

# THE EFFECTIVENESS EVALUATION OF A MULTIMEDIA HEPATITIS C PREVENTION PROGRAM FOR HISPANIC HIV-INFECTED INDIVIDUALS

**Introduction:** With the introduction of highly active antiretroviral therapy, the hepatitis C virus (HCV) infection has become a primary health problem among individuals suffering from HIV/AIDS in Puerto Rico, principally those who are injecting drug users (IDUs). A multimedia educational intervention, based on the Health Beliefs Model and Social Cognitive Theory was developed and implemented to reduce HCV-associated risk behaviors among IDUs.

**Methods:** A pre- and post- intervention study evaluated the knowledge and behavioral changes in a group of HIV-infected persons recruited from February 2006 through December 2008.

**Results:** A total of 110 participants were recruited: all were IDUs; 82% were men; 86.3% were HIV/HCV co-infected and 24.5% had active injected drugs in the month prior to recruitment. The group mean age was 42.2±9.2 years and mean educational level was 10<sup>th</sup> grade. Knowledge of HCV risk behaviors, perception of HCV susceptibility, and perception of disease severity increased after the intervention. Knowledge of HCV clinical manifestations and HIV co-infection complications and treatment also improved. In addition, HCV risk behaviors and injecting drug practice decreased significantly among IDUs.

**Conclusions:** This new multimedia intervention captured and maintained the participants' attention and interest, facilitating their educational process. Thus, greater attention and interest leads to greater knowledge and prevention improvement. (*Ethn Dis.* 2010;20 [Suppl 1]:S1-158-S1-162)

**Key Words:** HCV/HIV Program Evaluation, HCV/HIV Multimedia Intervention

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## INTRODUCTION

With the introduction of highly active antiretroviral therapies (HAART), the hepatitis C virus (HCV) infection has become a major contributor to the prognosis of HIV-infected subjects.<sup>1-3</sup> HIV/HCV infection are blood pathogens that share several risk factors for transmission.<sup>4-6</sup> For a large majority of co-infected individuals, injecting drug user (IDU) is the risk factor for the infections.<sup>1-4</sup> Consequently, the rate of HCV co-infection in IDUs may exceed 80%.

In the absence of a vaccine or an effective prophylactic therapy for HCV infection, preventive strategies that limit the spread of this virus is considered an important step in diminishing the target organ damage that is often seen in co-infected individuals.<sup>7,8</sup> Steps to initiate prevention programs in this population have stumbled because of such difficulties as diminished reading skills and a diminished understanding of the relevance of the information. In addition, prevention measures adopted by IDUs necessitate modifications, such as changes in lifestyle, and the implementation of new practices that are inherently complex in nature.<sup>9</sup>

Some studies have found that the use of images, figures, and animated presentations focused on specific learning objectives can be received and understood by individuals in this particular at-risk group.<sup>10-12</sup> We have developed a multimedia HCV preventive intervention for Hispanic HIV-infected, IDUs from Puerto Rico.<sup>13</sup> This intervention was based on the Health Belief Model (HBM) and the Social Cognitive Theory (SCT) that are theoretical frameworks frequently used in the design of educational and health

related interventions.<sup>14-16</sup> We have previously published data which suggest the feasibility and acceptability of this program in this high-risk population.<sup>13</sup> In this article, we present finding from our assessment of the effectiveness of this intervention in a cohort of patients.

## METHODS

### Study Enrollment

The study was conducted during a two-and-a-half-year period between February 2006 and December 2008. Individuals targeted for this intervention were HIV-infected IDUs, aged ≥21 years, receiving HIV-related care at the Retrovirus Research Center in Bayamón, Puerto Rico. Every other IDU patient who visited the center during the study period was invited to participate in the intervention. The remaining IDUs received the intervention at the end of the study.

After the initial recruitment and before each computerized intervention session, each participant received a 10-minute orientation on how to use the computer and navigate the program. Subsequently, a computer-based intervention was administered under the supervision and assistance of the health educator. The first session was offered immediately upon recruitment. The remaining sessions were offered two, four and eight weeks after the initial session, with the last session designed to reinforce the previous interventions. All participants were tested for HCV before participating in the study.

### Intervention Theoretical Frame

The intervention was developed using Power-Point software and included text, cartoons, pictures and an audio

tutorial. Each session was designed to be completed within 25 to 35 minutes. The theoretical frameworks guiding the intervention design were the HBM and SCT.<sup>14-16</sup> The HBM describes the relationships between the essential factors involved in behavioral change. Our intervention sessions focused on increasing HCV knowledge, HCV susceptibility perception, and HCV protective measure efficacy. SCT addresses four components of learning: attention, retention, reproduction, and motivation.<sup>15,16</sup> As described in our previous publication, the multimedia tools used in our intervention attract individual attention, thereby improving retention and the ability to reproduce or copy a modeled behavior.<sup>13</sup> Of particular importance were the personal motivations for behavior change, including perceptions of risks and benefits of behavior changes. Moreover, we anticipated that the installments of the intervention would provide reinforcement of the message, further enhancing retention, reproduction and motivation for behavior change.

### Intervention Content and Form

The first session was designed to increase HCV knowledge, focusing both on HCV as a health problem and on its adverse effects in the prognosis of HIV-infected patients. The second session was designed to increase the perception of susceptibility to HCV infection. The third session taught participants about HCV risk behaviors and prevention strategies. The final session reinforced the importance of HCV prevention. Before the study implementation, all sessions were reviewed and evaluated by an expert panel composed of two primary physicians, one gastroenterologist and one education professor, who concurred that the content and form of the intervention were adequate and covered the primary goals of the study.

### Effectiveness Evaluation

With the help of a self-administrated questionnaire adapted from preexisting

instruments,<sup>17-20</sup> the study evaluated: HCV knowledge, perception of severity of HCV, susceptibility to HCV, and injecting drug risk-behaviors and patterns. The questionnaire, using Likert scales and other measures, was administered to study participants before and after the intervention. Perceptions of severity, susceptibility and self-confidence were measured using a scale that range from "0" (none) to "10" (high). Similarly the frequency of HCV risk behaviors was measured on a scale ranging from "0" (never) to "10" (always). The post-evaluation was performed at week eight, just before the reinforcement session.

### Statistical Analysis

The Statistical Package of Social Sciences (SPSS Inc., Chicago IL) program was used to conduct univariate and bivariate analyses. Univariate analysis was used to evaluate the percentage and means distributions. The McNemar test, the pair *t* test and the Wilcoxon signed test (all using a two-tailed alpha level of .05) were used to evaluate and compare pre- and post-intervention changes.

## RESULTS

During the study period, 138 patients entered the study and 110 completed all four sessions. Of the 110 HIV-infected participants, 90 (81.8%) were male, all had history of IDU and 96 (86.3%) were co-infected with HCV. Of the male participants, 12.2% reported having sex with another man. The mean age was 42.2 years $\pm$ 9.3 years. The mean educational level was 10<sup>th</sup> grade. Almost half of the participants (47.3%) reported having IDU in the six months prior to study enrollment. The HIV mean disease duration was 5.2 $\pm$ 5.0 years; 21.8% had CD4+T cell count <200 cells/ $\mu$ l and 20.0% had received HAART at enrollment or in the previous 12 months.

### Hepatitis and HCV Knowledge Changes

In evaluating the knowledge acquired regarding the liver function, no significant changes were detected in the pre- and post-intervention assessments. In spite of the fact that before intervention, more than 92% of the participants already knew that HCV was found predominantly in blood, there was an improved knowledge regarding viral distribution in body fluids. Similarly, we found a slight increase in the already high levels of knowledge regarding HCV-infection-associated risk behaviors (eg, injecting drug, sharing razors, making tattoos, doing piercings). The misconceptions that coughing, sneezing, sharing food or utensils, or homosexual contact contributes to the spread of HCV decreased significantly after the intervention (Table 1). Conversely, there was a significant increase in identification of cocaine sniffing as an HCV-infection risky behavior. The study found an incremental gain in the level of knowledge regarding HCV clinical manifestations, treatment, and co-infection with HIV after the intervention. The differences were more significant in the areas relating to the lack of a vaccine and the complication of co-infection.

### HCV Perception of Severity and Susceptibility Changes

At study entry, participants had high levels of awareness regarding the severity of HCV infection as a healthcare condition; however, this awareness was increased significantly after completing the interventions (Table 2). Similarly, the awareness that viral infection causes damage to the liver, which in turn influences survival, was also augmented after the intervention, although this difference did not reach statistical significance. The understanding of the severity of HCV-HIV co-infection, which at baseline was already high, did not increase after the intervention (Table 2). In the evaluation of the

**Table 1. Results of pre-/post-testing: HCV-infection knowledge**

Parameter (N=110)	Intervention		
	Pre (%)	Post (%)	P value
<b>Knowledge of liver, hepatitis and HCV</b>			
The liver has metabolic functions	67.3	69.1	.87
Hepatitis means liver damage or harm	87.3	98.2	.01*
HCV-infection is a viral condition	73.1	85.2	.03*
<b>Knowledge of HCV location</b>			
HCV is predominantly in blood	92.7	95.4	.55
HCV is not predominantly in urine	67.0	82.6	.01*
HCV is not predominantly in stools	73.4	81.7	.18
HCV is not predominantly in semen	60.6	70.6	.10
<b>Knowledge of HCV risk behaviors</b>			
Reuse of syringes during drug injection	99.1	97.2	.63
Reuse cooker or cotton during drug injection	81.7	90.8	.09
Sharing paraphernalia for cocaine sniffing	56.9	84.4	.01*
Perform tattoos under unhygienic conditions	92.7	90.8	.82
Perform unhygienic body piercings	87.0	88.0	1.00
Sharing razors	84.4	85.3	1.00
Coughing and sneezing	35.8	14.7	.01*
Food preparation	13.9	5.6	.04*
Sharing eating utensils	45.9	21.1	.01*
Sex with a person infected with HCV	81.1	83.5	.84
Man having sex with man	57.4	39.8	.01*
<b>Knowledge of HCV and HCV/HIV co-infection</b>			
Not all HCV-infected persons have symptoms	55.0	61.5	.23
Some HCV patients develop liver cirrhosis	90.0	89.1	1.00
HCV therapy is available	60.9	69.1	.22
HCV treatment could affect HIV treatment	32.7	49.1	.02*
HCV vaccine is not available	35.5	51.8	.01*
Not all HCV treated persons are cured	73.4	75.2	.86
HCV/HIV co-infection is worse than single infection	61.8	72.1	.07
HCV therapy is not effective for HIV-infection	87.3	90.0	.63
Not all HCV/HIV persons can receive HCV therapy	23.6	36.4	.05*

\* P<.05 by McNemar test.  
HCV=hepatitis C virus.

perceived susceptibility of becoming infected with HCV, we found an incremental increase in the knowledge that one can become co-infected when sharing paraphernalia used in the preparation and disposition of injecting drugs and when sharing paraphernalia used for sniffing cocaine. Nevertheless, these differences did not reach statistical significance (Table 2).

**HCV Risk Behavior Changes**

We found a significant reduction in the practice of active IDU (in the previous month) after the intervention (24.5% vs 13.6%, respectively). Those individuals who remained active in IDU reported an improvement in their HCV

risk-reduction behavior. The frequenting of shooting galleries and the use of potentially contaminated injecting paraphernalia were less often reported in these persons, though these differences did not reach statistical significance (Table 3).

**Self Confidence Changes in Reducing HCV Risk Behaviors**

The degree of self confidence of the participants in avoiding HCV risk behaviors increased after the intervention (Table 4). Baseline data showed a high level of self-assurance regarding participants' estimations of their abilities to avoid the HCV risk behaviors. Still, participants showed an improvement in their levels of self-confidence

regarding the ability to avoid sharing filters, cookers, syringes and water. Participants reported a reduction in their belief that used syringes were clean if macroscopic blood could not be seen inside them (Table 4).

**DISCUSSION**

This article presents data that show a measurable change in HCV awareness in IDUs immediately after exposure to a multimedia educational intervention. Of most importance are the results indicating that we can measure and document an improvement in HCV knowledge and show that participants gained a better understanding of the severity of, and their individual susceptibility to, the HCV infection. In addition, a reduction of HCV risk behaviors and an improvement in the subjects' self-confidence regarding their abilities to avoid HCV risk behavior was observed. These findings suggest that multimedia interventions based on the HBM and SCT theoretical frameworks are a viable approach to health-related behavior changes for high-risk Hispanic populations. Programs based on these behavioral theories attract an individual's attention, thereby improving retention and the ability to reproduce or copy a modeled behavior.<sup>15,16</sup>

As previously reported by others authors,<sup>10-12</sup> multimedia intervention has the potential advantage of being capable of addressing a wide range of health-related issues and affecting the knowledge and behaviors of high-risk populations. Computer-based strategies offer an opportunity for systematically exposing high-risk individuals to individually relevant, effective health promotion messages.<sup>10-13</sup> Advances in computer software and hardware allowed us to create and implement a user-friendly multimedia intervention program that overcame the potential barriers (eg, limited formal education), which would have limited the delivery

**Table 2. Results of pre-/post-testing: perception of severity and susceptibility of HCV disease**

Parameter	Pre-intervention	Post-intervention
	Median (IQR)	Median (IQR)
<b>Perception of HCV-infection severity (N=110)</b>		
HCV infection is a severe disease	10.0 (7.0–10.0)	10.0 (8.0–10.0)*
HCV infection can cause death	7.0 (5.0–10.0)	7.0 (5.0–10.0)
HCV infection can cause liver cirrhosis	9.0 (6.0–10.0)	8.0 (6.0–10.0)
HCV/HIV co-infection can cause death	10.0 (6.0–10.0)	8.0 (6.0–10.0)
HCV infection can cause liver cancer	8.0 (5.0–10.0)	7.0 (6.0–10.0)
<b>Perception of HCV-infection susceptibility in HIV (-) participants (n=10)</b>		
Develop HCV and HIV co-infection	5.5 (0.0–9.3)	5.0 (2.5–10.0)
Develop HCV by sharing drug preparing paraphernalia	9.0 (3.0–9.0)	10.0 (5.7–10.0)
Develop HCV by back load syringe	10.0 (9.7–10.0)	10.0 (6.0–10.0)
Develop HCV by tattooing or making body piercing	10.0 (6.2–10.0)	9.0 (4.0–10.0)
Develop HCV by sharing cocaine sniffing paraphernalia	6.5 (3.5–10.0)	9.5 (5.0–10.0)

\* P value<.05 by Wilcoxon test.  
HCV=Hepatitis C virus.  
IQR=Inter quartile range.  
HIV(-)=HIV negative.

**Table 3. Results of pre-/post-testing: HCV-infection risk behaviors in active IDUs**

Parameter	Pre-intervention	Post-intervention
	Median (IQR)	Median (IQR)
<b>Risk behavior (n=20)</b>		
Use a shooting gallery to inject drug	7.5 (0.0–10.0)	0.0 (0.0–9.5)
Utilize water previously used by another person	0.0 (0.0–6.7)	0.0 (0.0–1.7)
Utilize cooker previously used by another person	5.0 (0.0–8.7)	0.0 (0.0–5.0)
Utilize filter or cotton previously used by others	0.0 (0.0–6.7)	0.0 (0.0–0.0)
Collect drug from a cooker after another person	0.0 (0.0–6.7)	0.0 (0.0–0.0)
Back load their syringe	0.0 (0.0–5.2)	0.0 (0.0–0.0)
Utilize other persons syringes	6.5 (2.5–9.0)	5.0 (2.5–10.0)
Cleaning syringe with Clorox	10.0 (8.2–10.0)	10.0 (6.5–10.0)

HCV=hepatitis C virus.  
IDUs=Injecting drug users.  
IQR=Inter quartile range.

**Table 4. Results of pre-/post-testing: measure of self confidence for HCV prevention**

Parameter	Pre-intervention	Post-intervention
	Median (IQR)	Median (IQR)
<b>Measures (N=110)</b>		
Using their own syringe	10.0 (8.0–10.0)	10.0 (10.0–10.0)
Not permitting others to use their syringe	10.0 (9.0–10.0)	10.0 (10.0–10.0)
Not using others' filters or cottons	10.0 (7.0–10.0)	10.0 (10.0–10.0)
Utilizing water from their own recipients	10.0 (8.7–10.0)	10.0 (10.0–10.0)
Not permitting others to use their water recipients	10.0 (8.0–10.0)	10.0 (10.0–10.0)
Using a new cooker every time	10.0 (8.0–10.0)	10.0 (10.0–10.0)
Rejecting other back load their syringe	10.0 (6.0–10.0)	10.0 (10.0–10.0)
Using new syringes every time	10.0 (8.0–10.0)	10.0 (10.0–10.0)
Discarding water use to clean injecting instruments	10.0 (9.0–10.0)	10.0 (10.0–10.0)
Rejecting used filters or cookers	10.0 (7.0–10.0)	10.0 (9.0–10.0)
Cleaning syringes with Clorox after used them	10.0 (0.0–10.0)	9.0 (7.5–10.0)
Syringe disinfection, only if blood is not seen inside	10.0 (4.0–10.0)	7.0 (2.0–10.0)

HCV=hepatitis C virus.  
IQR=Inter quartile range.

of messages to members of this population. The use of cartoons, pictures and audio narration that described in detail the most common risk behaviors and rituals performed by IDUs when preparing, administering, and sharing drugs facilitated the learning process and the subsequent incorporation of HCV-infection preventive behaviors in this high-risk population.

The principal goal of our intervention was to increase the participants' motivation to implement behavioral changes based on improved knowledge and risk perception. The multimedia intervention strategy we used was able to capture and maintain the participants' attention, in turn facilitating the educational process. Improved attention skills and a higher interest lead to greater knowledge and an improvement in preventive practices. We believe our data suggest that this improvement occurred in the study group. The content of the multimedia presentation attracted the participants' attention and augmented knowledge retention, improving their ability to practice the desired preventive behaviors modeled therein, as postulated by the HBM.<sup>14</sup> Our interpretations could explain the significant reduction of active IDU, despite the fact that this outcome was not the principal goal of the educational intervention. However, we have to consider the possibility that this finding could be influenced by an individual ambition to give socially desirable answers.

Our findings verify the potential benefit of multimedia programs for the dissemination of HCV prevention strategies in a Hispanic high-risk population. This type of intervention could easily and inexpensively be disseminated via the Internet to a wide number of healthcare providers and/or health educators for a number of clinical uses.

Our study has the following limitations. 1) Low prevalence of HIV mono-infection in the study sample could have affected the statistical power that evalu-

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ates changes in the perception of disease infection susceptibility. 2) Similarly, a low prevalence of active IDU in the study group could have limited the evaluation of the program's goal, ie, the reduction in HCV infection risk behavior. For the future, this multimedia intervention should be implemented in a group at an earlier stage of drug addiction and in a group with a higher level of active injecting drug use in order to confirm the preventive trend found in this study.

Our computer-based intervention appears to decrease HCV risk behaviors among HIV-IDUs. The introduction of preventive strategies in this hard-to-reach population may ultimately serve to decrease the hard-to-control health-care disparity in this group of patients.

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