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Barriers to hepatitis C treatment in the era of direct acting antiviral agents

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Abstract

BACKGROUND—Direct-acting antivirals (DAA) are safe, effective treatment of hepatitis C virus (HCV). Suboptimal linkage to specialists and access to DAAs are the leading barriers to treatment; however, data are limited.

AIM—Determine predictors of follow-up, receipt of DAAs, and reasons for the lack thereof.

METHODS—We used clinical data from retrospective cohort of HCV-infected patients with previously established HCV care in the US Department of Veterans Affairs to examine predictors of follow-up in HCV clinics and DAA treatment (during 12/1/2013–4/30/2015). We then conducted a structured review of medical charts of HCV patients to determine reasons for lack of follow-up and treatment.

RESULTS—We identified 84,221 veterans who were previously seen in HCV clinics during the pre-DAA era. Of these, 47,165 (56.0%) followed-up in HCV specialty clinics, 13,532 (28.7%) of whom received DAAs. Older age, prior treatment, presence of cirrhosis or HCC, HIV/HBV co-infection, and psychiatric illness were predictors of follow-up. Alcohol/drug abuse and medical comorbidity were predictors of lack of treatment. Of the 905 prospectively recruited patients, 56.2% patients had a specialist visit and 28% received DAAs. Common reasons for lack of follow-

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up were relocation (n=148, 37.4%) and missed/cancelled appointments (n=63, 15.9%). Reasons for lack of treatment included waiting for newer therapy (n=99, 38.8%), co-morbidities (n=66, 25.9%), and alcohol/drug abuse (n=63, 24.7%).

CONCLUSIONS—Half of patients with established HCV care were followed-up in the DAA era and only 29% received DAAs. Targeted efforts focusing on patient and system-levels may improve the reach of treatment with the new DAAs.

Keywords

Hepatitis C; direct-acting antivirals; viral hepatitis; hepatitis C therapy

INTRODUCTION

Chronic hepatitis C virus (HCV) infection is a major healthcare problem, which affects approximately 3.4 to 4.4 million Americans. Treatment with antiviral therapy vastly reduces morbidity and mortality and improves health related quality of life in patients with HCV. New direct acting antiviral (DAA) treatments offer an unprecedented opportunity to provide cure for HCV. In clinical trials, DAAs were shown to eliminate and cure HCV in >95% of patients, with low rate of adverse events¹⁻³. DAAs are equally effective in achieving sustained virological response in several large observational studies of patients treated as part of routine clinical care⁴⁻⁵. Furthermore, many patients who were previously excluded from antiviral treatment are now eligible for DAA treatment.

The ultimate population level effectiveness of DAA treatment will depend on the number of patients with HCV who receive this treatment. Previous studies show that although as many as 75% of HCV infected patients had been seen in dedicated HCV clinics, treatment was deferred in most of these patients⁶⁻⁷. Patients with established access to HCV care represent the group that might be 'first in line' to receive DAA care. It is also plausible that without a well-defined recall system and targeted outreach, many of these patients might have been lost to follow-up. For example, in a population-based study of 355 patients, none of the 25 patients excluded from interferon-based treatment due to depression had a repeat evaluation for HCV treatment after their depression had resolved or improved⁸. Evon and colleagues reported that 75% of 324 patients seen from 2001–2005 were deferred from therapy at the time of initial evaluation. Of those, half returned for follow-up and only 13% eventually received treatment⁹.

It is important to examine the extent to which patients with established access received discontinuous HCV care and its impact on receipt of DAA treatment. Identifying underlying sources of variation as well as subgroups at high risk of being lost to follow up can guide the clinicians and healthcare systems in spreading the benefits of the new agents to more patients, leveraging their impact on cirrhosis and related complication reductions. Therefore, we sought to estimate and identify the proportion of patients with established access to HCV clinics who had a follow up visit and received DAA treatment within the first 16 months of DAA availability. We also determined the reasons underlying lack of clinic follow and antiviral treatment.

We use data from the U.S. Veterans Administration (VA) health care system for this study. The VA is the largest integrated health care system in the U.S. and has a disproportionate number of patients with HCV. The VA system is federally funded and equal access system that provides free or subsidized healthcare to the U.S. veterans. It is also a semi-closed system with a relatively stable patient population, making long-term studies possible.^{10,11}

MATERIALS AND METHODS

We used mixed methods for our study. Specifically, using an administrative and clinical database, we determined the proportion of patients, who had HCV clinic follow up and who received treatment in an observational national level cohort of patients previously seen in HCV clinics. We then conducted a structured review of patient medical charts to explain findings from the database analysis.

Database analyses

Data source—We used the VA national Corporate Data Warehouse (CDW) for this study. CDW data exist on the VA Informatics and Computing Infrastructure (VINCI) platform in a relational database. It includes all laboratory test results as well as inpatient and outpatient utilization as indicated by procedure (CPT/ICD-9 procedure codes) and diagnosis (ICD-9 codes) codes for each encounter and admission. The database also includes separate files for patient demographics and pharmacy utilization.

Study cohort—We identified a retrospective cohort of patients with positive HCV RNA test recorded from 1999 to 2013, and included those 18 years of age or older who had at least one visit in the VA HCV specialty clinics between May 1, 2009 and December 1, 2013 (date of approval of the first 2nd generation DAA, sofosbuvir). We selected this timeframe for cohort accrual to match the timeframe for an existing study used for our medical chart review component, below.

Study outcomes—Our primary outcomes were follow-up in specialty clinic and receipt of DAA treatment from December 1, 2013 to April 30, 2015. In the VA, antiviral treatment is rendered by gastroenterologists (clinic stop code 307), infectious disease (310), and (in some VA facilities) by primary care providers (323). To ascertain which of these three clinics served as a specialty clinic for each VA facility, we used pharmacy data and determined the clinic responsible for writing the majority of the DAA prescriptions for HCV patients in a given facility, as described previously. We classified a patient as having seen the specialists if he or she had a clinic visit to the specialty clinic, which was accompanied with diagnostic codes for HCV, cirrhosis, or chronic liver disease not specified. In our previous work, we found a high agreement between this definition and chart documented specialty evaluation as the gold standard (agreement index ~75%)¹². We defined DAA treatment > 1 filled prescription of sofosbuvir, ledipasvir, simeprevir, or ombitasvir-paritaprevir-ritonavir with or without ribavirin.

Predictors—We examined several factors derived from CDW. These included race/ethnicity (African American, white, Hispanic, other), gender, age, copay requirement, homelessness status, HCV genotype, cirrhosis status, hepatocellular carcinoma (HCC), HIV

co-infection, diabetes, depression, alcohol or drug abuse, other medical comorbidity (Deyo index), and propensity to use healthcare including the number of overall and primary care clinic visits during the DAA era defined as December 2013 to April 2015. We also identified if patient's primary care clinic was based at the main VA hospital or at a community based outreach clinic (CBOC). We defined cirrhosis, HCC, HIV, diabetes, depression, and alcohol use by the presence of outpatient or inpatient ICD-9 diagnosis codes recorded during any time up until the end of the study period for the cohort. We defined cirrhosis, HCC, HIV, diabetes, anxiety, depression, and alcohol use disorder by the presence of outpatient or inpatient ICD-9 diagnosis codes recorded during any time up until the end of the study period for the cohort. The Deyo index is a weighted measure of illness based on the presence of specific ICD-9 codes¹³. Table 1 provides the full list of patient factors and method of categorization.

Statistical analysis

We created two multivariable logistic generalized estimating equation (GEE) models to estimate the probability of being seen in the HCV specialty clinics during the study follow up and, among those who were seen, the probability of receiving DAAs. The unit of analysis was individual patients previously seen in HCV clinics and eligible for DAA treatment. We used an exchangeable working correlation to model patient clustering (Intraclass Correlation Coefficient, ICC) within VA health care facility where patients were seen. Independent variables were as described above. We calculated the odds ratio (OR) and corresponding 95% confidence intervals (CI) of receiving specialty visit and treatment for various levels of patient demographic and clinical factors.

Medical record review

We conducted a structured review of electronic medical records of consecutive patients with active viremia seen in the HCV clinics at the Michael E. DeBakey VA Medical Center (MEDVAMC) between May 1, 2009 and November 1, 2013. These patients were prospectively recruited as part of a separate study that examined the clinical and genetic determinants of liver disease severity in patients with HCV. The study population and procedures were previously described in detail elsewhere¹⁴. The purpose of our medical record review was to identify explanations for lack of follow up that could not be obtained from administrative data. We extracted data regarding potential failures in the care pathway to obtaining antiviral treatment such as compliance with liver clinic appointments, no-shows, and cancellations. We also abstracted reasons for potential failures including, but not restricted to, ongoing drug and alcohol problems not captured in electronic data, receipt of care outside the VA, being too sick to receive indicated care, patients' noninterest in pursuing treatments, or primary care providers (PCP) failure to address liver disease and need for ongoing care.

RESULTS

Database analyses

Patient characteristics—We identified 107,022 veterans who were previously seen in HCV clinics during the pre-DAA era (between 5/1/2009 and 12/1/2013) prior to the start of

the study. Of these 15,781 patients died prior to 12/01/2013 and an additional 7020 patients died prior to end of study follow up (4/30/15). The remaining 84,221 patients constituted the cohort for this analysis. The majority of patients were >50 years of age (94.4%), male (96.6%), and white (48.1%). Approximately 37.3% were African American and 4.2% Hispanic. A total of 32.5% of patients had evidence of cirrhosis and 3.8% had HCC. The cohort also had a high burden of physical and mental health comorbidity; 41.7% had diabetes, 59.9% had depression, 33.5% had PTSD, and 61.8% had a diagnosis of alcohol use disorder.

Of the 84,221 patients, 47,165 (56.0%) patients had a follow up visit in HCV clinics during the DAA era (from December 2013 to April 2015). There were significant demographic and clinical differences between patients with and without follow up in specialty clinics (Table 1). Patients without follow up during DAA era were younger, more likely to be white, treatment naïve, non-cirrhotic, with non-genotype 1 HCV infection, and fewer medical and psychiatric comorbidities than patients with ongoing follow up. They were more likely to have history of alcohol use disorder or drug abuse and had fewer visits with their PCP than those seen in the HCV clinic.

Of the 47,165 patients with follow up in HCV clinic during the DAA era, 13,532 (28.7%) received HCV treatment after being seen in the clinic. Patients who did not receive DAA therapy were more likely to be younger, African American, and homeless compared with patients who received DAAs. They were more likely to have non-1 HCV genotype infection, HCC, co-infection with HIV, more medical and psychiatric comorbidity and fewer visits with their PCP than those treated with DAAs (Table 1).

Factors associated with specialty follow up and DAA treatment—Younger patients (< 50 years of age) were less likely to follow up in HCV specialty clinic than older patients (adjusted OR 0.87, 95% CI 0.82–0.93). Patients with non-genotype 1 HCV infection (HCV genotype 2 vs 1 adjusted OR 0.91, 95% CI 0.86–0.96; genotype 3 vs 1 adjusted OR 0.92, 95% CI 0.86–0.97) had lower odds of having a repeat visit than the comparison group. Similarly, patients with history of alcohol use disorder (adjusted OR 0.92, 95% CI 0.88–0.95) and drug use (adjusted OR 0.82, 95% CI 0.80–0.85) were less likely to be seen in follow up visits. Patients with prior treatment history (adjusted OR 1.51, 95% CI 1.44–1.58), cirrhosis (adjusted OR 2.19, 95% CI 2.06–2.33), HCC (adjusted OR 2.64, 95% CI 2.27–3.08), co-infection with HIV (adjusted OR 1.65, 95% CI 1.38–1.98) or hepatitis B (adjusted OR 1.26, 95% CI 1.10–1.45), and even few psychiatric illness (depression: adjusted OR 1.03, 95% CI 1.00–1.07; post-traumatic stress disorder: adjusted OR 1.04, 95% CI 1.00–1.07) had higher odds of following up in the HCV specialty clinic. There was a linear association between the number of visits with the PCP and odds of having a follow up in HCV clinic (see Supporting Table online).

The factors associated with receipt of DAAs were similar to those described above, with few exceptions. Although there were no differences in the likelihood of follow up among African American, Hispanic, and white patients, African American and Hispanic patients were less likely to receive DAA (adjusted OR 0.77, 95% CI, 0.72–0.82 and adjusted OR 0.88, 95% CI 0.0.79–0.97, respectively). Compared to patients with HCV genotype 1, those with genotype

2 were more likely to receive treatment (adjusted OR 1.44, 95% CI 1.31–1.58) and there was no difference in the odds of receiving treatment for HCV genotype 3. Presence of HCC (adjusted OR 0.73, 95% CI 0.65–0.83), alcohol use disorder (adjusted OR 0.73, 95% CI 0.70–0.77), drug abuse (adjusted OR 0.84, 95% CI 0.80–0.88), and medical comorbidity (Deyo 3 adjusted OR 0.71, 95% CI 0.66–0.77) were the strongest predictors of lack of DAA receipt (see Supporting Table online).

Medical record review—We conducted a review of medical records of 905 patients who were seen in the HCV specialty clinics in MEDVAMC in Houston, TX in the pre-DAA era (Figure 1). Of these patients, 509 (56.2%) patients had a follow up visit in the HCV specialty clinic during the study time frame. Among the 396 patients without HCV clinic follow up, 148 (37.4%) patients relocated to another geographic locale and were no longer receiving care at the MEDVAMC. Of these only 30 patients (20.3% of 148, 7.6% of total without follow up at MEDVAMC) were seen in the HCV clinics at their new VA facility and 10 (6.8% of 148, 2.5% of total without follow up at MEDVAMC) received DAA (Figure 2).

Of 248 patients who had ongoing care at MEDVAMC yet did not have HCV clinic follow up, 63 (25.4%) had scheduled appointments in HCV clinics that they missed or cancelled (Figure 2). Among these patients (who missed or cancelled the follow up appointments), only 17 (27.0%) had a documented reason in the chart for not following up in the HCV clinic (n=6, 9.5% physical or mental health comorbidity; n=4, 6.3% patient preference).

A total of 185 (46.7%) patients with ongoing enrollment at the MEDVAMC did not have any follow up visits scheduled. Of these, approximately 41.1% (n=76) had documented barriers to HCV care and treatment, including ongoing alcohol abuse (n=27, 14.6%), illicit drug use (n=20, 10.8%), and medical or psychiatric comorbidity (n=8, 4.3% and n=9, 4.9%, respectively). Approximately 10.8% (n=20) of patients preferred not to seek HCV care. Although these patients were enrolled in primary care, the need for HCV clinic follow up was not addressed by PCP for 56.2% (n=104) of the patients.

Of the 509 patients with specialty clinic follow-up, 255 (50.1%) were not treated as of April 30, 2015. The most common reasons for lack of treatment receipt included decision to wait for newer DAA therapy (n = 99, 38.8%), followed by medical co-morbidities (n = 66, 25.9%), and ongoing alcohol or illicit drug use (n = 63, 24.7%) (Table 2). In terms of medical co-morbidities, the treating clinicians documented a range of advanced medical conditions that they considered as potentially life-limiting. Some examples include chronic kidney disease, various malignancies, and severe COPD. Few patients (n=16, 6.3%) preferred not to pursue treatment. Psychiatric co-morbidity was a rare reason for lack of treatment. We stratified the sample by race to determine the reasons underlying the racial disparity in treatment observed in this as well as previous analysis¹⁵, Table 3 displays the reasons among African American and whites who did not receive DAA treatment during the study timeframe. Whites had a higher proportion of documented alcohol abuse (22.6% vs. 12.7%) than African American patients (p=0.04). Illicit drug use, personal preference and incomplete work up and/or noncompliance were documented as barrier in higher proportions of African American patients (10.3%, 11.5%, and 10.9%, respectively) than in whites (6.0%,

9.5%, and 7.1%, respectively); however, these differences did not reach statistical significance.

DISCUSSION

Our study has 3 key findings

We found that in a system with equal and easy access to the new DAAs, fewer than 50% of HCV infected veterans with previously established care in HCV clinics were re-seen within 16 months of the approval of DAA, and only 27% of these patients received DAA treatment. We also found several patient level barriers to antiviral treatment. Specifically, patients with less severe liver disease, those with ongoing alcohol and drug use, as well as multimorbidity had lower odds of being re-seen and treated than their counterparts. Similarly, the odds of having a repeat visit and treatment were lower for patients with non-genotype 1 infection, HCC, and homeless. The odds of follow up and DAA treatment were 1.51 and 1.99– fold higher for treatment experienced than treatment naïve patients.

Some of our findings are explained by patient motivation (as indicated by higher odds of follow up and treatment for treatment experienced patients) and the earlier treatment recommendations that prioritized treatment of patients with advanced fibrosis. However, the effects of several other characteristics, such as alcohol and drug use, are more difficult to justify based on evidence alone. We found that patients with alcohol use had 27% lower odds of receiving DAA; the odds of treatment were 16% lower in patients with history of drug use. The in-depth medical record review confirmed these findings; ongoing alcohol and drug use was one of the most common reasons for treatment exclusion. Patients with ongoing alcohol and drug use have traditionally been excluded from antiviral treatment in clinical trials as well as clinical practice. Much of these exclusionary criteria were based on concerns that patients will be unable to comply with long and toxic treatments as well as the risk of re-infection with ongoing drug use. However, data show that patients with a prior history of drug abuse have similar sustained response to treatment as patients without history of drug use¹⁶. In a systemic review and meta-analysis, patients with active drug use undergoing interferon-based therapy had a pooled SVR of 55.5%, which was similar to the general population¹⁷. Patients with drug use and those with alcohol abuse represent two important subpopulations: patients with comorbid alcohol abuse are at a high risk of cirrhosis and related complications¹⁸ – the relative benefit of SVR may indeed be substantially higher in patients with ongoing alcohol use – although the data to support this notion are lacking. The benefits of treating patients with ongoing drug abuse may extend beyond direct impact on patients' health to also limit the risk of transmission to others. More importantly, these factors are potentially modifiable and can be targeted both at the PCP and specialty clinic levels to improve access to and receipt of DAA treatment.

Our study found substantial gaps in the pathway to antiviral treatment. A substantial proportion of patients (37.4% of patients without follow up, 16.4% of total) had relocated during the study follow up; only 20.3% of these patients established liver care after moving to the other facility and even fewer received treatment. Although reasons for lack of re-linkage with care may be (at least in part) patient-related, we believe that these patients represent yet another important group that would need directed efforts to ensure delivery of

HCV therapy. Among patients with ongoing care and previous evaluation in the HCV clinics, 46.7% did not have a follow up appointment at least in the first 16 months of DAA availability. Most of these patients did not have a documented reason in the chart to explain lack of clinic follow up; the need for HCV therapy was addressed by the PCP in only 30.8% of these patients. These data highlight the need for robust recall systems in specialty clinics to ensure effective follow up. The PCPs may also serve as the safety net in this scenario. Other studies have shown suboptimal care of HCV patients at the level of the PCP⁶⁻⁷, with only a subset of patients being referred for appropriate care. Our results underscore the importance of targeted outreach at both PCP and specialists levels, with clear specification of roles, as well as explication of care pathways between PCP and specialty clinics. Most of these system level shortfalls and explanations would not have been captured with the automated data alone – and as such represents a significant strength of our study.

Nearly 40% of HCV patients who had continuous care deferred treatment to wait for newer therapy. Our study examines the period of time immediately following the approval of sofosbuvir, which explains the large proportion of patients who deferred treatment for next generation therapies. However, medical co-morbidities and ongoing alcohol or illicit drug use were other common reasons for not receiving HCV treatment.

Our study also provides an insight into the healthcare disparity. We found that although African Americans were as likely to be re-seen in specialty clinics, they had significantly lower odds of receiving DAAs than whites. Results from the medical record review also confirmed these findings: African Americans were less likely to receive HCV treatment (45.4% vs 56.5%) compared with white patients despite similar HCV clinic follow-up rates. These findings are also similar to the results of our previous study but extend them by exploring the reasons underlying this disparity. African American patients were more likely to have several barriers documented in their medical records; these included ongoing drug use, incomplete work up or general patient preference to defer treatment. However, none of these factors emerged as key drivers of the racial disparity. These data suggest that unmeasured factors – both at the patient and perhaps as the clinician level – might have contributed to the observed differences. These factors may include lack of understanding about the disease or misconceptions about treatment (i.e., side effects, cure rates), or other heuristics that influenced treatment decisions. Future studies using more qualitative in-depth evaluation are needed to identify these factors.

Our study has several limitations. The study cohort included HCV patients who use the VA thus limiting the generalizability of our data. Our medical record review was limited to a single VA center and thus the findings may not be generalizable to patients seen in other VA hospitals or those seen outside the VA. However, given the wide and early dissemination of DAA treatment in the VA, lesson that are learned from the observed practice patterns are likely to influence non-VA practice. We relied on providers' documentation to determine reasons underlying lack of recommended care in HCV clinics and treatment. Other methods of ascertainment (such as patient surveys) were not feasible. Our study examined the patterns of care in the first 16 months following DAA availability in the VA in an observation period that ended on April 30, 2015. With the introduction of even newer DAAs than those examined in this study and longer exposure and experience, treatment rates may

have changed considerably. However, our data are important for other healthcare systems that are in the earlier stages of treatment dissemination. A total of 78 patients died during the study period; these patients were excluded from analysis. While the VA electronic medical record keeps an accurate record of those who are deceased, it does not indicate cause of death. Therefore, we were unable to determine the cause of death. However, this finding is perhaps not unexpected with the aging of the U.S. birth cohort.

Availability of these highly effective treatments, although necessary, is not sufficient to close the known chasm between efficacy and effectiveness of antiviral in reducing HCV disease burden. Despite the system wide efforts to treat all patients, our data show many gaps, both at the patient and system-levels that were associated with lack of follow up in HCV clinic and lack of treatment. Targeted efforts focusing on patients with modifiable mental and physical health comorbidities may be the ways to make inroads into the problem of sub-optimal treatment with the new highly effective DAAs.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.

*reasons not mutually exclusive

Figure 2.

Table 1
Characteristics of HCV patients with and without HCV specialists visit during the DAA era.

Characteristics, %	Re-seen during study duration N=47165	Not re-seen during study duration N=37056	Treated during study duration N=13532	Not treated during study duration N=33633
Characteristics, %				
Age				
50	4.6	6.7	4.0	4.9
>50	95.4	93.3	96.0	95.1
Gender				
Male	96.6	96.5	96.6	96.7
Female	3.4	3.5	3.4	3.3
Race				
White	49.0	47.1	54.2	46.8
African American	36.1	38.8	31.1	38.1
Hispanic	4.5	3.8	4.7	4.4
Other	2.0	1.7	2.2	1.9
Missing	8.6	8.6	7.9	8.8
Homeless				
No	66.3	60.1	73.4	63.5
Yes	33.7	39.9	26.6	36.5
HCV genotype				
1a/1b	75.3	70.3	77.6	74.4
2	7.6	8.0	9.8	6.7
3	5.5	5.2	5.7	5.4
Other	0.9	0.8	0.8	1.0
No result	10.7	15.8	6.1	12.6
Prior HCV treatment				
No	76.3	86.1	63.9	81.3
Yes	23.7	14.0	36.1	18.7
Cirrhosis				

	Re-seen during study duration N=47165	Not re-seen during study duration N=37056	Treated during study duration N=13532	Not treated during study duration N=33633
No	59.0	78.3	48.1	63.4
Yes	41.0	21.8	51.9	36.6
Hepatocellular carcinoma				
No	94.4	98.6	94.4	94.4
Yes	5.6	1.4	5.6	5.6
Hepatitis B virus co-infection				
No	86.5	84.6	88.3	85.3
Yes	2.0	1.7	2.0	2.0
Missing	11.6	13.7	9.7	12.3
HIV co-infection				
No	95.7	96.9	96.0	95.5
Yes	4.3	3.1	4.0	4.5
Diabetes				
No	56.3	60.9	54.8	56.9
Yes	43.7	39.1	45.2	43.1
Depression				
No	39.7	40.8	41.3	39.0
Yes	60.3	59.2	58.8	61.0
Anxiety				
No	69.7	69.9	69.9	69.7
Yes	30.3	30.1	30.1	30.3
Post-traumatic stress disorder				
No	66.0	67.1	67.3	65.5
Yes	34.0	32.9	32.7	34.5
Alcohol abuse				
No	40.2	35.6	48.5	36.9
Yes	59.8	64.4	51.5	63.1
Drug abuse				

	Re-seen during study duration N=47165	Not re-seen during study duration N=37056	Treated during study duration N=13532	Not treated during study duration N=33633
No	46.5	40.6	53.4	43.7
Yes	53.5	59.4	46.6	56.3
Deyo score				
0	28.4	34.2	29.3	28.0
1-2	36.6	36.3	38.0	36.0
3	35.0	29.6	32.7	36.0
# of primary care physician visits (from 05/2009 to 11/2013)				
1-6	17.9	24.1	17.0	18.3
7-11	24.4	25.1	24.3	24.4
12-19	30.8	28.0	31.5	30.5
>19	26.9	22.9	27.2	26.9
# of primary care physician visits (from 12/2013 to 04/2015)				
<3	25.4	48.3	21.7	27.0
3-4	28.3	22.6	29.0	28.0
5-7	24.7	16.2	27.0	23.8
>=8	21.5	12.9	22.4	21.2

*** all p values are <0.05 except for all gender and anxiety comparisons and presence of HCC in those who were treated vs not treated

Table 2

Results from Implicit review: reasons for lack of HCV treatment

Reasons	n=255
Contraindication	
Medical co-morbidity	66 (25.9%)
Psychiatric co-morbidity	5 (2.0%)
Alcohol use	41 (16.1%)
Illicit drug use	22 (8.6%)
Personal issue/preference	27 (10.6%)
No-show or cancelled appointment	14 (5.5%)
Non-compliance/incomplete work-up	23 (9.0%)
Other	
Wait for new treatment	99 (38.8%)
Low fibrosis	8 (3.1%)

Table 3

Results from Implicit review: reasons for lack of HCV treatment by race

Lack of HCV treatment			
Reasons	African American (n=165)	White (n=84)	P-value
Medical co-morbidity	42 (25.5%)	23 (27.4%)	0.74
Psychiatric co-morbidity	3 (1.8%)	1 (1.2%)	1.00
Alcohol use	21 (12.7%)	19 (22.6%)	0.04
Illicit drug use	17 (10.3%)	5 (6.0%)	0.25
Personal issue/preference	19 (11.5%)	8 (9.5%)	0.63
Incomplete work-up/non-compliance	18 (10.9%)	6 (7.1%)	0.34
No-show or cancelled appointment	9 (5.5%)	5 (6.0%)	1.00
Wait for new treatment	62 (37.6%)	33 (39.3%)	0.79
Low fibrosis	5 (3.0%)	3 (3.6%)	1.00