

Improvements in HCV-related Knowledge Among Substance Users on Opioid Agonist Therapy After an Educational Intervention

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Objectives: Lack of knowledge about hepatitis C virus (HCV) is a principal barrier to substance users' engagement into care for the infection. As a step toward their increased engagement into HCV care, the objective of this study was to deliver an HCV-related educational intervention to substance users on opioid agonist therapy and to assess the change in HCV-related knowledge after the intervention.

Methods: We designed a comprehensive and interactive hepatitis C-related educational intervention, composed of two 30 to 60-minute sessions conducted during 2 consecutive weeks. Patients' knowledge about hepatitis C was assessed immediately before and after the intervention using a 7-item questionnaire.

Results: A total of 110 patients completed both educational sessions. Patients' mean age was 54.7 ± 7.8 years, 58.7% were men, 70.4% African American, and 30% were Hispanic. We observed a significant increase in HCV-related knowledge after completion of the educational intervention. Whereas 65.45% of patients answered 5 or more questions correctly before the intervention, 83.64% had 5 or more questions answered correctly on the posteducational quiz ($P < 0.001$). Male sex, ever receiving an HCV diagnostic test before

the educational intervention, and a higher level of HCV knowledge on the preeducational quiz were found to be significantly associated with HCV-related knowledge after the educational intervention.

Conclusions: Patients' knowledge about hepatitis C was found to be significantly improved after the educational intervention. Therefore, HCV-related education could be the first step toward effective enrollment of patients on opioid agonist therapy into hepatitis C care.

Key Words: educational intervention, HCV treatment, HCV-related knowledge, hepatitis C, substance users

(*J Addict Med* 2016;10: 104–109)

Hepatitis C virus (HCV) infection is one of the principal comorbidities among substance users. As direct blood-to-blood contact is the most effective route of HCV transmission, chronic infection is very prevalent among people who inject drugs, ranging between 30% and over 80%, with the prevalence highly influenced by the duration of injection use (Amon et al., 2008; Nelson et al., 2011). Unfortunately, many substance users are unaware of their HCV status, and those in whom HCV has been diagnosed have rarely been treated (Mehta et al., 2008; Alavi et al., 2014; Iversen et al., 2014). As a result, many older substance users are affected by the consequences of HCV-induced liver disease, including severe fibrosis, cirrhosis, and hepatocellular carcinoma (Martinez et al., 2012). Thus, HCV is a major health problem and a frequent cause of mortality among substance users as liver transplantation is generally not an option in this patient population (Kielland et al., 2013).

Multiple barriers limit substance users' enrollment into HCV care and treatment, and many of them are directly linked with patients' misconceptions and lack of knowledge related to HCV infection (Zeremski et al., 2013). For example, due to the largely asymptomatic nature of the infection, patients generally underappreciate the seriousness of chronic HCV infection. In addition, when interferon (IFN)-based therapies were the cornerstone of the therapeutic regimen used to treat HCV, many substance users perceived HCV treatment to be worse than the infection because of the severe adverse effects associated with IFN (Mehta et al., 2008; Swan et al., 2010; Treloar et al., 2011). Although the recent approval of novel, highly effective, HCV treatment regimens that combine directly acting antiviral medications have eliminated IFN

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Received for publication August 5, 2015; accepted January 3, 2016.

Source of funding: Supported by the CDC Foundation through the Viral Hepatitis Action Coalition with individual sponsorships from Gilead Sciences, Vertex Pharmaceuticals, Abbvie and Abbott Molecular Inc. We also acknowledge the support of the Troup Fund of the Kaleida Health Foundation.

Conflicts of interest: Lawrence S. Brown, Clewert Sylvester, and Roberto Zavala have received funding from Gilead Sciences. Andrew H. Talal has served on advisory boards for Abbott Molecular, Abbvie, and Gilead Sciences and has received research support from Vertex, Abbvie, Abbott, and Gilead Sciences. The remaining authors declare no conflicts of interest.

Supplemental digital content is available for this article. Direct URL citation appears in the printed text and is provided in the HTML and PDF versions of this article on the journal's Web site (www.journaladdictionmedicine.com). Send correspondence and reprint requests to Marija Zeremski, PhD, Weill Cornell Medical College, 1300 York Ave, Box 319, New York, NY 10065. E-mail: maz2003@med.cornell.edu.

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ISSN: 1932-0620/15/0901-0031
DOI: 10.1097/ADM.0000000000000196

from the HCV treatment regimen (AASLD/IDSA HCV Guidance Panel, 2015; EASL Recommendations on Treatment of Hepatitis C, 2015; Grebely et al., 2015), many patients remain unaware of these new treatment options and may remain unwilling to pursue HCV treatment due to fear of side effects of medications that are no longer prescribed (Norton et al., 2014; Marshall et al., 2015). Therefore, education designed to increase patients' HCV-related knowledge, their understanding of the consequences of the infection, and comprehension of available treatment options could lead to substance users increased enrollment into HCV care and treatment. Indeed, a recent systemic review demonstrated that educational interventions for patients with HCV and hepatitis B virus (HBV) infections not only significantly increase patients' hepatitis-related knowledge level, but such interventions can also motivate behavioral changes leading to increased rates of testing and treatment (Shah and Abu-Amara, 2013).

To engage substance users into HCV therapy, we initiated the "Prevention, Evaluation, and Treatment of Hepatitis C in Opiate Agonist Treatment (PET-C)" project at the end of 2012, with the goal of developing an effective care model for HCV management and treatment among substance users on opioid agonist therapy (OAT). Our initial survey of 320 methadone-maintained patients revealed that a large percentage were willing to participate in HCV-related education and to receive HCV treatment (Zeremski et al., 2014). We also found significantly higher treatment willingness among patients who had previously attended an HCV educational activity and in those with higher levels of HCV-related knowledge.

As a next step in the PET-C project, we designed a comprehensive educational intervention to address knowledge gaps and misconceptions regarding HCV among patients on OAT. The intervention was delivered in a casual environment onsite in the OAT clinic. It covered information about HCV transmission, screening, diagnostics, natural history of the infection, factors associated with disease progression, and HCV treatment and prevention. We evaluated HCV-related knowledge among substance users enrolled in the OAT clinic before and after the intervention, and assessed for factors that affect their HCV-related knowledge. We also assessed patients' willingness to receive HCV treatment.

METHODS

The present study summarizes the results of an educational intervention that was conducted as part of a larger PET-C project initiated in 2012, with the goal of developing telemedicine-based HCV evaluation and treatment for substance users on OAT. The project is conducted in an OAT clinic located in the Harlem neighborhood of New York City (as described in detail by Zeremski et al., 2014). The first stage of the PET-C project was composed of a screening survey that assessed patients' HCV-related knowledge and opinions, and willingness to attend an HCV-related educational intervention, and also to pursue HCV therapy. During the initial assessment, conducted between November 2012 and February 2013, we surveyed a total of 320 patients and the results were described in the study by Zeremski et al. (2014). We continued to survey patients as new HCV-seropositive individuals were admitted to the facility or additional patients expressed willingness to

engage in HCV-related education or treatment. The present study describes patients who were surveyed through the end of August 2014. Patients who completed the screening HCV-related survey were subsequently eligible to participate in HCV-related educational intervention.

Educational activities described in this study were conducted between June 2013 and August 2014. All methadone-maintained patients attending the OAT clinic who were willing to participate in the educational intervention and who previously completed a screening HCV-related survey were included in the study. Patients learned of the study from counselors and peers at the OAT clinic, largely through word-of-mouth. Study participation was voluntary, and all participants provided written informed consent before initiation of the study activities. The study was approved by the Institutional Review Boards of Weill Cornell Medical College, University at Buffalo, and the study site, and it was performed in accordance with the Declaration of Helsinki.

All educational sessions were delivered by a member of the research team (MZ). The intervention was composed of 2 sessions separated by 1 week, each lasting 30 to 60 minutes in duration. Patients who were unable to complete the intervention in the week after the first session were allowed to attend the second educational session on any subsequent week as close to the initial session as possible (average time between the 2 sessions was 12 ± 14 days). Educational sessions were limited to 10 participants, but attendance never exceeded 8 participants per group. Before the first session, participants' HCV knowledge was assessed using a 7-item questionnaire (preeducational quiz). These questions were identical to the HCV knowledge questions contained in the screening survey (Zeremski et al., 2014). Participants' blood was obtained before the first session and used for diagnostic assessments including HCV RNA quantitation and HCV genotyping. After the second educational session, participants were informed about their HCV RNA status, and were asked to complete a posteducational questionnaire composed of 15 questions (provided as Supplemental Digital Content 1, <http://links.lww.com/JAM/A37>). The first 7 questions assessed HCV knowledge and were identical to the preeducational quiz. The remaining 8 questions inquired about participants' employment and disability status, their use of illicit drugs in the past 6 months, and their willingness to be treated for HCV if they were infected. Patients received \$50 compensation at the end of the educational activity for their participation. Patients with positive HCV RNA results were offered enrollment into onsite telemedicine-based HCV evaluation and treatment.

Educational Intervention

Educational sessions were designed as PowerPoint presentations. Modified version (without animations and selected images) of the power point presentations used on the intervention is provided as a Supplemental Digital Content 2 (<http://links.lww.com/JAM/A38>). The first session provided information about the virus as a cause of the disease, routes of HCV transmission, and specifics of acute infection, including potential symptoms, HCV antibody development, and spontaneous resolution. We then discussed chronic infection and its potential symptoms, function of the healthy liver, and finally,

consequences of chronic HCV disease, including fibrosis, cirrhosis, and hepatocellular carcinoma. The second session provided information about HCV diagnostic testing (including HCV antibody and HCV RNA tests), treatment, and HCV prevention. The sessions were interactive and conducted in a way to stimulate participants to ask questions and to share their thoughts and experiences with the group. Several sources were used to develop the presentation including materials produced by the Centers for Disease Control and Prevention and the Substance Abuse Mental Health Services Administration.

Data Collection

Information about patients' demographics, educational level, and employment/disability status, former and current drug use, HCV infection status, and willingness to be educated about HCV or treated for the disease was obtained from the screening survey (Zeremski et al., 2014).

Statistical Analysis

Statistical analysis was performed using SAS (SAS Institute Inc, Cary, NC) and R (<http://www.r-project.org/>). Associations between categorical variables were assessed through the Fisher exact test and logistic regression. McNemar test was used for paired dichotomous data. For continuous variables, comparisons between groups were performed using the Wilcoxon rank-sum or Kruskal-Wallis tests. The HCV-related knowledge level was evaluated as the number of correctly answered questions. Ordinal logistic regression was used to assess the effect of patients' characteristics on posteducational level of knowledge, adjusted for the preeducational level of knowledge. The proportional odds assumption was verified through the score chi-square test, and when it was not satisfied, the generalized logit model was used. The significance level in all tests (2-sided) was set to 0.05.

RESULTS

Study Participants

A total of 111 participants were enrolled in the HCV-related educational intervention, and 110 of them completed

both educational sessions. One patient was lost to follow-up due to another medical condition. Patients' mean age at the time of the educational intervention was 54.7 ± 7.8 years, 59% (64/109) were men, 70% (76/108) were African American (AA), and 30% (31/103) were Hispanic (Table 1). The majority of patients had at least some secondary education, 50% had a high school diploma or the equivalent, and 13% had at least an associate's degree. Sixty-five patients (59%) had a history of injection drug use. The vast majority of patients (94%) were unemployed, and 57% were on disability. The mean duration of methadone maintenance was 6.85 ± 5.36 years. Before participation in the educational activity, all participants completed the survey that assessed their willingness to be educated about and to be treated for HCV, and also an assessment of HCV-related knowledge (Zeremski et al., 2014). Eighty participants completed the survey 6 to 20 months before the educational intervention (mean 447 ± 122 days). The remaining 30 patients completed the survey either on the day of the first educational session or the day immediately preceding it.

Based upon participants' comments, the majority of attendees had a very positive disposition towards the educational intervention. Many participants, especially those who were HCV-infected, expressed their gratitude for the opportunity to learn more about hepatitis C and current treatment options. In addition, some participants expressed interest to participate in other educational activities related to other diseases, should they ever be conducted in the OAT clinic.

HCV Knowledge

Patients' HCV-related knowledge was significantly higher after participation in the educational intervention compared with their preeducation knowledge level: 66% versus 84% of the patients correctly answered 5 or more questions before and after the intervention, respectively ($P < 0.001$). The mean number of correctly answered knowledge questions also increased significantly preceding and subsequent to participation in the intervention (4.95 ± 1.14 vs 5.40 ± 1.08 ; $P < 0.001$). The proportions of patients who correctly answered each HCV-related question on the survey,

TABLE 1. Patient Characteristics

Variables	N Respondents	n (%) or Mean (SD)
Age, y	110	54.7 (7.8)
Male sex	109	64 (59)
Race	108	
White		5 (5)
African American		76 (70)
Mixed		2 (2)
Other		25 (23)
Hispanic ethnicity	103	31 (30)
Education	109	
No general educational development (GED)/high school diploma		41 (38)
GED/high school		54 (50)
Associates degree		11 (10)
College degree		1 (1)
Masters or doctorate degree		2 (2)
History of injection drug use	110	65 (59)
History of non-injection drug use	110	105 (95)
Years attending OAT program	105	6.85 (5.36)

TABLE 2. Proportion of Participants Correctly Answering Knowledge Questions

Questions	Correctly Answered (%)		
	Survey	Preeducation	Posteducation
1. The easiest way to get hepatitis C is through sharing equipment to inject drugs True False	95	95	98
2. The majority of people with chronic hepatitis C do not have any symptoms True False	52	66	69
3. What can hepatitis C do? a. Infect cells of the liver b. Cause inflammation of the liver c. Cause cirrhosis of the liver d. Cause liver cancer e. All of the above f. a and b only	70	79	69
4. Everybody with a positive hepatitis C antibody test has chronic hepatitis C disease (infection) True False	52	53	59
5. There is medication to treat hepatitis C True False	88	88	93
6. There is a vaccine for hepatitis C True False	34	31	53
7. People who clear hepatitis C virus, either spontaneously or after medical treatment, can be infected again True False	77	79	91

Correct answers are in bold.

preeducational quiz, and post-educational questionnaire are shown in Table 2.

We then assessed the effect of patients' characteristics on the posteducational level of knowledge, after adjusting for the preeducational knowledge level. Male sex and ever receiving an HCV diagnostic test before the educational intervention were found to be significantly associated with higher HCV-related knowledge after the intervention (Table 3). There was a significant interaction between the preintervention knowledge level and a history of being tested for HCV. In 80 patients who completed the survey 6 to 20 months before participation in the first educational session, the level of HCV knowledge did not change significantly in the time interval between the completion of the survey and attendance at the educational intervention.

HCV Status and Willingness to Be Treated

Of 111 participants enrolled in the educational intervention, 60% (n=66) were HCV-seropositive and 43% (n=48) had detectable HCV RNA (ie, these participants had replicative HCV infection). Blood for HCV RNA quantification could not be obtained from 2 patients, one of whom was previously known to be HCV-seropositive and the other previously known to be seronegative. Of 18 patients who were HCV-seropositive, but had undetectable HCV RNA, 17 had spontaneous resolution of the disease, whereas 1 patient's infection resolved after antiviral therapy. Among patients with hepatitis C, 81% (38/47) were infected with HCV genotype 1, 11% (5/47) were infected with genotype 2, 9% (4/47) with genotype 3, whereas the HCV genotyping assay was indeterminate in 1 patient.

Based on the self-reported survey data, the majority of infected patients (n=37; 77%) had previously been diagnosed with HCV, 4 patients (8%) were unaware of their HCV status, whereas 7 (15%) thought they did not have the disease. After the educational intervention, 41 (85%) of HCV-infected

patients were willing to receive HCV treatment, 2 (4%) did not want to be treated, whereas 5 (10%) were unsure whether or not they wished to pursue antiviral therapy. In these 48 patients, willingness to be treated for HCV did not change significantly during the interval between completion of the survey and the posteducational questionnaire. Before the intervention, 41 (85%) patients expressed willingness to be treated, 5 (10%) were not willing to be treated, whereas 2 (4%) were not sure. Out of all 111 patients, 87 (78%) expressed willingness to be treated in their survey responses, 16 (14%) were unwilling, whereas 8 (7%) were either unsure or did not respond to the question.

DISCUSSION

Despite a very high prevalence of hepatitis C among former and current substance users, evaluation and treatment of the disease has been problematic in this patient population. The recent development of direct acting antiviral therapy for HCV with agents having increased efficacy, shorter duration of treatment, and virtually no side effects has presented new opportunities for engagement of substance users into HCV care. The work described here is part of the larger PET-C project, and it included the development and implementation of a detailed HCV-related educational intervention that was conducted over 2 sessions. Participation was offered to all interested OAT patients, 110 of whom were educated over a period of 14 months. Before attending the educational intervention, patients demonstrated moderate HCV-related knowledge, with 66% of participants correctly answering 5 out of 7 HCV knowledge questions. This finding is similar or somewhat higher compared with other studies that evaluated HCV-related knowledge among substance users (Cohen-Moreno et al., 2010; Treloar et al., 2011; Norton et al., 2014; Marshall et al., 2015). Differences with some of the previously published data could be, at least in part, due to the simplicity of our HCV knowledge quiz that was comprised of 7 questions, 6

TABLE 3. Variables Associated With HCV-related Knowledge After Attending the Educational Intervention

Variables	Univariable Model			Multivariable Model		
	OR	95% CI	P	OR	95% CI	P
Sex						
Male	1.935	0.955; 3.919	0.0669	2.15	1.038; 4.453	0.0394
Female*						
Education						
High school or lower*						
Higher than high school	2.472	0.884; 6.917	0.0846			
History of injecting drugs						
Yes	2.895	1.403; 5.974	0.004			
No*						
OAT attendance, years	1.041	0.973; 1.113	0.2446			
Ever received HCV test						
Yes	6.027	1.586; 22.9	0.0084			0.02 [†]
No*						
Knowledge of HCV education at OAT						
Yes	0.588	0.286; 1.211	0.1495			
No or not sure*						
Ever attended HCV-related education?						
Yes at START	0.704	0.322; 1.542	0.7057			
Yes elsewhere	0.379	0.135; 1.064	0.0867			
No*						
Injected drugs in the past 6 months						
Yes	3.392	1.017; 11.312	0.0468			
No*						
Used noninjection drugs in the past 6 months						
Yes	2	0.985; 4.057	0.055			
No*						
Do you have hepatitis C?						
Yes	1.531	0.764; 3.069	0.2295			
No or not sure*						
Level of HCV-related knowledge from pre-educational quiz	1.869	1.351; 2.585	0.0002			0.0027 [‡]

Level of HCV-related knowledge from preeducational quiz (increase with 1) at “No or not sure of previous HCV testing” (OR 15.856, 95% CI, 1.98; 126.71).

Level of HCV-related knowledge from preeducational quiz (increase with 1) at “Yes of previous HCV testing” (OR 1.61, 95% CI, 1.15; 2.25).

*Reference group for the reported odds ratios.

†There is an interaction between level of HCV related knowledge from pre-educational quiz and ever receiving HCV test ($P = 0.032$).

Abbreviations: CI, confidence interval; OR, odds ratio; SD, standard deviation.

of which required true/false answer. In addition, our patient population was older compared with those in other studies, participants were well stabilized on methadone (attending OAT for 6.85 ± 5.36 years), they were screened annually for HCV while attending the OAT clinic, and some of them had had the opportunity to participate in other educational activities in the OAT clinic, all of which might have influenced their HCV-related knowledge. After the educational intervention, HCV-related knowledge was significantly higher among study participants than beforehand. We noted a significant increase in the number of correctly answered HCV knowledge questions, and also in the percentage of patients who correctly answered 5 or more questions. These results are similar to other reports demonstrating that education and counseling in OAT settings can improve knowledge about viral hepatitis (Surjadi et al., 2011; Larios et al., 2014).

As part of the PET-C project, the educational activity was an intermediate step between the initial step, a survey assessing willingness to engage in an HCV-related educational activity and treatment, and actual entry into the telemedicine-based HCV evaluation and treatment phase of the study. The educational intervention was generally well accepted by patients, and the majority of participants were highly satisfied with it. In addition, HCV-infected participants

not only expressed high levels of interest in the onsite telemedicine-based HCV evaluation offered as part of the PET-C project, but they actually have pursued the treatment. As of August 2015 (approximately 11 months after completion of this study), roughly half of the HCV-infected patients have undergone a telemedicine-based HCV evaluation, and many of them are proceeding to receive, have received, or have completed HCV treatment.

Although we observed improvement in HCV-related knowledge after participation in the educational intervention, we did not observe an increase in treatment willingness among HCV-infected patients. This result differs from the findings of other investigators who observed that HCV-related education improves patients' willingness to be treated (Surjadi et al., 2011). A large number of our study participants agreed to pursue HCV treatment even before participation in the educational intervention: 85% of 48 HCV-positive patients expressed willingness to be treated both at the time of completion of the initial survey and after the educational intervention. Therefore, given the relatively small sample size ($n = 48$) and the large percentage of participants who were already convinced to pursue HCV treatment before entry into the educational intervention, we may have had low power to detect a significant change as a result of the intervention itself.

In addition, preintervention awareness of HCV status was quite high (77%) among study participants, and they may have viewed HCV-related education as a step toward engagement in HCV treatment, thereby having already committed themselves to HCV treatment before their participation in the educational activity. Finally, those who elected not to be treated may have had other reasons for refusing to pursue HCV therapy unrelated to knowledge about the infection. Future work should focus on substance users' willingness to pursue HCV treatment in the post-IFN era.

An additional limitation of this study relates to the fact that we relied on a self-administered questionnaire with relatively small number of HCV knowledge questions. However, the format, structure, and topic of the educational intervention were designed with input from experts in hepatology, addiction medicine, and public health. The number and content of the questions were agreed upon by the experts during the design phase in an attempt to balance accuracy in the self-administered questionnaire without being overly burdensome to the study participants. Finally, we did not assess participants' HCV-related knowledge over an extended period of time after the educational intervention and therefore cannot estimate how stable knowledge improvements were.

CONCLUSIONS

We observed an increase in HCV-related knowledge after participation in an educational intervention among substance users on OAT. As knowledge about hepatitis C was previously shown to be an important factor that determines patients' perception about the disease and their willingness to be treated, similar interventions should be integrated into OAT settings to promote patients' effective enrolment into HCV care and management of the infection.

ACKNOWLEDGMENTS

We thank Drs Bryce Smith and Jon Zibbell for assistance with the design of the educational intervention. We also thank Anthony McLeod for assistance with subject recruitment.

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