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Receipt of Alcohol-Related Care among Patients with HCV and Unhealthy Alcohol Use

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Abstract

Background—Alcohol use—particularly unhealthy alcohol use—exacerbates risks associated with Hepatitis C virus (HCV). However, whether unhealthy alcohol use is appropriately addressed among HCV+ patients is understudied. We examined receipt of alcohol-related care among HCV+ patients and unhealthy alcohol use.

Methods—All positive alcohol screens (AUDIT-C score ≥ 5) documented 10/01/09–5/30/13 were identified from national electronic health records data from the Veterans Health Administration (VA). Regression models estimated unadjusted and adjusted proportions of HCV+ and HCV- patients of receiving: 1) brief intervention within 14 days of positive screening, and 2) specialty addictions treatment and 3) pharmacotherapy for alcohol use disorder (AUD) in the year following positive screening. Adjusted models included demographics, alcohol use severity, and mental health and substance use disorder comorbidities.

Results—Among 830,825 VA outpatients with positive alcohol screening, 31,841 were HCV+. Among HCV+, unadjusted and adjusted prevalences of brief intervention were 69.2% (CI, 68.7–69.6) and 71.9% (CI, 71.4–72.4), specialty addictions treatment were 29.9% (CI, 29.4–30.4) and 12.7% (CI 12.5–12.9), and pharmacotherapy were 5.9% (CI, 5.7–6.1) and 3.3% (CI, 3.1–3.4), respectively. Among the 20,320 (64%) patients with HCV and documented AUD, unadjusted and adjusted prevalences of specialty addictions treatment were 40.0%, (CI, 39.3–40.6) and 26.7% (CI, 26.3–27.1), and pharmacotherapy were 8.1% (CI, 7.7–8.4) and 6.4% (CI, 6.1–6.6), respectively. Receipt of alcohol-related care was generally similar across HCV status.

Conclusions—Findings highlight under-receipt of recommended alcohol-related care, particularly pharmacotherapy, among patients with HCV and unhealthy alcohol use who are particularly vulnerable to adverse influences of alcohol use.

Keywords

Alcohol; HCV; Brief intervention; Alcohol Use Disorders

1. Introduction

In the United States, three to four million individuals are living with chronic hepatitis C virus (HCV; Centers for Disease Control and Prevention, 2016), making it four times more prevalent than the HIV (Satterwhite et al., 2013). HCV is a leading cause of liver damage and advanced liver disease, such as cirrhosis and hepatocellular carcinoma (Lavanchy, 2011; Sulkowski, 2007), which can necessitate liver transplantation (Charlton et al., 2011; Ly et al., 2012). Alcohol use at all levels can compound the adverse effects of HCV and lead to heightened risks of mortality, particularly among those co-infected with HIV. Alcohol use lowers the risk of HCV spontaneous clearance, exacerbates inflammation, and hastens the progression of HCV-related fibrosis (e.g., Hutchinson et al., 2005; Peters and Terrault, 2002; Piasecki et al., 2004; Tsui et al., 2016a) and subsequent liver diseases (e.g., cirrhosis, liver cancer; Morgan et al., 2003; Peters and Terrault, 2002; Sulkowski, 2007).

Despite the deleterious effects of alcohol use in this population, many patients with HCV consume alcohol (Tsui et al., 2016b). Further, in the U.S. population, persons with HCV are more likely than those without (Taylor et al., 2016) to drink at levels consistent with “unhealthy alcohol use”—a spectrum from drinking over national recommended limits to meeting diagnostic criteria for alcohol use disorders (Saitz, 2005). Thus, persons with HCV are a key target population for evidence-based alcohol-related interventions that may help facilitate cessation (Chung et al., 2015).

Multiple processes of care are efficacious and recommended for addressing the spectrum of unhealthy alcohol use (Bradley and Kivlahan, 2014; Department of Veterans Affairs, 2015; Jonas et al., 2012; Maciosek et al., 2006; National Health Service, 2010; Solberg et al., 2008). Brief intervention is recommended for primary care patients who screen positive for unhealthy alcohol use (Jonas et al., 2012). For individuals with more severe unhealthy alcohol use—those with alcohol use disorders (AUD)—both behavioral (e.g., cognitive behavioral therapy offered in a specialty addictions treatment setting) and pharmacological treatments are recommended (Department of Veterans Affairs, 2015; Jonas et al., 2012; National Health Service, 2010). Three pharmacotherapies are FDA-approved for treatment of AUD, and include *acamprosate*, *disulfiram*, and oral or injectable *naltrexone* (Jonas et al., 2014; Kranzler et al., 2014; National Institute on Alcohol Abuse and Alcoholism, 2007). *Topiramate* also has strong support based on a meta-analysis for the treatment of AUD (Jonas et al., 2014).

Despite availability, the extent to which patients with HCV receive evidence-based care for unhealthy alcohol use is unknown. The national Veterans Health Administration (VA) offers a unique opportunity to examine this question. The prevalence of HCV is higher among Veterans than within the general U.S. population, and the VA is the largest provider of HCV care in the world (Graham, 2016). Moreover, annual screening for unhealthy alcohol use is performed for the vast majority of outpatients in VA (thus enabling identification of the

target population for alcohol interventions; Bradley et al., 2006), and evidence-based care for unhealthy alcohol use is recommended (Department of Veterans Affairs, 2015) and incentivized either by national performance measure (brief intervention) or by routine monitoring of care for quality purposes (specialty addictions treatment and AUD pharmacotherapy receipt). Therefore, we used national data from the VA to examine receipt of evidence-based alcohol-related care among patients with unhealthy alcohol use with and without HCV.

2. Material and Methods

2.1 Study Setting and Data Source

The setting for this study was the national VA healthcare system, which is made up of 139 large facilities and over 900 clinics throughout the U.S. VA electronic health record (EHR) data are replicated in a large Corporate Data Warehouse (CDW) within VA's Informatics and Computing Infrastructure. In addition to clinical data, the CDW also contains enrollment, financial, administrative, pharmacy, and utilization data. We extracted national CDW data for all patients with a documented outpatient appointment between 10/01/09 and 05/30/13 to identify those with one or more with positive screens on the Alcohol Use Disorders Identification Test Consumption (AUDIT-C) questionnaire (Bush et al., 1998; Bradley, 1993). Those with AUDIT-C scores ≥ 5 were considered positive, consistent with the denominator specification for VA's national performance measure for brief intervention (Williams et al., 2017b). Each positive screen was tracked for up to one year (until 05/30/14) to assess alcohol-related care outcomes. Because positive screens were identified over four years, patients could contribute multiple positive screens.

All study procedures were approved by the Institutional Review Board at the facility where data were analyzed (VA Puget Sound Health Care System), which granted waivers of written consent and authorization to access patients' health information (HIPAA authorization).

2.2 Measures

2.2.1 HCV Status—HCV status was determined based on documentation of International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM) codes in the 0-365 days prior to each positive AUDIT-C screen using the following diagnoses: acute hepatitis C with (V070.41) or without (070.51) hepatic coma; chronic hepatitis C with (070.44) or without (070.54) hepatic coma; unspecified viral hepatitis C with (070.71) or without (070.70) hepatic coma; or hepatitis C carrier (02.62).

2.2.2 Alcohol-Related Care Outcomes—Four alcohol-related care outcomes were measured, including receipt of brief intervention, specialty addiction treatment, and AUD pharmacotherapy, and a composite measure of receiving any of these services. Brief intervention was defined as documentation of advice to reduce or abstain from drinking within 14 days of positive alcohol screening. This measure is consistent with components included in efficacious brief interventions (Whitlock et al., 2004) and with VA's national performance measure, which requires documentation of advice to reduce or abstain from drinking and feedback linking drinking to health for all patients who screen positive on the

AUDIT-C with scores ≥ 5 within 14 days of screening positive (Lapham et al., 2012; Williams et al., 2017b; Williams et al., 2014). Similar to previous studies (Bradley et al., 2013; Lapham et al., 2015; Williams et al., 2014), the measure of brief intervention was derived based on data that result from documentation of advice to reduce or abstain from drinking in an electronic clinical reminder, which becomes “due” for providers once a patient screens positive on the AUDIT-C and is routinely used across VA sites to facilitate meeting VA's performance measure (Lapham et al., 2012; Williams et al., 2014). The three remaining outcomes were all assessed in the year (0-365 days) after positive alcohol screening. Receipt of specialty addiction treatment was measured based on documentation of any visits (assessed via stop codes 513, 514, 519, 523, 547, 548, and 560 or bed section codes 27, 29, 72, 73, 74, 84, 86, and 111) to inpatient or outpatient addiction treatment documented in the year following positive screening (Williams et al., 2017c). This measure allows estimation of utilization but does not assess content or course of treatment and does not include participation in 12-step self-help groups. Receipt of AUD pharmacotherapy was measured as any filled prescription for acamprosate, disulfiram, oral or injectable naltrexone, or topiramate in the year following positive screening (Harris et al., 2010). Finally, a composite measure indicating receipt of any alcohol-related care was derived to represent receipt of any brief intervention, specialty addiction treatment, and/or AUD pharmacotherapy in the year following positive screening.

2.2.3 Covariates—Covariates included demographic characteristics, and measures of alcohol use severity, and mental health and substance use disorder comorbidity. These measures were chosen based on known associations between these factors and both HCV status and receipt of alcohol-related care (Burman et al., 2004; Denniston et al., 2014; Lapham et al., 2012). Demographic characteristics included: sex (male, female); age in years by group (18-29, 30-44, 45-64, 65); race/ethnicity (Asian American/Pacific Islander, Black, Hispanic/Latino, Native American, White); VA eligibility for co-payment status (full VA coverage, service connection $<50\%$, no coverage) used as a possible proxy variable for socio-economic status (Williams et al., 2012; Young et al., 2003); and marital status (divorced/separated, married, never married/single, widowed). Fiscal year of the positive AUDIT-C screen (2010, 2011, 2012, 2013) was also examined as a covariate to account for changes in rates of brief interventions from 2010-2013 (i.e., national rates of documented brief intervention increased from approximately 50% in 2009 to 76% in 2011; Bradley et al., 2011a).

Measures of mental health and substance use comorbidity were largely derived using ICD-9-CM codes from electronic health records during the 0-365 days prior to each positive alcohol screen. Mental health disorders included major depression, posttraumatic stress disorder, other anxiety disorders, other mood disorders, and serious mental illness (e.g., schizophrenia, bipolar disorder, and/or psychosis). Because severity of unhealthy alcohol use is a strong predictor of receipt of alcohol-related care (Burman et al., 2004; Volk et al., 1996), three measures of severity were used: AUDIT-C risk groups were categorized based on scores of 5-8 and 9-12 with higher scores indicating greater severity (Rubinsky et al., 2013), and clinically recognized AUD and alcohol-specific medical conditions (e.g., alcoholic cirrhosis) were measured dichotomously using ICD-9-CM codes documented in

the 0-365 days prior to positive alcohol screening (Williams et al., 2017c). Non-alcohol substance use disorders included stimulant disorders (amphetamine and/or cocaine), opioid use disorders, and all other drug use disorders (cannabis, hallucinogens, and/or sedatives). Tobacco use was defined as having a tobacco use disorder or current smoker status documented in the electronic health record in the 0-365 days prior to each positive AUDIT-C screen (Williams et al., 2017c).

2.3 Analyses

Characteristics of the sample were described at the patient level, based on information collected at the time of patient's first positive AUDIT-C screen. Chi-square tests of independence were used to compare patients across HCV status in the entire sample of patients with positive screening, as well as in the sub-sample with a clinically documented AUD.

Consistent with procedures from previous studies (Williams et al., 2017c), all primary analyses were conducted with positive screens (not patients) as the unit of analysis. The decision to use all available data was made to maximize estimation. Modified Poisson regression models (Zou, 2004) were used to describe the prevalence of each alcohol-related care outcome, as well as to assess the relative rates and 95% confidence intervals of receipt of each outcome for patients with HCV compared to those without. Poisson regression was selected as an alternative to logistic regression to estimate relative rates (as opposed to odds ratios) because outcomes were expected to be common (Greenland, 1995; Zou, 2004). Analyses were clustered at the level of the patient to account for correlation within positive screens and to address the misspecification of the Poisson model's variance structure (Greenland, 1995; Liang and Zeger, 1986; Zou, 2004). Unadjusted models were estimated first. Adjusted models included other factors that may account for receipt of alcohol-related care, including socio-demographic characteristics, fiscal year of the positive screen, mental health and non-alcohol substance use disorders, and severity of alcohol use.

Because specialty addiction treatment and AUD pharmacotherapy are recommended specifically for individuals with AUD (National Institute on Alcohol Abuse and Alcoholism, 2007), regression analyses were repeated in the subset of positive screens with a clinically recognized AUD. For these analyses, we assessed only elements of care specifically recommended for this population with the most severe unhealthy alcohol use (National Institute for Health and Care Excellence, 2015): receipt of specialty addiction treatment, receipt of AUD pharmacotherapy, and receipt of any alcohol-related care. Analyses with receipt of brief interventions as the sole outcome were not repeated due to evidence that these alone are likely not effective for individuals with AUD (Jonas et al., 2012).

Analyses conducted at the screen-level were repeated at the patient level to ensure use of repeated measures did not bias results. Two approaches were undertaken to identify the samples for these patient-level sensitivity analyses: first each initial positive screen was selected, second a random positive screen for each patient was selected. All analyses were conducted in Stata 13 software (StataCorp., 2013).

3. Results

During the study period (October 1, 2009 to October 30, 2013), 830,825 VA patients screened positive for unhealthy alcohol use (AUDIT-C scores ≥ 5), reflecting 1,172,606 positive screens. Among them, 31,841 (3.8%) patients (45,859 positive screens) had a documented diagnosis for HCV, and, of these, 20,320 (30,765 positive screens) had an AUD. Among all patients, the number of positive screens ranged from 1-5, with a median number of 1. Characteristics of patients described and compared across HCV status in Table 1 in the full sample and in Table 2 in the sub-sample with a clinically recognized AUD. The sample was largely male (97%) and white race/ethnicity (73%); most patients (52%) were between 45 and 64 years old. Forty-three percent were married, with fewer that were divorced/separated (29%) or never married/single (24%); more than half did not have VA health care coverage (60%). Compared to those without HCV, those with HCV were more likely to be middle-aged, black race/ethnicity, unmarried (either via divorce/separation or never being married), to have no VA coverage, to have HIV, and to have severe unhealthy alcohol use and mental health and substance use disorder diagnoses (Table 1). Notably, 64% of those with HCV had a clinically recognized AUD. Patterns were similar in the subsample with AUD (Table 2).

Results of regression analyses are presented in Table 3. Patients with HCV were slightly less likely than those without to receive brief intervention in both unadjusted and adjusted models, with 71.9%. [95 % Confidence Interval (CI) 71.4-72.4] and 73.7% (95% CI 73.6-73.8) of those with and without HCV receiving brief intervention, respectively. However, patients with HCV were more likely than those without HCV to receive specialty addictions treatment, AUD pharmacotherapy, and any alcohol-related care in unadjusted models (Table 3). After adjustment, all three associations were attenuated, though a significant positive association remained between HCV status and receipt of specialty addictions treatment (Table 3). No differences were observed in receipt of AUD pharmacotherapy or any alcohol-related care across HCV status after adjustment (Table 3).

Among the 267,207 with an AUD diagnosis. HCV status was associated with increased likelihood of receiving specialty addiction treatment in unadjusted and adjusted models with 26.7% (95% CI 26.3 – 27.1) of those with and 24.8% (95% CI 24.7 – 24.9) of those without HCV receiving specialty addiction treatment after adjustment (Table 3). HCV status was positively associated with receipt of AUD pharmacotherapy in unadjusted models, but after adjustment those with HCV were less likely than those without to receive AUD pharmacotherapy (Table 3). A similar pattern was observed in receipt of any alcohol-related care. However, though significant, absolute differences were small (Table 3).

Results of sensitivity analyses at the patient level did not differ from primary results (data not shown).

4. Discussion

Findings in this large national sample of VA patients with unhealthy alcohol use highlight gaps in receipt of recommended alcohol-related care for patients with unhealthy alcohol use

for patients with and without HCV. Differences in receipt of evidence-based alcohol-related care were observed across HCV status, though differences varied based on outcome, and appeared to be substantially influenced by other demographic and clinical characteristics that differed vastly across HCV status.

Gaps in receipt of alcohol-related care among those with HCV are surprising and particularly concerning given the adverse influences of alcohol use on HCV outcomes. While most patients with HCV received brief interventions, approximately one-third still did not, and far fewer received specialty addiction treatment or AUD pharmacotherapy. Moreover, among those with HCV and a clinically recognized AUD (the majority of all patients with HCV, 64%), two-thirds did not receive specialty addiction treatment, and more than 90% did not receive pharmacotherapy that are FDA-approved to treat AUD. These rates are concerning given the negative impact alcohol use can have on HCV. Specifically, alcohol use adversely influences the progression of HCV infection and outcomes (Hutchinson et al., 2005; Oser et al., 2012; Peters and Terrault, 2002; Tsui et al., 2006). Further, it is possible that alcohol use influences direct-acting antiviral (DAA) treatment outcomes among persons with HCV. Only one study to date has evaluated the influence of alcohol use on DAA treatment outcomes (Tsui et al., 2016b). Consistent with current recommendations provided by the American Association for the Study of Liver Diseases (Chung et al., 2015), primary analyses from this study identified high cure rates with no significant differences across alcohol use severity groups, suggesting that DAA treatment should be offered regardless of alcohol use. However, secondary analyses accounting for missing data suggested the possibility that unhealthy alcohol use may slightly reduce likelihood of cure (Tsui et al., 2016b), albeit to a degree that may not be considered clinically relevant.

Reasons for gaps in alcohol-related care among those with HCV are unknown, as no studies to our knowledge have described barriers to provision of alcohol-related care among patients with HCV or explored factors specific to HCV treatment settings. However, multiple studies have assessed barriers to provision of alcohol-related care in other settings, including in specialty settings addressing chronic viral infections (i.e. HIV), such as barriers related to the context in which care is being provided (e.g., lack of external incentives and internal capacity for provision of care), those related to individuals (e.g., patient preferences and knowledge, provider knowledge and self-efficacy), those related to the elements of alcohol-related care (e.g., the complexity of and multiple options for treating unhealthy alcohol use), and perceived barriers to implementation (e.g., lack of buy-in or inadequate staffing; Johnson et al., 2011; Oliva et al., 2011; Williams et al., 2015; Williams et al., 2016). These barriers are likely enhanced in HCV treatment and other specialty medical settings. Also of note in the present study is that differences in receipt of alcohol-related care across HCV status decreased in magnitude and occasionally switched directions after adjusting for demographic and clinical characteristics. These findings suggest that variation in sociodemographic and clinical characteristics across HCV status may, at least, in part, drive differences in receipt of alcohol-related care across HCV status. As per Table 1 results, patients with HCV were more likely than those without to have demographic and clinical characteristics that highlight them as a vulnerable population (e.g., high prevalence of black race/ethnicity, low social support based on marital status, and substantial mental health and substance use comorbidity). These factors may increase need for alcohol-related care but

also increase barriers to its receipt. Although a full examination of mechanisms underlying gaps in alcohol-related care in this population is beyond the scope of the present study, future research is needed to begin to separate and understand how these experiences and risk factors might interact and act as barriers to receipt of alcohol-related care among those with HCV. For example, it may be that patients with HCV only discuss their alcohol and related concerns in primary care clinics, where providers may lack the knowledge or experience to prescribe pharmacotherapy for AUD (Williams et al., 2017a).

While low rates of AUD pharmacotherapy are common across populations (Harris et al., 2010; Mark et al., 2009; Oliva and Harris, 2014), for patients with HCV, it is possible that comorbid liver disease may preclude them from certain FDA-approved pharmacotherapy for AUD that are metabolized through the liver (e.g., disulfiram, naltrexone). Findings from a small number of randomized clinical trials suggest that pharmacotherapy options can be safe for this population, (Leggio et al., 2012; Saxon et al., 1998), although evidence of effectiveness may vary (Hauser et al., 2017). Of note, our study only included pharmacotherapies that were FDA-approved specifically for AUD treatment and one with strong meta-analytic support for AUD treatment, in part because it is difficult to determine when other pharmacotherapies were prescribed for AUD specifically versus other health conditions (e.g., gabapentin). Future research to assess use of other AUD pharmacotherapies options being considered (e.g., baclofen; Lyon, 2017) among patient with HCV and AUD may be warranted.

Findings from this study have several clinical implications. While historically unhealthy alcohol use has been the single most important contraindication for starting treatment among patients with HCV, recent data demonstrates that the vast majority of patients treated with DAAs, including those with unhealthy alcohol use, achieve a cure suggesting that alcohol use should not be a contraindication to new HCV treatments (Tsui et al., 2016b). Aligned with this, in September 2016, the VA updated its treatment guideline to recommend that all patients with HCV be considered for treatment, regardless of substance use, explicitly stating that alcohol use and length of abstinence should not be disqualifiers for receiving HCV treatment (Department of Veterans Affairs et al., 2016). Nonetheless, HCV treatment is extremely costly, and failing to treat unhealthy alcohol use among patients receiving HCV treatment may undermine the investment in treatment. Specifically, after HCV is cured, patients still may develop liver disease because of their unhealthy alcohol use. Further, overall receipt of alcohol-related care appeared to be relatively comparable across HCV status (i.e., those with HCV did not differ substantially than those without). While results are encouraging in that rates of care were not lower among patients with HCV, all patients with HCV should be receiving evidence-based alcohol-related care given the risks of alcohol use in this population, particularly among those co-infected with HIV. Thus, additional steps to improve rates of alcohol-related care for this high-risk population both inside and outside of the VA are needed. Moreover, future research should focus on identifying methods of providing concurrent care to treat both HCV and unhealthy alcohol use. Addressing unhealthy alcohol use in the context of medical illnesses affected by drinking can be crucial in enacting change (Willenbring and Olson, 1999). In qualitative interviews, patients with HCV and comorbid substance use described that combining HCV and addictions treatment

as “transformative” and leading to improvement in their substance use (Batchelder et al., 2015).

There are limitations associated with this study. First, while the VA was an ideal setting in which to conduct the study due to its large population of patients with HCV and ongoing monitoring of alcohol-related care, it is likely that rates of receipt of alcohol-related care for patients with HCV and unhealthy alcohol use are lower in non-VA healthcare systems where screening for alcohol use is not routine and where related care may not be as widely available or accessible. Additionally, generalizability of results may be limited because data came from patients accessing VA services, who were largely white males between the ages of 45 and 64. Similarly, data came from patients with a documented AUDIT-C screen who may be different clinically from those patients who were not screened (e.g., patients too medically compromised to be screened). Further, reliance on secondary clinical data to measure covariates and outcomes may have introduced both residual confounding and mis-categorization. For instance, our measure of AUD pharmacotherapy was based on pharmacy dispense date but does not measure prescriptions given that were not filled or receipt of pharmacotherapy outside of VA, does not enable disaggregation of types of medications, and may have resulted in overestimating rates because two of the four agents have other indications (naltrexone, topiramate). In addition, our measure of brief intervention may not accurately reflect the content or quality of care provided.

Despite these limitations, this is the first study to our knowledge to investigate receipt of evidence-based treatments for unhealthy alcohol use in a large patient sample with HCV. In this large national sample of persons with HCV and unhealthy alcohol use, a large majority had a clinically recognized AUD, and gaps in alcohol-related care were identified. While most patients with HCV received a brief intervention following a positive alcohol screen, approximately one-third still did not, despite being in the VA health care system, where providers are required and incentivized to do so. This is particularly concerning given that those with HCV often are coinfecting with HIV, which exacerbates the risks of any alcohol use. Further, the majority of patients with HCV and a documented AUD do not receive special addiction treatment or AUD pharmacotherapy. Future efforts should target strategies to increase receipt of alcohol-related care and AUD pharmacotherapy for patients with HCV and unhealthy alcohol use, and research should be conducted to identify models of providing concurrent care.

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Characteristics of VA outpatients with unhealthy alcohol use (AUDIT-C ≥ 5) at first recorded positive screen between 2009-2013: Overall and across HCV status

Table 1

	HCV +		HCV -		Total	
	N	(%)	N	(%)	N	(%)
Female	549	(1.7)	25,145	(3.2)	25,694	(3.1)
Age in years						
18-29	202	(0.6)	100,217	(12.5)	100,419	(12.1)
30-44	881	(2.8)	120,479	(15.1)	121,360	(14.6)
45-64	28,896	(90.8)	400,478	(50.1)	429,274	(51.7)
65+	1,862	(5.9)	177,910	(22.3)	179,772	(21.6)
Race/ethnicity [†]						
Asian American/Pacific Islander	357	(1.2)	13,066	(1.8)	13,423	(1.7)
Black	10,332	(33.6)	121,145	(16.2)	131,477	(16.9)
Hispanic/Latino	2,252	(7.3)	53,435	(7.1)	55,687	(7.1)
Native American	415	(1.4)	8,560	(1.1)	8,975	(1.2)
White	17,392	(56.6)	552,087	(73.4)	569,479	(73.1)
Marital status [‡]						
Divorced/Separated	13,901	(43.9)	226,346	(28.8)	240,247	(29.4)
Married	7,229	(22.8)	344,509	(43.8)	351,738	(43.0)
Never Married/Single	9,344	(29.5)	186,807	(23.8)	196,151	(24.0)
Widowed	1,181	(3.7)	28,978	(3.7)	30,159	(3.7)
VA eligibility status [‡]						
Full VA Coverage	5,221	(16.4)	140,738	(17.7)	145,959	(17.6)
Service connection <50%	5,691	(17.9)	180,281	(22.8)	185,972	(22.4)
No coverage	20,929	(65.7)	45,677	(59.7)	496,606	(59.9)
Fiscal year of first AUDIT-C						
2010	14,113	(44.3)	329,802	(41.3)	343,915	(41.4)
2011	8,804	(27.7)	229,176	(28.7)	237,980	(28.6)

	HCV +		HCV -		Total	
	N	(%)	N	(%)	N	(%)
2012	6,184	(19.4)	174,732	(21.9)	180,916	(21.8)
2013	2,740	(8.6)	65,274	(8.2)	68,014	(8.2)
HIV+	797	(2.5)	2,717	(0.3)	3,514	(0.4)
Major depression	4,042	(12.7)	53,620	(6.7)	57,662	(6.9)
Other mood disorder	12,040	(37.8)	174,579	(21.9)	186,619	(22.5)
Post Traumatic Stress Disorder	6,061	(19.0)	134,327	(16.8)	140,388	(16.9)
Anxiety disorder	4,239	(13.3)	81,557	(10.2)	85,816	(10.3)
Serious mental illness	4,526	(14.2)	37,368	(4.7)	41,894	(5.0)
Stimulant use disorder	7,449	(23.4)	31,065	(3.9)	38,514	(4.6)
Opioid use disorder	3,623	(11.4)	11,024	(1.4)	14,647	(1.8)
Other drug use disorder	5,118	(16.1)	32,385	(4.1)	37,503	(4.5)
AUDIT-C severity categories						
5-8	20,401	(64.1)	611,349	(76.5)	631,750	(76.0)
9-12	11,440	(35.9)	187,635	(23.5)	199,075	(24.0)
Alcohol use disorder	20,320	(63.8)	246,887	(30.9)	267,207	(32.2)
Alcohol specific condition	2,248	(7.1)	11,555	(1.5)	13,803	(1.7)

[†]Total N varies for characteristic due to missing values: race/ethnicity (n 779,041); marital status (n 818,293); VA eligibility status (n 828,536); Characteristics differed significantly by HCV status (p-values 0.001) for all characteristics.

Characteristics of VA outpatients with alcohol use disorder diagnosis at first recorded positive screen between 2009–2013: Overall and across HCV status

Table 2

	HCV +		HCV -		Total	
	N	(%)	N	(%)	N	(%)
Female	393	(1.9)	8,315	(3.4)	8,708	(3.3)
Age in years						
18-29	114	(0.6)	22,642	(9.1)	22,756	(8.5)
30-44	564	(2.8)	36,926	(15.0)	37,490	(14.0)
45-64	18,605	(91.6)	147,249	(59.6)	165,854	(62.1)
65+	1,037	(5.1)	40,070	(16.2)	41,107	(15.4)
Race/ethnicity [†]						
Asian American/Pacific Islander	216	(1.1)	3,448	(1.5)	3,664	(1.4)
Black	6,907	(34.9)	48,774	(20.9)	55,681	(21.9)
Hispanic/Latino	1,395	(7.1)	15,525	(6.6)	16,920	(6.7)
Native American	296	(1.5)	3,298	(1.4)	3,594	(1.4)
White	10,973	(55.5)	162,933	(69.6)	173,906	(68.5)
Marital status [‡]						
Divorced/Separated	9,304	(46.0)	86,914	(35.6)	96,218	(36.4)
Married	3,830	(19.0)	82,803	(33.9)	86,633	(32.7)
Never Married/Single	6,924	(31.1)	66,017	(27.0)	72,311	(27.3)
Widowed	788	(3.9)	8,694	(3.6)	9,482	(3.6)
VA eligibility status [‡]						
Full VA Coverage	3,339	(16.4)	48,011	(19.5)	51,350	(19.2)
Service connection <50%	3,592	(17.7)	50,377	(20.4)	53,969	(20.2)
No coverage	13,389	(65.9)	148,455	(60.1)	161,844	(60.6)
Fiscal year of first AUDIT-C						
2010	9,456	(46.5)	109,621	(44.4)	119,077	(44.6)
2011	5,520	(27.2)	69,481	(28.1)	75,001	(28.1)

	HCV +		HCV -		Total	
	N	(%)	N	(%)	N	(%)
2012	3,728	(18.4)	49,518	(20.1)	53,246	(19.9)
2013	1,616	(8.0)	18,267	(7.4)	19,883	(7.4)
HIV+	527	(2.6)	1,197	(0.5)	1,724	(0.7)
Major depression	3,432	(16.9)	31,484	(12.8)	34,916	(13.1)
Other mood disorder	9,494	(46.7)	89,953	(36.4)	99,447	(37.2)
Post Traumatic Stress Disorder	4,569	(22.5)	61,973	(25.1)	66,542	(24.9)
Anxiety disorder	3,329	(16.4)	38,646	(15.7)	41,975	(15.7)
Serious mental illness	3,770	(18.6)	24,237	(9.8)	28,007	(10.5)
Stimulant use disorder	6,757	(33.3)	27,011	(10.9)	33,768	(12.6)
Opioid use disorder	3,164	(15.6)	8,938	(3.6)	12,102	(4.5)
Other drug use disorder	4,687	(23.1)	27,172	(11.0)	31,859	(11.9)
AUDIT-C severity categories						
5-8	11,183	(55.0)	141,995	(57.5)	153,178	(57.3)
9-12	9,137	(45.0)	104,892	(42.5)	114,029	(42.7)
Alcohol specific condition	1,969	(9.7)	9,335	(3.8)	11,304	(4.2)

[†]Total N varies for characteristic due to missing values: race/ethnicity (n 253,765); marital status (n 264,644); VA eligibility status (n 267,163). Characteristics differed significantly by HCV status (p-values 0.001) for all characteristics (except anxiety disorder p = 0.006).

Receipt of Alcohol-related Care across HCV status among VA Patients Screening Positive for Unhealthy Alcohol Use (AUDIT-C 5) between 2009 and 2013, and in a Subsample of Patients with a Documented AUD.

Table 3

HCV+		HCV-		RR ^f	95% CI	p-value ^g
%	95% CI	%	95% CI			
Among All Patients with Unhealthy Alcohol Use						
Receipt of Brief Intervention						
Unadjusted	69.2 (68.7-69.6)	73.9 (73.8-74.0)	0.94 (0.93 – 0.94)			<0.001
Adjusted *	71.9 (71.4-72.4)	73.7 (73.6-73.8)	0.98 (0.97 – 0.98)			<0.001
Receipt of Specialty Addictions Treatment						
Unadjusted	29.9 (29.5-30.4)	10.1 (10.0-10.1)	2.97 (2.92 – 3.02)			<0.001
Adjusted *	12.7 (12.5-12.9)	10.9 (10.9-11.0)	1.16 (1.14 – 1.18)			<0.001
Receipt of AUD Pharmacotherapy						
Unadjusted	5.9 (5.7-6.1)	3.0 (3.0-3.1)	1.94 (1.86 – 2.03)			<0.001
Adjusted *	3.3 (3.1-3.4)	3.2 (3.2-3.3)	1.02 (0.97 – 1.06)			0.409
Composite: Receipt of Any Alcohol-Related Care ^g						
Unadjusted	80.3 (79.9-80.7)	77.5 (77.4-77.6)	1.04 (1.03 – 1.04)			<0.001
Adjusted *	77.7 (77.3-78.1)	77.7 (77.7-77.8)	1.00 (0.99 – 1.00)			0.910
Among Eligible Patients with Clinically Recognized AUD						
HCV+		HCV-		RR ^f	95% CI	p-value ^g
%	95% CI	%	95% CI			
Receipt of Specialty Addictions Treatment						
Unadjusted	40.0 (39.3-40.6)	23.4 (23.3-23.6)	1.70 (1.68 – 1.73)			<0.001
Adjusted *	26.7 (26.3-27.1)	24.8 (24.7-24.9)	1.08 (1.06 – 1.10)			<0.001
Receipt of AUD Pharmacotherapy						
Unadjusted	8.1 (7.7-8.4)	6.6 (6.5-6.7)	1.23 (1.17 – 1.3)			<0.001
Adjusted *	6.4 (6.1-6.6)	6.8 (6.8-6.9)	0.93 (0.89 – 0.97)			0.002
Composite: Receipt of Any Alcohol-Related Care ^g						

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		HCV-		HCV+		RR ^f	95% CI	p-value ^g
		%	95% CI	%	95% CI			
Unadjusted		83.6	(83.1-84.0)	82.9	(82.8-83.1)	1.01	(1.00 – 1.01)	0.005
Adjusted [*]		82.4	(81.9-82.8)	83.0	(82.9-83.1)	0.99	(0.99 – 1.00)	0.008

^{*} Adjusted for sex, age, race/ethnicity, marital status, VA eligibility status, fiscal year in which positive screen occurred, mental health conditions, drug use disorders, and severity of unhealthy alcohol use (AUDIT-C risk group, diagnoses for alcohol use disorders, and alcohol-attributable medical conditions).

^f Relative Rate

^g p-value from test to evaluate if RR is equal to one.

^h Composite Outcome defined as any brief Intervention, specialty addictions treatment or AUD pharmacotherapy 0-365 days following positive screening.

Some confidence intervals are reported to include 1.00, but still were statistically significant (p<0.05) due to rounding.