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Alcohol-Related and Mental Health Care for Patients with Unhealthy Alcohol Use and Posttraumatic Stress Disorder in a National Veterans Affairs Cohort

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Abstract

Objective—Unhealthy alcohol use and posttraumatic stress disorder (PTSD) frequently co-occur. Patients with both conditions have poorer functioning and worse treatment adherence compared to those with either condition alone. Therefore, it is possible that PTSD, when co-occurring with unhealthy alcohol use, may influence receipt of evidence-based alcohol-related care and mental health care. We evaluated receipt of interventions for unhealthy alcohol use and receipt of mental health follow-up care among patients screening positive for unhealthy alcohol use with and without PTSD in a national sample from the Veterans Health Administration (VA).

Methods—National clinical and administrative data from VA's electronic medical record were used to identify all patients who screened positive for unhealthy alcohol use (AUDIT-C score ≥ 5) between 10/1/09–5/30/13. Unadjusted and adjusted Poisson regression models were fit to estimate the relative rate and prevalence of receipt of: brief interventions (advice to reduce or abstain from drinking 14 days after positive screening), specialty addictions treatment for alcohol use disorder

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(AUD; documented visit 365 days after positive screening), pharmacotherapy for AUD (filled prescription 365 days after positive screening), and mental health care 14 days after positive screening for patients with and without PTSD (documented with ICD-9 CM codes). In secondary analyses, we tested effect modification by both severity of unhealthy alcohol use and age.

Results—Among 830,825 patients who screened positive for unhealthy alcohol use, 140,388 (16.9%) had documented PTSD. Of the full sample, 71.6% received brief interventions, 10.3% received specialty AUD treatment, 3.1% received pharmacotherapy for AUD, and 24.0% received mental health care. PTSD was associated with increased likelihood of receiving all types of care. Adjusted relative rates were 1.04 (95% CI 1.03-1.05) for brief interventions, 1.06 (1.05-1.08) for specialty AUD treatment, 1.35 (1.31-1.39) for AUD pharmacotherapy, and 1.82 (1.80-1.84) for mental health care. Alcohol use severity modified effects of PTSD for specialty AUD treatment, AUD pharmacotherapy, and mental health care such that effects were maintained at lower severity but attenuated among patients with severe unhealthy alcohol use. Age modified all effects with the strength of the association between PTSD and care outcomes being strongest for younger (18-29 years) and older veterans (65+ years) and weaker or nonsignificant for middle-aged veterans (30-44 and 45-64 years).

Conclusions—In this large national sample of patients with unhealthy alcohol use, PTSD was associated with increased likelihood of receiving alcohol-related and mental health care. PTSD does not appear to be a barrier to care among VA patients with unhealthy alcohol use.

Keywords

Unhealthy Alcohol Use; PTSD; Brief Interventions; Pharmacotherapy; Mental Health; Utilization

1. Introduction

Posttraumatic stress disorder (PTSD) is associated with increased risk of unhealthy alcohol use (Jakupcak et al., 2010) and is theorized to be causally related to the onset of alcohol use disorders (AUDs; Jacobsen, Southwick, & Kosten, 2001; Ouimette, Read, Wade, & Tirone, 2010). Despite the high co-occurrence of unhealthy alcohol use and PTSD, there is little consensus on what the best course of care is for these conditions when they occur together (Institute of Medicine, 2014; Roberts, Roberts, Jones, & Bisson, 2016). When individuals present with unhealthy alcohol use, recommended interventions include brief alcohol counseling interventions (“brief interventions”), specialty addictions treatment, and pharmacotherapy (Jonas et al., 2012; VA/DoD, 2015). For individuals with PTSD and “complex” co-occurring conditions, such as alcohol or substance use disorders, care from specialists in general mental health or PTSD care is often recommended (VA/DoD, 2017). Although evidence is building for integrated or concurrent treatments that target both alcohol use and mental health conditions simultaneously (van Dam, Vedel, Ehring, & Emmelkamp, 2012), available practice guidelines do not provide clarification on how to assimilate condition-specific treatment recommendations into a coordinated course of care for a given patient.

Among patients with unhealthy alcohol use, PTSD may be a barrier to or a facilitator of alcohol-related care or general mental health care, but the extent to which this occurs may

vary based on alcohol use severity. For instance, patients with PTSD are at elevated risk for AUD (Grant et al., 2015) and patients with AUD are more likely than those without to receive brief interventions for unhealthy alcohol use (Arndt, Schultz, Turvey, & Petersen, 2002; Kaner, Heather, Brodie, Lock, & McAvoy, 2001; Lapham et al., 2012). Alcohol use severity has been found to modify the effect of PTSD on referral to alcohol treatment, with PTSD being associated with higher rates of referral among those with moderate but not severe unhealthy alcohol use (Grossbard et al., 2013), and treatment recommendations differ for moderate versus severe unhealthy alcohol use (National Institute on Alcohol Abuse and Alcoholism, 2007; VA/DoD, 2015). Furthermore, despite a lack of empirical support, clinicians commonly report that AUD is a contraindication for PTSD treatment (Cook, Dinnen, Simiola, Thompson, & Schnurr, 2014), a practice which could increase receipt of alcohol-related care among patients with both PTSD and high levels of unhealthy alcohol use or, alternatively, dissuade patients from care if integrated treatment is preferred (Back et al., 2014).

The Veterans Health Administration (VA) may be an ideal place to study whether PTSD is associated with receipt of alcohol-related treatment and general mental health care given the high prevalence of both PTSD and unhealthy alcohol use among veterans (Lan et al., 2016; Seal et al., 2011). In 2008, VA sought to improve care for these commonly co-occurring conditions by requiring each VA facility to have at least one provider in either the specialty addictions or mental health setting serve as a substance use disorder (SUD) and PTSD (SUD-PTSD) specialist to provide concurrent treatment targeting both conditions (Bernardy, Hamblen, Friedman, & Kivlahan, 2011). VA also routinely screens patients for unhealthy alcohol use (Bradley et al., 2006) and PTSD (VA/DoD, 2017), which improves identification of patients with these conditions and enables a national study using electronic medical record data (Lapham et al., 2012).

No study to date has examined receipt of alcohol-related and mental health care in a large, national sample of patients across a range of ages with unhealthy alcohol use and PTSD. While one previous study in VA evaluated receipt of alcohol-related care among patients with and without PTSD and AUD, it was conducted among veterans returning from Iraq or Afghanistan (Grossbard et al., 2013), thus limiting generalizability given that these veterans are younger on average and age has been associated with differential receipt of alcohol-related care (Burman et al., 2004; Kaner et al., 2001; Williams et al., 2014). Furthermore, the study did not examine receipt of non-alcohol-related mental health care, which is an important outcome for those with PTSD. Others have examined the influence of alcohol use on general mental health care utilization among patients with PTSD (Berk-Clark, Balan, Shroff, Widner, & Price, 2016; Kaier, Possemato, Lantinga, Maisto, & Ouimette, 2014; Maguen et al., 2012; Seal et al., 2010), but not the influence of PTSD on care outcomes among patients with unhealthy alcohol use. Therefore, how PTSD may or may not modify the receipt of alcohol-related and mental health care among patients with unhealthy alcohol use overall and across age groups is understudied.

The present study—conducted in a national sample of all VA patients who screened positive for unhealthy alcohol use over a three-and-a-half-year period—evaluated receipt of brief interventions for unhealthy alcohol use, specialty addictions treatment for AUD,

pharmacotherapy for AUD, and general mental health care among patients with unhealthy alcohol use with and without PTSD. Because the association between PTSD and receipt of care may vary by alcohol use severity and by age (Burman et al., 2004; Grossbard et al., 2013), we also conducted secondary analyses to examine potential effect modification by alcohol use severity and age.

2. Material And Methods

2.1 Data Source and Study Sample

Following methods from a previous study of alcohol-related care in VA, VA electronic health records (EHR) data were extracted from the national Corporate Data Warehouse and used to identify all patients with an outpatient appointment between October 1, 2009 and May 30, 2013 who had a positive screen on the Alcohol Use Disorders Identification Test Consumption (AUDIT-C), defined as a score greater than or equal to 5. This definition of unhealthy alcohol use is consistent with VA's performance measure that requires provision of brief interventions for patients with AUDIT-C scores of 5 or more (Lapham et al., 2012; Williams et al., 2017b). For each patient, the first positive screen that occurred within the study period was used for the present study. Extracted EHR data also included information about sociodemographic characteristics, medical and psychiatric diagnoses, and alcohol-related and mental health treatment encounters following the positive screen.

2.2 Measures

2.2.1. Predictor variable—PTSD was the primary predictor variable and it was defined by the corresponding diagnosis code (309.81) from the International Statistical Classification of Diseases and Related Health Problems, Ninth Revision, Clinical Modification (ICD-9-CM). Patients were considered to have documented PTSD at the time of positive alcohol screening if the diagnosis was present in the chart 0-365 days prior to the positive screen.

2.2.3. Outcome variables—Brief interventions were defined as documented advice to reduce or abstain from drinking within 14 days following the index positive alcohol screen, consistent with VA's performance measure for evidence-based brief interventions (Lapham et al., 2015; Williams et al., 2014). As has been done previously, this measure was derived using EHR text data generated by documentation in VA's clinical decision support tool ("clinical reminder") for brief interventions (Lapham et al., 2015; Williams et al., 2014). Specialty addictions treatment for AUD was defined as any encounter associated with an AUD diagnosis in the specialty addictions inpatient or outpatient setting 0-365 days following the index positive screen (Appendix A). This allowed for differentiation of alcohol-related specialty addictions care from care for other SUDs. Visits with a VA SUD-PTSD specialist were coded as specialty addictions treatment for AUD when the encounter was associated with an AUD diagnosis. Pharmacotherapy for AUD was defined as any filled prescription for acamprosate, disulfiram, topiramate, or oral or injectable naltrexone 0-365 days following the index positive screen. Medications were selected based on their being FDA approved for treatment of AUD (acamprosate, disulfiram, and naltrexone; Anton et al., 2006) or having strong meta-analytic support (topiramate; Jonas et al., 2014). Alcohol-

related care was defined as documented receipt of brief interventions, specialty addictions treatment for AUD, and/or pharmacotherapy for AUD, whereas AUD-specific care was defined as documented receipt of specialty addictions treatment for AUD and/or pharmacotherapy for AUD.

Mental health care immediately following a positive alcohol screen was defined as any encounter within 14 days of the index positive screen with a stop code in the specialty mental health or primary care mental health setting (Appendix A). Having a visit within 14 days of a positive alcohol screen would be appropriate care and consistent with the open (walk-in) and immediate access model promoted by co-located mental health in primary care (Pomerantz, Kearney, Wray, Post, & McCarthy, 2014), where unhealthy alcohol use is likely to be identified (Fiellin, Reid, & O'Connor, 2000).

2.2.3. Effect modifiers—Severity of unhealthy alcohol use was categorized as moderate or severe according to AUDIT-C score. Moderate unhealthy alcohol use was defined as an AUDIT-C score between 5 and 8 and severe unhealthy alcohol use was defined as an AUDIT-C score greater than or equal to 9, consistent with previous work in this area (Hawkins, Lapham, Kivlahan, & Bradley, 2010) and cut-points that are associated with elevated likelihood of AUD (Rubinsky, Dawson, Williams, Kivlahan, & Bradley, 2013; Rubinsky, Kivlahan, Volk, Maynard, & Bradley, 2010). Age at the time of the index positive alcohol screen was grouped into four categories: 18-29 years, 30-44 year, 45-64 years, or 65 years,

2.2.4. Covariates—Selection of covariates was guided by Andersen's behavioral model of health service utilization, which includes predisposing (e.g., sociodemographics), enabling (e.g., social support), and need (e.g., symptom severity) factors (Andersen, 1995), as well as by review of the literature to identify variables expected to confound the association between PTSD and receipt of alcohol-related or mental health care (Glass et al., 2010; Johnson et al., 2016; Maguen et al., 2012; Williams et al., 2016).

Predisposing factors included socio-demographic characteristics obtained from EHR documentation, specifically age (grouped as defined above), sex (male or female) and race/ethnicity (non-Hispanic black, Hispanic, American Indian/Native American, Asian/Pacific Islander, or non-Hispanic white).

Enabling factors obtained from EHR documentation included marital status (divorced/separated, married, never married/single, or widowed) and VA eligibility status (non-veteran or employee/volunteer, non-service connected, service-connected <50%, full VA coverage), which is determined by the veteran's length and nature of military service, income level, and the existence and severity of medical or mental health conditions linked to military service ("service-connected disability"), with higher levels of eligibility indicating greater disadvantage. Organizational enabling factors, such as between-facility variation in the diagnosis of AUD or mental health conditions, were approximated by calculating a facility-level rate of AUD diagnosis (for alcohol-related outcome variables) or mental health diagnosis (for the mental health outcome variable), consistent with previous work utilizing VA EHR data (Bensley et al., 2017; Harris, Rubinsky, & Hoggatt, 2015).

Need factors included other mental and behavioral health conditions that were coded dichotomously, specifically current tobacco use or tobacco use disorder, identified by EHR documentation indicating current smoker status (McGinnis et al., 2011) or by the presence of the corresponding ICD-9-CM diagnosis code in the chart 0-365 days prior to the positive screen; other SUD (stimulant use disorders, opioid use disorders, and other drug use disorders) based on ICD-9-CM diagnosis codes; other mental health conditions (depressive disorders, anxiety disorders, and serious mental illness) based on ICD-9-CM diagnosis codes; and medical comorbidity as measured by the Deyo index derived from ICD-9-CM diagnosis codes and dichotomized as 3 medical conditions (Deyo, Cherkin, & Ciol, 1992). A count of outpatient visits 1-365 days prior to the index positive alcohol screen (0, 1-4, 5-10, 11-24, and 25 visits) was used to approximate previous use of any VA outpatient health services. Appendix A includes a list of ICD-9 codes used to define each diagnostic measure.

2.3 Analytic plan

At the patient level, descriptive statistics were calculated to describe the overall sample and to compare characteristics across PTSD status. Chi square tests of independence tested for differences in the distribution of characteristics across PTSD status. Descriptive statistics were also calculated to describe overall rates of alcohol-related and general mental health care across the entire sample and to describe rates of AUD-specific care (specialty addictions treatment, pharmacotherapy) among two subgroups of patients for whom this level of care would be most appropriate: those with a documented AUD diagnosis and those with severe unhealthy alcohol use. Assessment of the latter group is consistent with previous work (Glass et al., 2010; Williams et al., 2017b) and reflects that patients with severe unhealthy alcohol use have increased likelihood of AUD (Rubinsky et al., 2013) and that clinical recognition of AUD may vary across providers and facilities independent of actual prevalence (Harris et al., 2015).

Poisson regression models were fit to estimate the relative rate and 95% confidence intervals (CIs) of receipt of brief interventions, specialty addictions treatment for AUD, pharmacotherapy for AUD, and general mental health care following a positive screen for patients with PTSD relative to those without. Regression models were both unadjusted and then adjusted for all covariates except VA eligibility status. Eligibility status was not included due to the high potential for multicollinearity, given that PTSD is a common reason for receiving service-connected disability. Due to clustering of individuals within facilities, we also adjusted for between-facility variation in diagnosis rates of AUD and mental health conditions to allow for better separation of the individual-level effect of PTSD from facility-level confounding (Begg & Parides, 2003). Adjusted models were considered primary analyses given the strong potential for confounding. Regression models were also used to obtain unadjusted and adjusted prevalence estimates and 95% CIs for each outcome across PTSD status. Adjusted prevalence estimates were obtained from recycled predictions, a method that held all covariates constant at the actual values found in the sample while allowing the predictors of interest to vary (Williams, 2012).

In secondary analyses, we tested effect modification by both severity of unhealthy alcohol use and age. Effect modification was tested only in the adjusted (primary) models using a multiplicative term (e.g., alcohol use severity x PTSD status); if the interaction term was significant, the adjusted models were then stratified by levels of the effect modifier. Finally, we conducted one sensitivity analysis regarding receipt of brief intervention to examine whether the shorter time window for receipt of brief intervention influenced results. In this analysis, we repeated primary analyses but assessed receipt of brief intervention within 365 (as opposed to 14) days of a positive alcohol screen. All regression models were run using robust standard errors to account for overly conservative error estimates when the Poisson model is used for binomial data (Zou, 2004).

All analyses were conducted in R Version 3.3.1 and Stata Version 14.

3. Results

3.1 Sample characteristics and descriptive results

The overall sample of 830,825 VA patients who screened positive for unhealthy alcohol use between October 1, 2009 and May 30, 2013 was largely male, non-Hispanic White, and aged 45 years or older (Table 1). Across the entire sample, 71.6% of all patients had documented brief interventions, 10.3% received specialty addictions treatment for AUD, 3.1% received pharmacotherapy for AUD, and 24.0% received mental health care following their positive screen. Among those with an AUD diagnosis (32.2%), 26.3% received specialty addictions treatment for AUD and 6.9% received pharmacotherapy for AUD. Among patients with severe unhealthy alcohol use (24.0%), 23.5% received specialty addictions treatment for AUD and 6.5% received pharmacotherapy for AUD.

Within the sample, 140,388 (16.9%) patients had documented PTSD. The distribution of predisposing, enabling, and need characteristics varied by PTSD status (Table 1). Compared to those without PTSD, VA patients with PTSD were younger, more likely to be female, more likely to be non-White, and more likely to be married or single rather than divorced or widowed. VA patients with PTSD were more likely to have severe rather than moderate unhealthy alcohol use, more likely to have mental health and substance use comorbidities, and less likely to have medical comorbidity compared to those without PTSD. Those with PTSD generally used more outpatient VA services in the year prior to their positive screen than those without PTSD.

3.2 Primary analyses

In the unadjusted models, PTSD was associated with increased likelihood of receiving specialty addictions treatment for AUD within 365 days (relative rate 1.87; 95% CI 1.84-1.89), pharmacotherapy for AUD within 365 days (2.87; 2.80-2.94), and mental health follow-up within 14 days (3.27; 3.24-3.29), but not brief interventions within 14 days (1.00; 1.00-1.00) (Table 2). After adjusting for covariates known to influence receipt of alcohol-related and mental health care, PTSD was associated with increased likelihood of receiving all elements of care (Table 2). Adjusted relative rates were 1.04 (95% CI 1.03-1.05) for brief interventions, 1.06 (1.05-1.08) for specialty addictions treatment for AUD, 1.35 (1.31-1.39)

for pharmacotherapy for AUD, and 1.82 (1.80-1.84) for mental health care following a positive alcohol screen.

3.3 Effect modification analyses

Severity of unhealthy alcohol use modified the association between PTSD and receipt of specialty addictions treatment for AUD, pharmacotherapy for AUD, and general mental health care as indicated by statistically significant interaction terms (all p -values $< .001$) but did not modify the association between PTSD and receipt of brief interventions ($p = .15$). Results of the stratified models for specialty addictions treatment for AUD, pharmacotherapy for AUD, and general mental health care are presented in Table 3. Among those with moderate unhealthy alcohol use, PTSD was associated with increased likelihood of receiving specialty addictions treatment for AUD, but among those with severe unhealthy alcohol use, PTSD was associated with decreased likelihood of receiving this type of care. For pharmacotherapy for AUD and general mental health care, PTSD was associated with increased likelihood of receiving care, but the association was stronger among patients with moderate unhealthy alcohol use compared to severe unhealthy alcohol use.

Age modified the association between PTSD and receipt of brief interventions ($p < .001$), specialty AUD treatment ($p < .001$), AUD pharmacotherapy ($p < .001$), and general mental health care ($p < .001$). Results of the stratified models are presented in Table 4. Across all outcomes, the strength of association between PTSD and higher rates of care was strongest for younger veterans (18-29 years old) and older veterans (65+ years old) and was weaker or nonsignificant for veterans between the ages of 30-44 years old and 45-64 years old.

3.4 Exploratory analysis

To better understand why PTSD was associated with a lower likelihood of specialty addictions treatment for AUD among those with severe unhealthy alcohol use, exploratory analyses were conducted among the entire sample using a composite outcome variable that combined specialty addictions treatment for AUD and general mental health care follow-up. The goal of the exploratory analyses was to help clarify whether lower rates of specialty addictions care in this subpopulation with PTSD and severe unhealthy alcohol use indicated less care overall (e.g., difficulty engaging these patients in treatment) or whether this group of patients received other, potentially appropriate forms of treatment in a different setting (e.g., mental health care outside of the specialty addictions setting). Across all patients screening positive for unhealthy alcohol use, PTSD was associated with increased likelihood of receiving any kind of specialty addictions treatment for AUD or general mental health care even after adjusting for all covariates, and this association held after taking into account effect modification by alcohol use severity (Table 5).

3.5 Sensitivity analysis

We found a similar pattern of results when the outcome for brief interventions was defined as 0-365 days after a positive alcohol screen (Appendix B). Rates of brief interventions within 365 days were higher than rates within 14 days. PTSD was associated with increased likelihood of receipt of brief interventions within 365 days in both unadjusted and adjusted

models (as opposed to only in the adjusted model). There was no evidence of effect modification by alcohol use severity.

4. Discussion

This is the first study to examine the association of PTSD with utilization of both alcohol-related and general mental health care in a national sample of patients with unhealthy alcohol use across a range of ages. PTSD was associated with increased likelihood of receiving nearly all aspects of care. These findings are generally consistent with previous research showing that severity of symptomatology tends to predict utilization, with more severe mental health and/or alcohol use symptoms being associated with higher utilization (Hankin, Spiro, Miller, & Kazis, 1999; Hoerster et al., 2012; Kaier et al., 2014; Maguen et al., 2012; Seal et al., 2010).

One exception was among patients with severe unhealthy alcohol use, for whom PTSD was associated with slightly lower receipt of specialty AUD care, a measure which included visits to VA SUD-PTSD specialists. It is possible that utilization differs in some way for this vulnerable subpopulation despite VA's efforts to offer specialized SUD-PTSD services. However, exploratory analyses suggested that this group received other potentially appropriate interventions, such as mental health care outside of the specialty addictions setting. Patients with dually diagnosed PTSD and AUD may prefer treatments that address PTSD in some way (Back et al., 2014) and tend to see AUD symptoms as a consequence of PTSD symptoms (van Dam et al., 2012). This may partly explain why, in this study, receipt of care was lower for specialty addictions treatment for AUD but not for mental health follow-up among patients with PTSD and severe unhealthy alcohol use. Relatedly, because AUD is associated with significant stigma and social disapproval (Glass, Mowbray, Link, Kristjansson, & Bucholz, 2013), perhaps more so than PTSD (Schomerus et al., 2011), patients with co-occurring conditions may feel more comfortable seeking mental health care for PTSD alone. Nevertheless, it is not known whether the general mental health care received by patients with PTSD and severe unhealthy alcohol use addressed alcohol use in any way. Secondary analyses also suggested that, among patients in the age range of 30-44 and 45-65 years old, PTSD was not associated or was more weakly associated with receipt of all elements of care. This could reflect other characteristics associated with age that were not measured in our dataset, such as service era or organizational factors that influenced the availability of care (e.g., post-deployment health clinics for recently returning veterans), rather than differences attributable to age per se.

Although the overall findings indicated that PTSD is not a barrier to receiving evidence-based care for VA patients with unhealthy alcohol use, rates of AUD treatment were less than ideal across all outcomes, particularly specialty addictions treatment for AUD (26.3% of those with an AUD diagnosis, 23.5% of those with severe unhealthy alcohol use) and pharmacotherapy for AUD (6.9% of those with an AUD diagnosis, 6.5% of those with severe unhealthy alcohol use). It is possible that we underestimated rates of specialty addictions treatment given that our measure required a documented diagnosis for AUD. However, others have noted that AUD treatments are significantly underutilized (e.g., Grant et al., 2015; Mark, Kassed, Vandivort-Warren, Levit, & Kranzler, 2009) despite efforts to

increase access to these treatments (Harris et al., 2012). The present study corroborates these findings in a large, national sample of VA patients.

At the same time, it is also worth noting the relative success of VA compared with other healthcare systems. VA has implemented universal screening for unhealthy alcohol use, incentivized evidence-based brief interventions, and is treating those with AUD at a rate more than double the general population (Lipari, Park-Lee, & Van Horn, 2016). In 2008, VA began implementing integrated behavioral health in its 900 primary care clinics to reduce barriers to mental health care access (Wray, Szymanski, Kearney, & McCarthy, 2012). Such large-scale organizational changes may have had implications for the lack of PTSD-related barriers to care seen in this sample taken from 2009-2013. While there remains a need for interventions that better engage all patients in alcohol-related and mental health care regardless of PTSD diagnosis, the VA system may also provide important lessons on how to achieve higher rates of care than is typically obtained in the private sector (Creedon & Cook, 2016; Grant et al., 2015; Zemore et al., 2014).

Several limitations to the present study must be acknowledged. VA has in place large-scale initiatives to prioritize PTSD recognition and treatment (Karlin et al., 2010), including mandating SUD-PTSD specialists, and similar initiatives and resources do not necessarily exist for other health conditions or in non-VA healthcare settings. This may limit the generalizability of these findings. Additionally, the use of EHR diagnostic data to identify PTSD is imperfect, as the estimated concordance rate between VA EHR data and a standardized diagnostic interview for current PTSD is 72.3% (Holowka et al., 2014). However, for the purposes of understanding healthcare utilization, clinicians' perceptions of PTSD or their willingness to assign the diagnosis in the EHR may still be relevant for examining when and to whom care is provided.

Our ability to fully capture brief interventions may have been limited due to our reliance on clinicians' documentation in the EHR. However, the EHR methods we used to ascertain brief interventions have been previously employed in other VA studies (Williams et al., 2017a; Williams et al., 2017b; Williams et al., 2014), albeit with varying timeframes for documentation of brief interventions (Lapham et al., 2015; Williams et al., 2017b), and are similar to methods used in studies outside of the VA (Chi, Weisner, Mertens, Ross, & Sterling, 2017; Slain et al., 2014). Measurement of other outcomes besides brief interventions was also limited. All outcome measures were binary indicators of whether a certain type of care was documented within a pre-specified time frame. The mental health outcome variable was limited to a short time period immediately following positive alcohol screening (14 days) and did not include visits to SUD-PTSD specialists, as these outcomes were only included in our dataset when there was an associated AUD diagnosis and were thus categorized as an AUD specialty care visit. None of the outcomes measures could address the quality or sufficiency of care, such as the number of treatment sessions completed or adherence to pharmacotherapy.

It is unknown whether the care received in this study reflects new episodes of care triggered by alcohol screening or a continuation of ongoing treatment. We focused on care received and not on referrals to care, which would be relevant for referral-based specialty AUD or

mental health treatment. Given that previous research has found referral rates for alcohol-related care as high as 43.2% among veterans with AUD and severe unhealthy alcohol use (Grossbard et al., 2013), it is possible that the low rates of AUD care observed in this study reflect low initiation rates of patients being referred for specialty treatments. Future research could replicate the present analyses with a sample of patients who are new to care and could include information on referrals to care to better understand the potential influence of PTSD on subsequent utilization.

While this study includes several limitations, it also offers several strengths that corroborate and build upon previous research on the influence of PTSD on receipt of alcohol-related and mental health care. Specifically, this study utilized a large, national dataset of patients with unhealthy alcohol use receiving care from the largest mental health care provider in the U.S. It is the first study to examine receipt of care for unhealthy alcohol use and PTSD across a range of ages, rather than being limited to younger veterans returning from Iraq and Afghanistan.

4.1 Conclusions

These findings indicate that PTSD does not appear to be a barrier to receipt of alcohol-related care or mental health follow-up among patients with unhealthy alcohol use in this national VA sample. Given the context in which these patients received care, these findings need to be replicated in other healthcare systems. Although patients with recognized PTSD do not seem to be receiving less care than those without PTSD, overall rates of care, particularly specialty addictions treatment and pharmacotherapy for AUD, were quite low. Additional research is needed to identify interventions that reduce barriers to alcohol-related care among patients with PTSD and unhealthy alcohol use.

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Competing Interests: The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs or the University of Washington. All authors declare no potential competing interests. This study, including a HIPAA waiver of written consent, was approved by the Institutional Review Board at VA Puget Sound.

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Appendix A

Definition of diagnostic and utilization measures.

Variable	Definition
Alcohol abuse or dependence, excluding in remission	ICD-9 303.9-303.92, 305.0-305.02
Anxiety disorders	ICD-9 300.0x, 300.2x, and 300.3

Variable	Definition
Depressive disorders	ICD-9-CM 296.2-296.39, 293.83, 296.82, 296.9x, 300.4, 301.12, 309.0 309.1, and 311
Medical comorbidity Deyo index (count)	myocardial infarction (ICD-9-CM 410–410.9, 412) congestive heart failure (428–428.9), peripheral vascular disease (443.9441–441.9785.4 and V43.4 procedure 38.48), cerebrovascular disease (430–438), senile and presenile dementias (290–290.9), chronic pulmonary disease (490–496, 500–505, and 506.4), rheumatologic disease (710.0, 710.1, 710.4, 714.0–714.2, 714.81, and 725), peptic ulcer disease (531–534.9, 531.4–531.7, 532.4–532.7, 533.4–533.7, and 534.4–534.7), mild liver disease (571.2, 571.5, 571.6, and 571.4–571.49), moderate or severe liver disease (572.2–572.8 and 456.0–456.21), diabetes (250–250.3 and 250.7), diabetes with chronic complications (250.4–250.6), hemiplegia or paraplegia (344.1 and 342–342.9), renal disease (582–582.9, 583–583.7, 585; 586, and 588–588.9), malignancies (140–172.9, 174–195.8, and 200–208.9), metastatic solid tumor (196–199.1), AIDS and HIV (042–044.9)
Opioid abuse or dependence	ICD-9-CM 304.7-304.72 and 305.5-305.52
Other drug abuse or dependence	ICD-9 304.3-304.32, 305.2-305.22, 304.1-304.12, 304.5-304.52, 305.3-305.32, and 305.4-305.42
Posttraumatic stress disorder (PTSD)	ICD-9 309.81
Serious mental illness	ICD-9-CM 295.0-295.4x, 295.6-295.9x, 296.0-296.1x, 296.4-296.8x, 297.0-297.3x, 297.8-297.9x, 298.0-298.4x, and 298.8-298.9x
Stimulant abuse or dependence	IC9-9-CM 304.2-304.22, 305.6-305.62, 304.4-304.42, and 305.7-305.72
Tobacco use, current	tobacco screening dichotomized as current user
Tobacco abuse or dependence	ICD-9-CM 305.1
Specialty addictions treatment	Stop codes 513, 514, 519, 523, 547, 548, and 560 or bedsecn 27, 29, 72, 73, 74, 84, 86, and 111 with accompanying diagnosis for alcohol use disorder (ICD-9 CM 303.90-303.92 and 305.0-305.02)
Mental health care	Stop codes that included primary care mental health and specialty mental health settings 511, 522, 529, 590, 502, 505, 506, 509, 510, 512, 524, 525, 532, 533, 534, 538, 550, 553, 554, 557, 558, 559, 564, 565, 566, 591, 592, 552, 567, 582, 583, 516, 540, 561, 562, and 580

Appendix B

Sensitivity analyses of unadjusted and adjusted prevalence and relative rate ratios of receipt of brief interventions 0-365 days following a positive alcohol scree among VA patients with and without PTSD.

	PTSD		No PTSD		RR	(95% CI)	p-value
	%	(95% CI)	%	(95% CI)			
Brief interventions within 365 days							
Unadjusted	87.7	(87.5-87.8)	84.3	(84.3-84.4)	1.04	(1.04-1.04)	<.001
Adjusted	88.0	(87.8-88.2)	84.4	(84.3-84.5)	1.04	(1.04-1.05)	<.001

Note. Model adjusted for age, gender, race/ethnicity, marital status, comorbid mental health and substance use conditions, facility-level rate in AUD diagnosis, medical comorbidity, and previous utilization of outpatient care.

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Highlights

- Unhealthy alcohol use and posttraumatic stress disorder (PTSD) frequently co-occur.
- We tested whether PTSD influences receipt of alcohol-related or mental health care.
- PTSD was associated with increased likelihood of receipt of all elements of care.

Table 1
Sample sociodemographic characteristics of VA patients with documented positive alcohol screen by PTSD status

Characteristic	PTSD N = 140,388 (16.9%)		No PTSD N = 690,437 (83.1%)		p-value	Total Study Sample N = 830,825	
	N	%	N	%		N	%
Age							
18-29	29,559	21.1	70,859	10.3	<0.001	100,418	12.1
30-44	31,189	22.2	90,171	13.1		121,360	14.6
45-64	66,215	47.2	363,060	52.6		429,275	51.7
>=65	13,425	9.6	166,347	24.1		179,772	21.6
Gender (Female)	6,436	4.6	19,258	2.8	<0.001	25,694	3.1
Race/ethnicity†					<0.001		
Asian /Pacific Islander	2,723	2.1	8,529	1.3		11,252	1.4
Non-Hispanic black	25,450	19.2	110,505	17.1		135,955	17.5
Hispanic or Latino	12,668	9.6	42,155	6.5		54,823	7.0
American Indian/Native American	1,890	1.4	5,642	0.9		7,532	1.0
Non-Hispanic white	89,901	67.8	479,578	74.2		569,479	73.1
Marital status†					<0.001		
Divorced/separated	36,105	26.0	204,140	30.0		240,245	29.4
Married	63,618	45.9	288,121	42.4		351,739	43.0
Never married/single	36,201	26.1	36,201	23.5		196,152	24.0
Widowed	2,675	1.9	2,675	4.0		30,159	3.7
AUDIT-C severity					<0.001		
Moderate (5-8)	98,699	70.3	533,051	77.2		631,750	76.0
Severe (9-12)	41,689	29.7	157,386	22.8		199,075	24.0
Mental health comorbidity							
Depressive disorders	76,432	54.4	135,546	19.6	<0.001	211,978	25.5
Anxiety disorders	28,405	20.2	57,411	8.3	<0.001	85,816	10.3
Serious mental illness	12,913	9.2	28,981	4.2	<0.001	41,894	5.0
Substance use comorbidity							
Tobacco current use or disorder	77,652	55.3	344,263	49.9	<0.001	421,915	50.8
Stimulant use disorders	11,077	7.9	27,435	4.0	<0.001	38,512	4.6

	PTSD N = 140,388 (16.9%)		No PTSD N = 690,437 (83.1%)		p-value	Total Study Sample N = 830,825	
Opioid use disorders	5,320	3.8	9,327	1.4	<0.001	14,647	1.8
Other drug use disorders	13,133	9.4	24,368	3.5	<0.001	37,501	4.5
Medical comorbidity (Deyo 3)	8,927	6.4	48,283	7.0	<0.001	57,210	6.9
Outpatient visits in year prior					<0.001		
0	13,838	9.9	151,650	22.0		165,488	19.9
1-4	30,010	21.4	248,771	36.0		278,781	33.6
5-10	27,702	19.7	140,441	20.3		168,143	20.2
11-24	36,015	25.7	100,127	14.5		136,142	16.4
25	32,823	23.4	49,448	7.2		82,271	9.9

Note. Percentages do not always sum to 100.0 due to rounding. Total N may vary for each characteristic due to missing values: race/ethnicity (*n* missing = 51,784); marital status (*n* missing = 12,530).

Unadjusted and adjusted prevalence and relative rate ratios of alcohol-related care and mental health follow-up care among VA patients with and without PTSD.

Table 2

	PTSD		No PTSD		RR	(95% CI)	p-value
	%	(95% CI)	%	(95% CI)			
Brief interventions within 14 days							
Unadjusted	71.5	(71.3-71.7)	71.6	(71.5-71.7)	1.00	(1.00-1.00)	0.51
Adjusted	73.9	(73.7-74.2)	71.0	(70.9-71.2)	1.04	(1.04-1.05)	<.001
Specialty addictions treatment for AUD within 1 year							
Unadjusted	16.8	(16.6, 17.0)	9.0	(9.0-9.1)	1.87	(1.84-1.89)	<.001
Adjusted	11.1	(10.9-11.2)	10.4	(10.3-10.5)	1.06	(1.05-1.08)	<.001
Pharmacotherapy for AUD within 1 year							
Unadjusted	6.7	(6.5-6.8)	2.3	(2.3-2.4)	2.87	(2.80-2.94)	<.001
Adjusted	3.8	(3.7-3.9)	2.8	(2.8-2.9)	1.35	(1.31-1.39)	<.001
Mental health care within 14 days following positive alcohol screen							
Unadjusted	56.7	(56.5-57.0)	17.4	(17.3-17.5)	3.27	(3.24-3.29)	<.001
Adjusted	36.0	(35.7-36.2)	19.8	(19.7-19.9)	1.82	(1.80-1.83)	<.001

Note. Models adjusted for age, gender, race/ethnicity, marital status, comorbid mental health and substance use conditions, facility-level rate in AUD diagnosis (for alcohol-related care outcomes) or mental health diagnosis (for mental health care outcome), medical comorbidity, and previous utilization of outpatient care.

Table 3

Adjusted prevalence and relative rate ratios of specialty addictions treatment for AUD, pharmacotherapy for AUD, and mental health follow-up care among VA patients with and without PTSD at moderate and severe levels of unhealthy alcohol use.

	PTSD		No PTSD		RR	(95% CI)	p-value
	%	(95% CI)	%	(95% CI)			
Specialty addictions treatment for AUD within 1 year							
AUDIT-C moderate (5-8)	6.9	(6.8-7.0)	6.2	(6.1-6.2)	1.12	(1.09,1.15)	<.001
AUDIT-C severe (9-12)	23.3	(23.0-23.7)	24.2	(24.0-24.4)	0.96	(0.95,0.98)	.001
Pharmacotherapy for AUD within 1 year							
AUDIT-C moderate (5-8)	2.7	(2.6-2.7)	1.7	(1.7-1.8)	1.52	(1.46,1.58)	<.001
AUDIT-C severe (9-12)	7.3	(7.1-7.5)	6.4	(6.2-6.5)	1.14	(1.10,1.19)	<.001
Mental health care within 14 days following positive alcohol screen							
AUDIT-C moderate (5-8)	32.6	(32.3-32.9)	16.2	(16.1-16.3)	2.02	(1.99, 2.04)	<.001
AUDIT-C severe (9-12)	46.0	(45.5-46.4)	31.6	(31.4-31.8)	1.46	(1.44, 1.47)	<.001

Note. Models adjusted for age, gender, race/ethnicity, marital status, comorbid mental health and substance use conditions, facility-level rate of AUD diagnosis (for alcohol-related care outcomes) or mental health diagnosis (for mental health care outcome), medical comorbidity, and previous utilization of outpatient care. Results are not included for brief interventions as there was no evidence for effect modification by alcohol use severity.

Table 4

Adjusted prevalence and relative rate ratios of brief interventions, specialty addictions treatment for AUD, pharmacotherapy for AUD, and mental health follow-up care among VA patients with and without PTSD by age categories.

	PTSD		No PTSD		RR	(95% CI)	p-value
	%	(95% CI)	%	(95% CI)			
Brief interventions within 14 days							
18-29 years	74.0	(73.6-74.7)	70.8	(70.4-71.1)	1.04	(1.04-1.06)	<.001
30-44 years	73.2	(72.8-73.9)	70.9	(70.5-71.2)	1.03	(1.03-1.04)	<.001
45-64 years	72.6	(72.4-73.1)	70.6	(70.4-70.7)	1.03	(1.02-1.04)	<.001
65+ years	76.8	(75.9-77.5)	72.5	(72.3-72.7)	1.06	(1.05-1.07)	<.001
Specialty addictions treatment for AUD within 1 year							
18-29 years	9.6	(9.3-9.9)	8.9	(8.6-9.1)	1.08	(1.03-1.13)	.001
30-44 years	13.9	(13.5-14.2)	14.1	(13.9-14.4)	0.98	(0.95-1.02)	.303
45-64 years	13.4	(13.2-13.6)	13.3	(13.2-13.5)	1.00	(0.99-1.02)	.623
65+ years	4.0	(4.0-4.3)	2.8	(2.7-2.9)	1.46	(1.36-1.57)	<.001
Pharmacotherapy for AUD within 1 year							
18-29 years	4.6	(4.4-4.8)	2.8	(2.6-2.9)	1.66	(1.53-1.80)	<.001
30-44 years	6.4	(6.1-6.6)	4.8	(4.6-4.9)	1.33	(1.26-1.41)	<.001
45-64 years	3.9	(3.8-4.1)	3.3	(3.2-3.3)	1.20	(1.16-1.25)	<.001
65+ years	1.4	(1.2-1.5)	0.7	(0.7-0.8)	1.85	(1.62-2.11)	<.001
Mental health care within 14 days							
18-29 years	51.5	(50.3-51.5)	30.6	(30.4-31.1)	1.65	(1.62-1.68)	<.001
30-44 years	50.6	(49.7-50.8)	30.5	(30.3-31.0)	1.64	(1.61-1.67)	<.001
45-64 years	36.5	(36.4-37.1)	20.6	(20.5-20.7)	1.78	(1.76-1.80)	<.001
65+ years	20.2	(20.5-21.7)	6.4	(6.2-6.4)	3.35	(3.22-3.47)	<.001

Note. Models adjusted for alcohol use severity, gender, race/ethnicity, marital status, comorbid mental health and substance use conditions, facility-level rate in AUD diagnosis (for alcohol-related care outcomes) or mental health diagnosis (for mental health care outcome), medical comorbidity, and previous utilization of outpatient care.

Table 5

Exploratory analyses examined rates of any specialty addictions or mental health care by PTSD status and alcohol use severity.

	PTSD		No PTSD		RR	(95% CI)	p-value
	%	(95% CI)	%	(95% CI)			
Any specialty addictions treatment or pharmacotherapy for AUD or mental health care by PTSD status							
Unadjusted	62.0	(61.8-62.3)	21.6	(21.5-21.7)	2.87	(2.86,2.89)	<.001
Adjusted	40.4	(40.1-40.6)	24.5	(24.4-24.6)	1.65	(1.64,1.66)	<.001
Any specialty addictions treatment or pharmacotherapy for AUD or mental health care by PTSD status and alcohol use severity							
AUDIT-C moderate (5-8)	35.6	(35.4-36.0)	19.3	(19.2-19.4)	1.85	(1.83, 1.87)	<.001
AUDIT-C severe (9-12)	54.0	(53.6-54.4)	41.3	(41.0-41.5)	1.31	(1.30, 1.32)	<.001

Note. Models adjusted for age, gender, race/ethnicity, marital status, comorbid mental health and substance use conditions, facility-level rate of AUD diagnosis, medical comorbidity, and previous utilization of outpatient care.