per week vs Placebo

# Medication Summary

- ▶ **Which medications would I consider?**
  - ▶ Naltrexone, Depakote, Topiramate
- ▶ Would IM ER Naltrexone be a better option?
- ▶ Disulfiram contraindicated?
  
- ▶ **When to start?**
  - ▶ When alcohol becomes accessible, currently using
  
- ▶ **Is controlled drinking an option?**
  
- ▶ **Who long should a person use these meds?**
  - ▶ As long as needed

***\*\*Psychosocial interventions are foundational for relapse prevention\*\****

## Next Steps

- ▶ What opportunities do you have to address SUD in your patients?
- ▶ What are the potential benefits of expanding screening, education, advice and brief interventions in your settings?
- ▶ What strategies might you want to experiment with?
- ▶ What would be your next step(s)?

THANK YOU



# TAPS

1. In the PAST 12 MONTHS, how often have you used any tobacco product (for example, cigarettes, e-cigarettes, cigars, pipes, or smokeless tobacco)?

Daily or Almost Daily       Weekly       Monthly  
 Less Than Monthly       Never

2. In the PAST 12 MONTHS, how often have you had 5 or more drinks containing alcohol in one day? One standard drink is about 1 small glass of wine (5 oz), 1 beer (12 oz), or 1 single shot of liquor. (Note: This question should only be answered by males).

Daily or Almost Daily       Weekly       Monthly  
 Less Than Monthly       Never

3. In the PAST 12 MONTHS, how often have you had 4 or more drinks containing alcohol in one day? One standard drink is about 1 small glass of wine (5 oz), 1 beer (12 oz), or 1 single shot of liquor. (Note: This question should only be answered by females).

Daily or Almost Daily       Weekly       Monthly  
 Less Than Monthly       Never

4. In the PAST 12 MONTHS, how often have you used any drugs including marijuana, cocaine or crack, heroin, methamphetamine (crystal meth), hallucinogens, ecstasy/MDMA?

Daily or Almost Daily       Weekly       Monthly  
 Less Than Monthly       Never

5. In the PAST 12 MONTHS, how often have you used any prescription medications just for the feeling, more than prescribed or that were not prescribed for you? Prescription medications that may be used this way include: Opiate pain relievers (for example, OxyContin, Vicodin, Percocet, Methadone) Medications for anxiety or sleeping (for example, Xanax, Ativan, Klonopin) Medications for ADHD (for example, Adderall or Ritalin)

Daily or Almost Daily       Weekly       Monthly  
 Less Than Monthly       Never

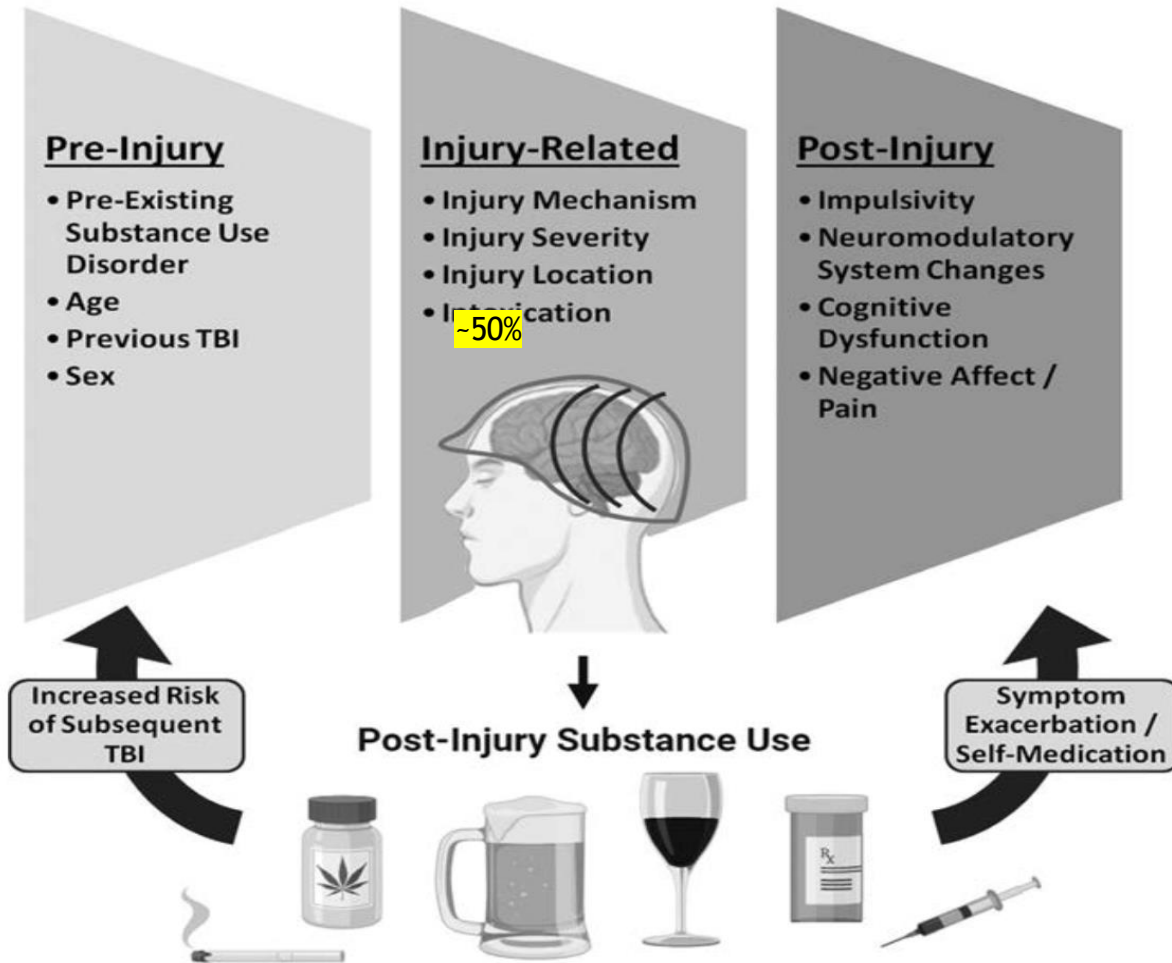
# Substance Use Screening

## How not to do it

- ▶ Screen selectively
- ▶ Screen separately
- ▶ Frame as a special moral or personality issue
- ▶ Remain skeptical due to alcoholic “denial”
- ▶ Provide no reassurance
- ▶ Use “clinical judgment”

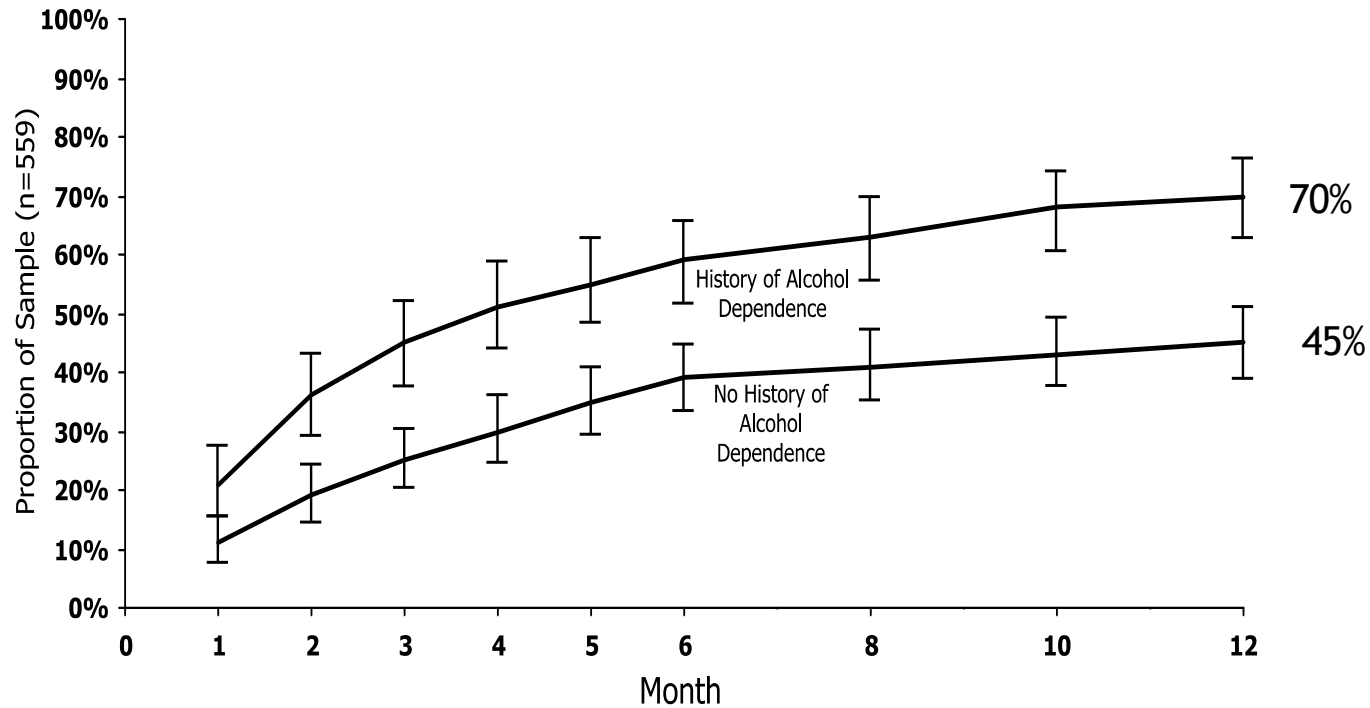
## How to do it

- ▶ Screen everyone
- ▶ Imbed screening
- ▶ Frame as part of health and recovery
- ▶ Use a neutral, nonjudgmental tone
- ▶ Ensure confidentiality
- ▶ Use valid measures





## Pre-TBI Alcohol Dependence and Post-TBI Depression



Bombardier, Fann et al., JAMA 2010

# Patient Willingness To Discuss Alcohol

## VA Primary Care Study

- ▶ 90% of patients with heaviest alcohol use indicated they drank more than they should
- ▶ 75% of patients of any patients screening positive for alcohol misuse indicated readiness to change behavior

Williams et al., Ann Fam Med  
2006, 4 (3) 213-220;

## VA Qualitative Study

- ▶ Patients interviewed were generally receptive to being asked about alcohol use and to receive a treatment referral, particularly when providers:
  - ▶ Framed treatment as a collaborative choice
  - ▶ Had practical knowledge of treatment options
  - ▶ Had a good relationship with the patient

Lewis et al. J Addict Dis 2016

# Substance Use Before And After TBI

| Substance Use Diagnosis | Before TBI | After TBI | New Onset | Current |
|-------------------------|------------|-----------|-----------|---------|
| Alch Abuse              | 7%         | 3%        | 2%        | 2%      |
| Alch Dep                | 29%        | 14%       | 1%        | 10%     |
| Drug Abuse              | 5%         | 2%        | 0%        | 2%      |
| Drug Dep                | 12%        | 7%        | 3%        | 5%      |
| Totals*                 | 41%        | 21%       | 3%        |         |

Whelan-Goodinson et al., 2009; n=100; \*Totals include some comorbidity

# Adverse Effects of Alcohol Use After TBI

## Speculative

- ▶ TBI magnifies alcohol-related cognitive and balance impairments. 38% report being more affected by alcohol.
- ▶ 30-70% report insomnia, daytime sleepiness or fatigue after TBI. Alcohol use is associated with greater
- ▶ TBI lowers sex drive and alcohol can lower testosterone, erections and orgasm in men and sexual satisfaction in men and women

Oddy et al 1985;