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School of Community Health Sciences
University of Nevada, Las Vegas

Integrating Viral Hepatitis Screening and Prevention Services into an Urban Chemical Dependency Treatment Facility for American Indians and Alaska Natives

Shelly Huffman, MPH, CHES, Urban Indian Health Institute
Rachel Brucker, MPH, RN, Urban Indian Health Institute
John T. Redd, MD, MPH, FACP, Division of Viral Hepatitis, CDC
Maile Taualii, PhD, MPH, Native Hawaiian Epidemiology Center
Cecile M. Town, MPH, National Center for Immunization and Respiratory Diseases, CDC
Mei L. Castor, MD, MPH, US Indian Health Service
Crystal C. Tetrick, MPH, Urban Indian Health Institute
Ralph Forquera, MPH, Urban Indian Health Institute
Joanna Buffington, MD, MPH, Global Immunization Division, CDC

ABSTRACT

American Indian/Alaska Natives (AI/AN) patients at an urban residential chemical dependency treatment center participated in a viral hepatitis prevention project. Project activities integrated into patients' treatment programs included viral hepatitis and human immunodeficiency virus (HIV) risk factor screening, education and counseling, laboratory testing, and hepatitis A and B vaccination. Of 928 AI/AN admissions, 585 (63%) completed risk factor screening assessment. Of these, 436 (75%) received at least one vaccination, viral hepatitis testing, or both. Of 322 patients tested, 91 (28%) were hepatitis C virus (HCV) antibody positive. Lack of pre-existing immunity to vaccine-preventable viral hepatitis infection was common: 132 (45%) were susceptible to hepatitis A and 224 (70%) were susceptible to hepatitis B infection. Chemical dependency treatment centers serving urban AI/AN provide important opportunities for implementing viral hepatitis prevention programs for high-risk populations and for improving ongoing efforts to reduce the disparate impact of chronic liver disease in AI/AN people.

Key words: Hepatitis C infections; Chemical dependency treatment programs; Injection drug use; Vaccinations; American Indian/Alaska Native

BACKGROUND

Viral hepatitis caused by infection with hepatitis A virus, hepatitis B virus and hepatitis C virus is a major public health problem (Buffington & Jones, 2007). In 2007, there were an estimated 25,000 new infections of hepatitis A, 43,000 new infections of hepatitis B, and 17,000 new hepatitis C infections (CDC, 2009). Although safe and effective vaccines have been available for hepatitis B since 1981 and for hepatitis A since 1995 (CDC, 2009), no vaccine exists against hepatitis C. Hepatitis C virus (HCV) infection is now the most common chronic blood borne infection in the United States (Armstrong, et al. 2006 and Neumeister, et al. 2007).

Chronic liver disease and viral hepatitis infection have historically been areas of health disparities for American Indians and Alaska Natives (AI/AN). Major gains have recently been made in hepatitis A and B prevention in AI/AN people, in whom the incidence of both acute hepatitis A and acute hepatitis B have approached national rates (CDC, 2009); but hepatitis C, either alone or with alcohol use/abuse, remains a major contributor to chronic liver disease among American Indians (Bialek, et al. 2008). The chronic liver disease mortality rate among AI/AN is more than twice that of Whites and African Americans nationwide, and remained unchanged throughout the 1990s, unlike rates for other racial/ethnic populations, which have demonstrated declines (Vong & Bell, 2004).

The prevalence of HCV infection among AI/AN is not well understood. The National Health and Nutrition Examination Survey conducted between 1999 and 2002 estimated a prevalence of 1.6% of HCV infection in the United States, which was higher among men than women (Armstrong, et al. 2006). However, these results do not include estimates for AI/AN. Due to the substantial burden of chronic liver disease among AI/AN, there is urgent need to develop a better understanding of HCV epidemiology among AI/AN populations.

American Indians/Alaska Natives living in urban areas across the country typically lack any kind of unifying surveillance system. As a result, a paucity of information exists about viral hepatitis epidemiology, risk factors, and prevention efforts in these populations. Also, rates of substance use/abuse among urban AI/AN can be difficult to describe, although surveys conducted by the Substance Abuse and Mental Health Services Administration indicate higher rates of alcohol use and illicit drug use disorders among AI/AN as a whole compared to other populations (SAMHSA, 2007). This information strongly suggests that the burden of viral hepatitis among urban AI/AN is high.

Various regional studies in the United States have shown prevalence of HCV infection and related risk factors in urban AI/AN higher than the nationally reported prevalence of 1.6% (Armstrong, et al. 2006). An urban Indian clinic in Omaha, Nebraska reported HCV infection among 8.6% of those AI/AN tested. Significant risk factors associated with HCV infection included injection drug or cocaine use, a sexual partner with HCV, and a tattoo for more than five years (Neumeister, et al. 2007). Among a small sample of American Indian women receiving prenatal care in Phoenix, Arizona, 3.1% were found to be infected with HCV (Wilson, 2004). Another study among American Indians in the Southwest found that the majority of patients with confirmed HCV diagnosis reported injection drug use (Norton, et al. 2009).

Data exist that support the integration of prevention and education services for viral hepatitis and human immunodeficiency virus (HIV) with existing programs serving high-risk patients, and numerous examples have demonstrated the benefits of this approach (Buffington & Jones, 2007). Counseling and testing sites, reproductive health clinics, substance abuse treatment programs, and correctional facilities all provide opportunities for prevention intervention.

The *Healthy Liver Program* in Minneapolis established a method for addressing viral hepatitis infections among patients who present for chemical dependency treatment. Their experience

confirms that patients entering chemical dependency treatment have a high risk for HCV infection and low rate of immunity to hepatitis A and B virus infections (Hagedorn, et al. 2007). Another program in San Diego successfully integrated services for viral hepatitis, sexually transmitted infection, and HIV into a drug rehabilitation program: 83% of enrollees participated in the program which offered hepatitis B vaccination, hepatitis B and C serologic testing, sexually transmitted infection screening, and HIV counseling and testing (Gunn, et al. 2005).

While examples in the literature exist of such integrated programs, there are few if any examples of programs serving urban AI/AN. This article describes the development of our project integrating viral hepatitis prevention services into a residential chemical dependency treatment center targeting urban AI/AN. We describe methods used to integrate viral hepatitis prevention services and report results of risk factor assessment and laboratory testing.

METHODS

Project Location

The project was located in Seattle, Washington at the Seattle Indian Health Board, a private, non-profit 501(c)(3) community health center. The Seattle Indian Health Board is comprised of the Leschi Clinic, a full-service primary medical and dental health care center; the Thunderbird Treatment Center, which provides residential chemical dependency treatment targeting adult AI/AN living in the Seattle-King County area; and the Urban Indian Health Institute, one of 12 Tribal Epidemiology Centers partially funded by the Indian Health Service to manage public health information systems, investigate diseases of concern, manage disease prevention programs, and coordinate activities with other public health authorities.

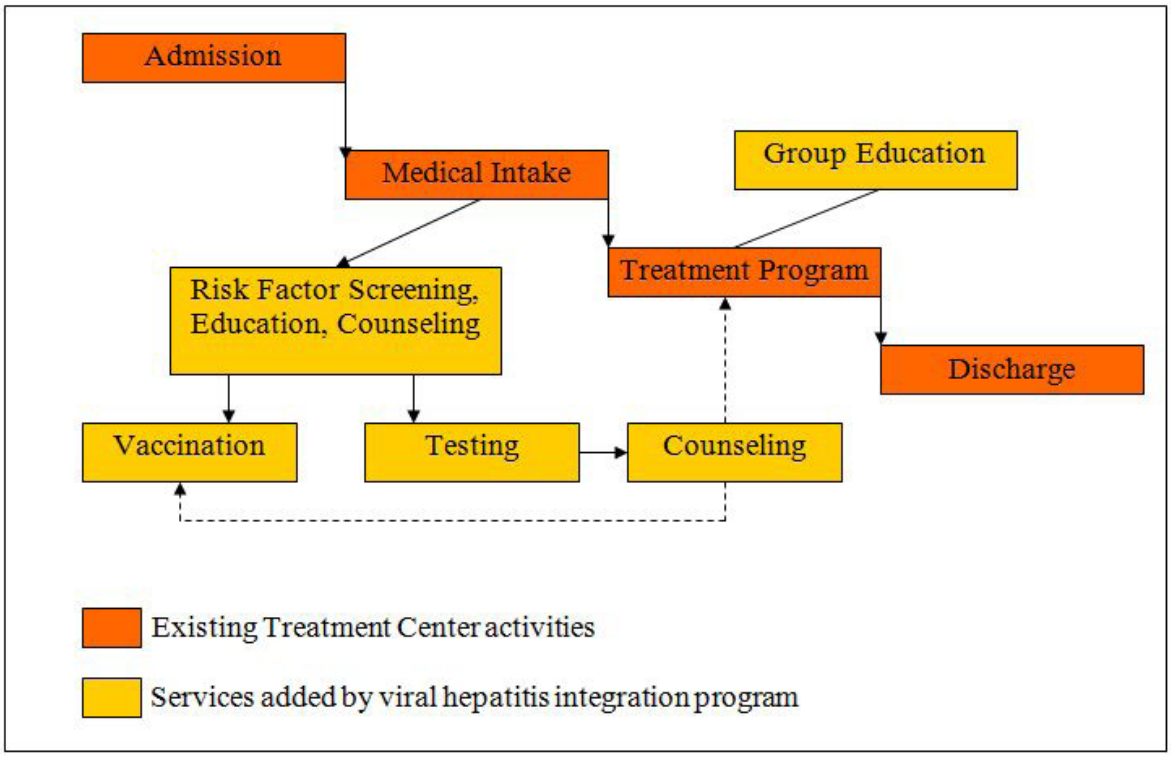
Beginning in 2001, the Seattle Indian Health Board received funding from the CDC and support from the Indian Health Service to develop a viral hepatitis integration project for patients residing at the Thunderbird Treatment Center. The treatment facility offers an intensive residential program (28 days) and a limited long-term residential program (six months), serving 600-700 patients per year. The Seattle Indian Health Board's ability to provide chemical dependency treatment, clinical services, and public health support provided an outstanding opportunity to describe the epidemiology of viral hepatitis and determine risk factors for this population and, most importantly, improve services.

The following activities were integrated into the patients' treatment programs: viral hepatitis and HIV risk factor screening; viral hepatitis and HIV education and counseling; viral hepatitis and HIV laboratory testing; and hepatitis A and B vaccination (Figure 1). We present results from June 2003 – September 2007 for the viral hepatitis portion of the project.

Risk Factor Screening and Education

We attempted to screen all patients admitted to Thunderbird Treatment Center for risk factors associated with viral hepatitis and HIV within a few days of admission. The screening process included a personalized risk assessment for viral hepatitis and HIV, a standard part of the medical intake for all admissions. Risk factor screening questions were asked either by a health educator or intake nurse, who provided education and counseling about individual risk of viral hepatitis; modification of the counseling occurred based on individual risk factors and/or patient questions. In addition to one-on-one sessions and individualized risk factor screenings, patients received general education about viral hepatitis and HIV via a mandatory monthly group education session; which included viewing a HCV video followed by a group discussion.

Figure 1. Viral Hepatitis Integration Project Activities Integrated into Existing Treatment Center Program



Risk factors included: injection drug use (ever), incarceration for more than one year, sex in exchange for money or drugs, multiple sex partners (more than two in the last six months), sexually transmitted infections, tattoos, and receipt of blood or blood products prior to 1992.

Vaccination

After completing the risk factor screening and educational session, hepatitis A and hepatitis B vaccines were provided at no cost to all patients admitted to Thunderbird Treatment Center. Previous hepatitis vaccinations administered at other locations/clinics prior to admission were only recorded and documented if patient had proof of vaccination record. Personal vaccination records also were provided to patients and they were encouraged to return for follow-up at the Leschi clinic to complete the hepatitis A and B vaccine series.

Testing

A. Specific Methods:

Upon completion of the risk factor screening and educational session, all patients admitted to treatment were offered serum testing for chronic viral hepatitis and HIV. Patients serum samples were sent to a contract laboratory for testing for: antibodies to HCV (anti-HCV) using the enzyme immunoassay (EIA) test; immunoglobulin G antibody to hepatitis A virus (anti-HAV IgG); hepatitis B surface antigen (HBsAg); hepatitis B surface antibody (anti-HBs); total hepatitis B core antibody (anti-HBc); and antibodies to HIV-1. We defined cases of current or past hepatitis B virus infection and immunity according to standard interpretations of hepatitis B serologic markers (CDC, 2008).

B. Follow-up/patient care:

Results and post-test counseling were provided to patients by a health educator, nurse or medical provider. Post-test counseling sessions included education with focus on a risk reduction

plan. Hepatitis A and B vaccines were offered again if the patient initially declined and if appropriate. Patients with positive results were recommended to receive confirmatory testing and if appropriate, a specialty referral.

Data collection and analysis

We collected the following data from patient charts: demographics (gender, race, age), responses to risk factor screening questions (see above), receipt of vaccinations, and testing results. All data were stored in a secure Access (Microsoft, Redmond, Washington) database, and analyzed and reported to funding agencies on a quarterly basis. Only vaccines with recorded dates were considered to have been given, and only patients with recorded test results were considered to have been tested. Any indeterminate test results were considered negative for this analysis if confirmatory testing was not completed. Only those patients with responses to at least two or more risk factor questions were considered to have completed the risk factor assessment. Gender, race and age were determined by self-report at the time of admission to the treatment program. For those patients who were admitted two or more times during the project period, only the first admission data were analyzed.

All available data from the database were included in the logistic regression models in order to maximize statistical power, including for those patients that did not complete a full risk factor screening assessment. Indicators found to be significant in univariate analysis were entered in logistic regression models which included age and injection drug use; tests of significance were computed after controlling for these known risks. Odds ratios were considered significant at the <.05 level. Stata version 9.0 (StataCorp LP, College Station, Texas) was used for all analyses.

The project was reviewed and approved by the Portland Area Indian Health Service Institutional Review Board.

RESULTS

Patients Served

A total of 928 persons admitted to the Thunderbird Treatment Center during the project period self-identified as AI/AN. Of these, 585 (63%) unduplicated individuals participated by completing a risk factor screening assessment. The remaining 343 patients (37%) did not participate due primarily to refusal or non-contact during the intake process. Of the 585 individuals, 425 (73%) were male. The mean age was 36.7 years (range 18 to 69 years) for men and 36.6 years (range 18 to 61) for women.

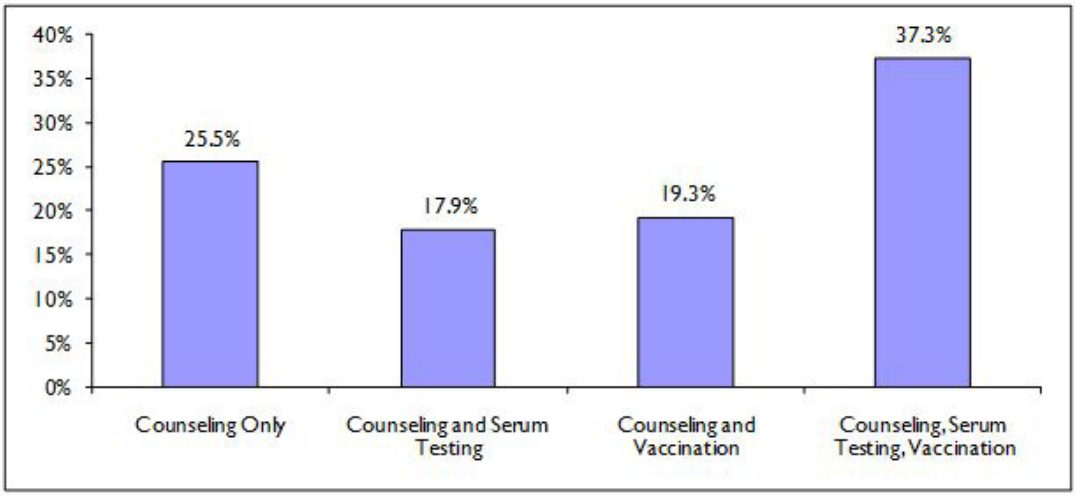
Services Provided

A total of 436 patients (75% of those completing risk factor assessment) received at least one vaccination, viral hepatitis testing, or both (Figure 2). Three hundred (51%) received at least one hepatitis A vaccine and 322 (55%) received at least one hepatitis B vaccine. The majority of patients after August 2005 received the combined Twinrix (GlaxoSmithKline, London, United Kingdom) vaccine. Due to the length of stay in treatment, most patients did not complete the full series of the hepatitis A and hepatitis B vaccination while a patient at Thunderbird. Three-hundred twenty three (55%) consented to viral hepatitis testing; most received the full chronic viral hepatitis panel.

Test Results

Of 322 participants who consented to blood testing and completed the risk factor assessment, 91 (28%) were hepatitis C virus antibody positive. Fifty (16%) showed evidence of past hepatitis

Figure 2. Distribution of Services Delivered to 585 AI/AN Patients



Abbreviations
AI/AN: American Indian/Alaska Native

B exposure (anti-HBc), and 96 (30%) were immune to hepatitis B through either exposure or vaccination (anti-HBs). No patients were chronically infected with hepatitis B infection (HBsAg). One hundred fifty- nine (55%) showed evidence of immunity to hepatitis A, either through past vaccination or exposure. Among those who tested positive for hepatitis C infection, 32 (38%) were susceptible to hepatitis A and 60 (67%) were susceptible to hepatitis B (Table 1).

Table 1. Serum Test results in 323 AI/AN Patients

	Percent positive	95% Confidence Interval for Proportion
Anti-HAV (IgG)	159/291 (55%)	49% – 60%
Anti-HBc	50/321 (16%)	12% - 20%
Anti-HBs	96/320 (30%)	25% - 35%
HBsAg	0/321	0% - 1%
Anti-HCV (EIA)	91/322 (28%)	23% - 33%
Anti-HCV+ susceptible to hepatitis A	32/85 (38%)	28% - 48%
Anti-HCV+ susceptible to hepatitis B	60/90 (67%)	56% - 76%

Abbreviations
AI/AN: American Indian/Alaska Native
Anti-HAV (IgG): Immunoglobulin G antibody to hepatitis A
Anti-HBc: Total hepatitis B core antibody
Anti-HBs: Hepatitis B surface antibody
HBsAg: Hepatitis B surface antigen
Anti-HCV (EIA): Antibodies to hepatitis C virus using the enzyme immunoassay test

Risk Factor Results

The 585 participants who completed the risk factor assessment reported risks for hepatitis infection included injection drug use (186/585, 32%), prior incarceration for greater than one year (131/579, 23%), receipt of blood product before 1992 (5/81, 6%), traded sex for money or drugs (70/581,12%), tattoos (335/580, 58%), history of sexually transmitted infections (164/576, 28%), and

multiple sex partners (more than two in the last six months) (109/580, 19%). Because participants were free to answer or not answer any questions, not all participants answered all questions.

Risk factors shown to be associated with a positive HCV EIA included the following: injection drug use, prior incarceration for greater than one year, receipt of a blood product before 1992, and sex traded for money or drugs. When controlling for age and injection drug use using conditional logistic regression, incarceration for greater than one year was the only risk factor which remained significant. Injection drug use also remained highly significant after controlling for age (Table 2).

Table 2. Risk Factor Results by Anti-HCV EIA Status

	Anti-HCV+ patients who report risk factor	Anti-HCV- patients who report risk factor	Unadjusted OR (95% CI)	Adjusted OR (95% CI)*
Male Gender	69/95 (73%)	183/241 (76%)	0.85 (0.5 – 1.5)	1.7 (0.7 – 3.7)
Age > 40 Years	69/95 (73%)	75/241 (31%)	5.96 (3.4 – 10.5)	11.3 (5.2 – 25.5)^
Injection Drug Use	72/90 (80%)	39/231 (17%)	19.9 (10.3 – 39.2)	30.2 (13.9 – 65.5)‡
Incarcerated > 1 year	35/91 (39%)	33/229 (14%)	3.8 (2.1 – 6.9)	3.4 (1.5 – 7.6)
History of sexually transmitted infection	30/89 (34%)	59/225 (26%)	1.4 (0.8 – 2.5)	0.7 (0.3 – 1.7)
Multiple sex partners	18/90 (20%)	48/228 (21%)	0.9 (0.5 – 1.7)	0.8 (0.3 – 1.9)
Traded sex for money or drugs	18/91 (20%)	19/229 (8%)	2.7 (1.25 – 5.7)	1.7 (0.6 – 4.4)
Tattoo (any)	56/90 (62%)	128/227 (56%)	1.2 (0.7 – 2.1)	1.4 (0.7 – 2.9)
Blood/Blood products prior to 1992	3/22 (14%)	1/52 (2%)	8.0 (0.6 – 430.7)	9.2 (0.7 – 128.1)

*Adjusting for age > 40 years and injection drug use
^Adjusting for injection drug use only
‡ Adjusted for age > 40 years only

Abbreviations
Anti-HCV (EIA): Antibodies to hepatitis C virus using the enzyme immunoassay test

DISCUSSION

This project demonstrates the successful integration of viral hepatitis risk factor assessment, screening, counseling, and vaccination activities into a residential chemical dependency treatment program serving a high-risk urban AI/AN population.

Twenty-eight percent of the AI/AN patients tested at this urban residential chemical dependency treatment program had positive anti-HCV EIA test results. As our project was designed to improve clinical services at the residential chemical dependency treatment center, we caution its interpretation as a measure of overall or specific AI/AN population prevalence. Our results may not apply to other rural or urban AI/AN populations, or to other AI/AN chemical dependency treatment populations. Since our program was meant to provide initial screening only, we did not perform confirmation of anti-HCV EIA results and did not measure presence of serum HCV RNA. These further clinical tests were to be performed later, generally after discharge from the residential chemical dependency treatment program, as part of ongoing medical care.

As in other populations, injection drug use was the primary risk factor for presence of anti-HCV EIA in our patients. Nearly one-third of AI/AN patients who answered the risk assessment questions reported at least one episode of injection drug use, and 80% of those testing positive for anti-HCV

reported injection drug use. This contributes to the mounting evidence that injection drug use is the most important HCV risk factor in AI/AN people, as it is in other populations. Moreover, AI/AN may be more likely to use injection drugs than other populations (SAMHSA, 2007; Rutman, et al. 2008). Given the known disproportionate burden of chronic liver disease in AI/AN populations and the likely large contribution of HCV infection to this burden, reduction of chronic liver disease death rate in AI/AN people will require increased efforts around the prevention and treatment of chemical dependency.

Prior incarceration for more than one year also was independently associated with HCV infection among patients; this association remained significant after controlling for injection drug use and age. Studies have shown high rates of HCV among prison populations; of note however, is that previous incarceration is generally not considered an independent risk factor for HCV infection (CDC, 2007). One estimate indicated that 39% of all Americans with chronic HCV infections were released from jail or prison during the previous year (CDC, 2003). Some proportion of the risk attributed to incarceration may be due to underreporting of injection drug use by those incarcerated.

In most analyses, male gender is associated with increased prevalence of HCV (CDC, 2001; CDC, 2007; Neumeister, et al. 2007; Armstrong, et al. 2006), but we did not find this association in our project. In the general population, men are more likely than women to report a history of injection drug use, contributing to their higher rate of HCV infection (SAMHSA, 2007). Interestingly, among the patients admitted to the residential chemical dependency treatment program, women were somewhat more likely to report injection drug use than men (37.9% vs. 30.0%, p=.07). Again, the highly selected nature of our patient population should be considered when interpreting these results.

Immunity to hepatitis A virus - through vaccination or infection - was far from universal in this group of AI/AN adults (55%). Rates of hepatitis A infection have traditionally been high among AI/AN (CDC, 1999; CDC, 2007), but recent immunization efforts in these communities have drastically reduced the incidence of hepatitis A overall (Bialek, et al. 2004). This project demonstrated, however, that groups of high-risk AI/AN adults are being missed in these efforts and that on-going vaccination programs to reach them are still needed.

The majority of patients tested (70%) also showed susceptibility to hepatitis B infection, and would benefit from vaccination. The CDC currently recommends universal vaccination against hepatitis B for all children, and for high-risk adults (CDC, 2006). Evidence from this project indicates that this group of high-risk adults may be missed in current vaccination efforts, and targeted programs to reach them are still urgently needed. Based on the findings from this project, hepatitis A and hepatitis B vaccine delivery in settings such as a residential treatment center is an effective strategy to reduce the likelihood of incident viral hepatitis in these high-risk patients.

In addition to the HCV testing limitations discussed, other limitations need to be considered when interpreting findings. We were not able to screen and conduct risk factor assessments on every patient admitted into Thunderbird Treatment Center, therefore non-participants may differ than those who participated in the activities. Other similar facilities could improve upon this percentage by having a clear system in place which assures that the risk factor screening assessment occurs at the same time as the intake.

Of note, due to the length of stay in treatment, most patients did not complete the full series of the hepatitis A and hepatitis B vaccination. However, one of the strengths of the project was the success of capturing high-risk patients for a first dose of vaccine, as even one dose has been shown to be beneficial. Another limitation was that before 2006, no information about year of blood transfusion was collected; thus we had to omit this variable from our analysis for patients reporting transfusion before 2006. Finally, as stated earlier, all results presented here may not apply to AI/AN

participating in other chemical dependency treatment programs.

Interest in viral hepatitis prevention services was high among patients at this residential chemical dependency treatment center, and most chose to accept either vaccination and/or testing when offered. It is important to connect chemical dependency and clinical services in high-risk populations such as ours, and this project showed that integration was possible and successful. Our serology results showed an unmet need for hepatitis A and B vaccination on patient entry, and suggest that a strategy of vaccine delivery without pre-vaccination testing may be the most appropriate one for this and similar settings where at-risk patients will be served. Chemical dependency treatment centers serving urban AI/AN are excellent locations in which to implement viral hepatitis prevention programs, and can contribute directly to ongoing efforts to reduce the disparate impact of chronic liver disease among AI/AN populations.

FOOTNOTES

Conflicts of interest: The authors report no commercial associations that might pose a conflict of interest.

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Meetings: This work was presented at the National Viral Hepatitis Prevention Conference, December 7, 2005, Washington DC, the Urban Indian Health Conference, August 2006 and August 2, 2007, Seattle, Washington, the American Public Health Association Annual Meeting, November 2006, Boston, Massachusetts, and the 2nd National Conference on Methamphetamine, HIV, and Hepatitis Conference, February 2, 2007, Salt Lake City, Utah.

Disclaimer: The findings, conclusions, and opinions expressed in this paper are those of the authors and do not necessarily reflect the views of the Centers for Disease Control and Prevention or the Indian Health Service.

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REFERENCES

Armstrong, G.L., Wasley, A., Simard, E.P., McQuillan, G.M., Kuhnert W.L., Alter, M.J. (2006). The Prevalence of Hepatitis C Virus Infection in the United States, 1999 through 2002. *Annals of Internal Medicine, 144*(10), 705-714.

Bialek, S.R., Redd, J.T., Lynch, A., Vogt, T., Lewis, S., Wilson, C., Bell, B.P. (2008). Chronic liver disease among two American Indian patient populations in the southwestern United States, 2000-2003. *Journal of Clinical Gastroenterology, 42*(7), 849-854.

Bialek, S.R., Thoroughman, D.A., Hu, D., Simard, E.P., Chattin, J., Cheek, J., Bell, B.P. (2004). Hepatitis A incidence and hepatitis A vaccination among American Indians and Alaska Natives, 1990-2001. *American Journal of Public Health, 94*(6), 996-1001).

Buffington, J., Jones, T.S. (2007). Integrating viral hepatitis prevention into public health programs serving people at high risk for infection: Good public health. *Public Health Reports, Supplement 2*(122), 1-5.

Centers for Disease Control and Prevention. Surveillance for acute viral hepatitis – United States, 2007. *MMWR* 2009:58(SS03): 1-27.

Centers for Disease Control and Prevention. Surveillance for acute viral hepatitis – United States, 2005. *MMWR* 2007:56(SS03): 1-24.

Centers for Disease Control and Prevention. A comprehensive immunization strategy to eliminate transmission of hepatitis B virus infection in the United States; Recommendations of the Advisory Committee on Immunization Practices (ACIP) Part II: Immunization of adults. *MMWR* 2006:55(No.RR-16): 1-25.

Centers for Disease Control and Prevention. Prevention of hepatitis A through active or passive immunization: Recommendations of the Advisory Committee on Immunization Practices. *MMWR* 1999:48(No.RR-12): 1-37.

Centers for Disease Control and Prevention (Summer 2001). A comprehensive strategy for the prevention and control of hepatitis C virus infection and its consequences. Available at http://www.cdc.gov/hepatitis/HCV/Strategy/PDFs/NatHepCPrevStrategy.pdf Accessed 28 January 2011.

Centers for Disease Control and Prevention. Interpretation of hepatitis B serologic test results. Available at http://www.cdc.gov/hepatitis/HBV/PDFs/SerologicChartv8.pdf. Accessed 28 January 2011.

Centers for Disease Control and Prevention. Prevention and control of infections with hepatitis viruses in correctional settings. *MMWR* 2003:52(No.RR01): 1-33.

Gunn, R.A, Lee, M.A., Callahan, D.B., Gonzales, P., Murray, P.J., Margolis, H.S. (2005). Integrating hepatitis, sexually transmitted diseases (STD), and HIV services into a drug rehabilitation program. *American Journal of Preventive Medicine, 29*(1)27-33.

Hagedorn, H., Dieperink, E., Dingmann, D., Durfee, J., Ho, S., Isenhart, C., Rettmann, N., Willenbring, M. (2007). Integrating hepatitis prevention Services into a substance use disorder clinic. *Journal of Substance Abuse Treatment, 32*, 391-398.

Neumeister, A., Pilcher, L.E., Erickson, J.M., Langley, L.L., Murphy, M.M., Haukass, N.M., Mailliard, M.E., Larsen, J.L. (2007). Hepatitis C prevalence in an urban Native-American clinic: A prospective screening study. *Journal of the National Medical Association, 99*(4), 389-392.

Norton, H.E, Redd, J.T, Bryan, R.T. (2009). Hepatitis C Diagnoses in an American Indian Primary Care Population. *Journal of Health Disparities Research and Practice, Fall;3*(2), 59-66.

Rutman, S., Park, A., Castor M.L., Taualii, M., Forquera, R. (2008). Urban American Indian and Alaska Native Youth: Youth Risk Behavior Survey 1997-2003. Maternal Child Health Journal, 12(Suppl 1), 76-81.

Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (January 19, 2007). *The NSDUH Report: Substance Use and Substance Use Disorders among American Indians and Alaska Natives*. Rockville, MD.

Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (July 19, 2007). The NSDUH Report: *Demographic and Geographic Variations in Injection Drug Use.* Rockville, MD.

Vong, S., Bell, B.P. (2004). Chronic liver disease mortality in the United States, 1990-1998. *Hepatology, 39*(2), 476-483.

Wilson, C. (2004). Hepatitis C infection and type 2 diabetes in American-Indian women. *Diabetes Care, 27*(9):2116-2119.

Shelly Huffman, MPH, CHES
Seattle Indian Health Board, Urban Indian Health Institute, Seattle, WA

Rachel Brucker, MPH, RN
Seattle Indian Health Board, Urban Indian Health Institute, Seattle, WA

John T. Redd, MD, MPH, FACP
Division of Viral Hepatitis, US Centers for Disease Control and Prevention, Atlanta, GA
Division of Epidemiology and Disease Prevention, US Indian Health Service, Albuquerque, NM

Maile Taualii, PhD, MPH
Native Hawaiian Epidemiology Center, Honolulu, HI
Seattle Indian Health Board, Urban Indian Health Institute, Seattle, WA

Cecile M. Town, MPH
Immunization Services Division, National Center for Immunization and Respiratory Diseases, US Centers for Disease Control and Prevention, Atlanta, GA
Division of Epidemiology and Disease Prevention, US Indian Health Service, Albuquerque, NM

Mei L. Castor, MD, MPH
Division of Epidemiology and Disease Prevention, US Indian Health Service, Albuquerque, NM

Crystal C. Tetrick, MPH
Seattle Indian Health Board, Urban Indian Health Institute, Seattle, WA

Ralph Forquera, MPH
Seattle Indian Health Board, Urban Indian Health Institute, Seattle, WA

Joanna Buffington, MD, MPH
Division of Viral Hepatitis, US Centers for Disease Control and Prevention, Atlanta, GA
Global Immunization Division, US Centers for Disease Control and Prevention, Atlanta, GA

Please address reprints to the corresponding author:
Crystal Tetrick, MPH,
Seattle Indian Health Board, Urban Indian Health Institute
PO Box 3364, Seattle, WA 98114
Phone: 206-812-3030, Fax: 206-812-3044
info@uihi.org