Published in final edited form as:
Ethn Dis. 2010 ; 20(1 0 1): S1–158-62.

The effectiveness evaluation of a multimedia hepatitis C prevention program for Hispanic HIV-infected individuals

Angel M. Mayor, MD
Retrovirus Research Center, Internal Medicine Department, Universidad Central del Caribe, School of Medicine (AMM)

Diana M. Fernández, EdD
Retrovirus Research Center, Internal Medicine Department, Universidad Central del Caribe, School of Medicine (DMF)

Héctor M. Colón, PhD
Center for Addiction Study, Universidad Central del Caribe, School of Medicine (HMC)

James C. Thomas, PhD
Department of Epidemiology, School of Public Health, University of North Carolina, Chapel Hill, NC (JCT)

Robert F. Hunter-Mellado, MD
Retrovirus Research Center, Internal Medicine Department, Universidad Central del Caribe, School of Medicine (RFH)

Abstract

Introduction—With the introduction of highly active antiretroviral therapy the Hepatitis C virus (HCV) infection has became 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 last month (prior to recruitment). The group mean age was 42.2 ± 9.2 years and mean educational level was 10th 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 decrease significantly among IDUs.

Conclusions—This new multimedia intervention captured and maintained the participants' attention and interest, in that way facilitating their educational process. Thus, a greater of attention and interest leads to greater knowledge and prevention improvement.

Keywords

HCV/HIV prevention multimedia intervention evaluation

Address correspondence and reprint requests to: Angel M. Mayor, MD, MS; Retrovirus Research Center; Universidad Central del Caribe; School of Medicine; Call Box 60-327; Bayamón, Puerto Rico 00960-6032; 787-787-8722; 787-787-8733 (fax); amayorb@hotmail.com.

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.[1–3] HIV/HCV infection are blood pathogens that share several risk factors for transmission. [4–6] For a large majority of co-infected individuals injecting drug use (IDU) is the risk factor for the infections.[1–4,] Consequently, the rate of HCV co-infection in injecting drug users (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 viruse is been considered as an important step in diminishing the target organ damage that is often seen in co-infected individuals.[7,8] 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, the issues of prevention will necessitate IDU modifications that imply changes in lifestyle and the implementation of practices that are inherently complex in nature.[9]

The use of images, figures, and animated presentations focused on specific learning objectives may be better received and understood by individuals in this particular at risk group. [10–12] We have developed a multimedia HCV preventive intervention for Hispanic HIV-infected, IDUs from Puerto Rico.[13] 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.[14–16] We have previously published data which suggests the feasibility and acceptability of this program in this high-risk population.[13] The current study assess the effectiveness of this intervention in the selected cohort of patients.

METHODS

Study enrollment

The study was conducted over a two-and-a-half-year period between February 2006 and December 2008. Individuals targeted for this intervention were HIV-infected IDUs over 21 years visiting the Retrovirus Research Center in Bayamón, Puerto Rico, for HIV-related care. Every other IDUs participant that 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, to avoid ethical issues.

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 others, two, four and eight weeks after. The last session was 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 includes 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.[14–16] 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.[15,16] 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.[13] 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. And 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 developed from preexisting adapted instruments,[17–20] the study evaluated the HCV knowledge, and perception of severity and susceptibility as well as the injecting drug risk-behaviors and patterns in the study group before and after the intervention. The instrument included Likert scales beside other measures to evaluate the study domains. Perceptions of severity, susceptibility and self-confidence were measure 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). Pre- and post-intervention tests were performed to explore changes. 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 Mc Nemar 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

Study enrollment

During the study period 138 patients entered in the study, and 110 completed all fourth 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 sex with another man. The mean age was 42.2 years ± 9.3 years. The mean educational level was 10th 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 ±5.0 years; 21.8% had CD4+T cell count < 200 cells/μl and 20.0% had received HAART at enrollment or in the previous 12 months.

Hepatitis and HCV knowledge changes

In evaluating of the knowledge acquired regarding the liver function no significant changes was detected in the pre- and post-intervention patients' assessment. In spite of the fact that before intervention over 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, there was a slight increase in the already high levels of knowledge evidence regarding HCV-infection-associated risk behaviors (e.g., injecting drug, sharing razors, making tattoos, doing piercings). The misconceptions that coughing, sneezing, sharing food or utensils, contributes to the spread of HCV decreased significantly after the intervention (Table 1). Conversely, there was a significantly increase in identification of cocaine sniffing as an HCV-infection risky behavior. The study found there to be an incremental 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 health care 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 augment after the intervention (though 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 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-behaviors 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. The study subjects reported a reduction in their self-belief that used syringes were clean if macroscopic blood could not be seen inside them (Table 4).

DISCUSSION

The purpose of this paper is to present data that show a measurable change in HCV awareness in IDUs immediately after their having been exposed to a multimedia educational intervention. The most important results are 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-behavior and an improvement in the subjects' self-confidence regarding their abilities to avoid HCV risk behavior was observed. These findings suggests that multimedia interventions based on the HBM and SCT theoretical frameworks is a viable approach to health related behavior changes for high risk Hispanic populations. These behavioral theories attract the individual attention; thereby improving retention and the ability to reproduce or copy a modeled behavior.[15,16]

As previously reported by others authors[10–12] 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 population. Computer-based strategies offer an opportunity for systematically exposing high-risk individuals to individually relevant, effective health promotion messages.[10–13] Advances in computer software and hardware allowed us to create and implement a user-friendly multimedia intervention program that overcame the potential barriers that would have limited the delivery of messages to members of the studied population, with their generally limited formal educations. 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 self-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 the preventive practices required. We believe our data suggests 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.[14] 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 health care 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 evaluates 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, i.e., the reduction in HCV infection risk behavior. For the future this multimedia intervention would need to be implemented in a group at an earlier stage of drug addiction and in a group with a higher level of active injecting drug used 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.

Acknowledgments

The present study was sponsored by the NIH Grant number IU54RR0195071 and RCMI grant G12RR03035. We would like to thank Mayra Soto, the program case manager, and Christine Miranda, the program health educator, for their help and collaboration.

REFERENCES

1. Sherman KE, Rouster SD, Chung RT, et al. Hepatitis C prevalence among patients co-infected with human immunodeficiency virus: a cross-sectional analysis of the USA adult AIDS clinical trials group. Clin Infect Dis. 2002; 34:831–837. [PubMed: 11833007]
2. Dodig M, Tavill A. Hepatitis C and human immunodeficiency virus co-infection. J Clin Gastroenterol. 2001; 33(5):367–374. [PubMed: 11606851]
3. Soto B, Sanchez-Quijano A, Rodrigo L, et al. Human immunodeficiency virus infection modifies the natural history of chronic parenterally-acquired hepatitis C with an unusually rapid progression to cirrhosis. J Hepatol. 1997; 26:1–5. [PubMed: 9147999]
4. Perez CM, Suarez E, Torres EA, et al. Seroprevalence of hepatitis C virus and associated risk behaviors: a population-based study in San Juan, Puerto Rico. Interna J Epidemiol. 2005; 34:593–599.
5. Center for Disease Control and Prevention. Hepatitis C. In: Sexually transmitted diseases treatments guidelines 2002. Recomm. Rep. MMWR. 2000; 51:64–66.
6. Center for Disease Control and Prevention. Recommendation for prevention and control of hepatitis C (HCV) infection and HCV-related chronic disease. MMWR. 1998; 47(RR19)
7. Center for Disease Control and Prevention HIV/AIDS. Surveillance Report. 2005; 17:28–29.
8. Center for Disease Control and Prevention. Revised guidelines for HIV counseling, test and referral. MMWR. 2001; 50:1–57.
9. Franken IH, Kaplan CD. Risk contexts and risk behaviors in the Euregion Maas-Rein: the Boule de Neige intervention to AIDS prevention among drug users. AIDS Educ Prev. 1997; 9:161–180. [PubMed: 9167801]
10. Krishna S, Balas EA, Spencer DC, et al. Clinical trial of interactive computerized patients' education: implications for family planning. J Fam Pract. 1997; 45:25–33. [PubMed: 9228910]
11. Bellis JM, Grimley DM, Alexander LR. Feasibility of tailored intervention targeting STD related behaviors. Am J Health Behav. 2002; 26:378–385. [PubMed: 12206447]
12. Revere D, Dumbar PJ. Review of computer generated outpatient health behavior intervention. J Am Med Infrom Assoc. 2001; 8:62–79.
13. Mayor AM, Fernandez DM, Colon HM, Thomas JC, Hunter-Mellado RF. The feasibility and acceptability of a multimedia Hepatitis C prevention program for Hispanic HIV-Infected persons. Ethn Dis. 2008; 18:S2-195–S2-199.
14. Rosenstock IM. The health belief model and preventive health behavior. Health Educ Monogra. 1974; 2:354–386.
15. Bandura A. Human agency in social cognitive theory. Am Psycholo. 1989; 44:1175–1184.
16. Bandura, A. Social foundations of thought and action: A social cognitive theory. 1st ed. Prentice-Hall; J Englewood Cliffs NJ: 1986.
17. Caloir S, Spencer J, Bresnahan A, et al. Hepatitis integration training manual. Am Liver Found CDC. 2003
18. Robles RR, Colon HM, Sahai H, et al. Behavioral risk factors and human immunodeficiency virus HIV prevalence among intravenous drug users in Puerto Rico. Am J Epidemiol. 1992; 135:531–540. [PubMed: 1570819]
19. Weatherby NL, Needle R, Cesari H, et al. Validity of self-reported drug use among injection drug users and crack cocaine users recruited through street outreach. Eval Program Plann. 1994; 17:347–355.
20. Needle R, Fisher DG, Weatherby N, et al. The reliability of self-reported HIV risk behavious of drug users. Psychol Addict Behav. 1995; 9:242–250.

Table 1

Results of Pre/Post testing: HCV-infection knowledge

Parameter (n=110)	Intervention		
	Pre (%)	Post (%)	p-value
Knowledge of liver, hepatitis and HCV			
The liver has metabolic functions	67.3	69.1	0.87
Hepatitis means liver damage or harm	87.3	98.2	0.01*
HCV-infection is a viral condition	73.1	85.2	0.03*
Knowledge of HCV location			
HCV is predominantly in blood	92.7	95.4	0.55
HCV is not predominantly in urine	67.0	82.6	0.01*
HCV is not predominantly in stools	73.4	81.7	0.18
HCV is not predominantly in semen	60.6	70.6	0.10
Knowledge of HCV risk behaviors			
Reuse of syringes during drug injection	99.1	97.2	0.63
Reuse cooker or cotton during drug injection	81.7	90.8	0.09
Sharing paraphernalia for cocaine sniffing	56.9	84.4	0.01*
Perform tattoos under unhygienic conditions	92.7	90.8	0.82
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	0.01*
Food preparation	13.9	5.6	0.04*
Sharing eating utensils	45.9	21.1	0.01*
Sex with a person infected with HCV	81.1	83.5	0.84
Man having sex with man	57.4	39.8	0.01*
Knowledge of HCV and HCV/HIV co-infection			
Not all HCV-infected persons have symptoms	55.0	61.5	0.23
Some HCV patients develop liver cirrhosis	90.0	89.1	1.00
HCV therapy are available	60.9	69.1	0.22
HCV treatment could affect HIV treatment	32.7	49.1	0.02*
HCV vaccine is not available	35.5	51.8	0.01*
Not all HCV treated persons are cured	73.4	75.2	0.86
HCV/HIV co-infection is worse than single infection	61.8	72.1	0.07
HCV therapy is not effective for HIV-infection	87.3	90.0	0.63
Not all HCV/HIV persons can receive HCV therapy	23.6	36.4	0.05*

HCV= Hepatitis C virus

* p value < .05 by Mc.Nemar test

Table 2

Results of Pre/Post testing: Perception of severity and susceptibility of HCV disease

Parameter	Pre-intervention Median (IQR)	Post-intervention Median (IQR)
Perception of HCV-infection severity (n=110)		
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)
Perception of HCV-infection susceptibility in HCV (−) participants. (n=10)		
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)

HCV= Hepatitis C virus

IQR= Inter quartile range

HIV(−) = HIV negative

* p value<.05 by Wilcoxon test

Table 3

Results of Pre/Post testing: HCV-infection risk behaviors in active IDUs

Parameter	Pre-intervention Median (IQR)	Post-intervention Median (IQR)
Risk behavior (n=20)		
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

* p value <.05 by Wilcoxon test

Table 4

Results of Pre/Post testing: Measure of self confidence for HCV prevention

Parameter	Pre-intervention Median (IQR)	Post-intervention Median (IQR)
Measures (n=110)		
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

* p value <.05 by Wilcoxon test.