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Nursing Case Management, Peer Coaching, and Hepatitis A and B Vaccine Completion Among Homeless Men Recently Released on Parole: Randomized Clinical Trial

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Abstract

Background—Although hepatitis A virus (HAV) and hepatitis B virus (HBV) infections are vaccine-preventable diseases, few homeless parolees coming out of prisons and jails have received the hepatitis A and B vaccination series.

Objectives—The study focused on completion of the HAV and HBV vaccine series among homeless men on parole. The efficacy of three levels of peer coaching and nurse-delivered interventions was compared at 12-month follow up: (a) intensive peer coaching and nurse case management (PC-NCM); (b) intensive peer coaching (PC) intervention condition, with minimal nurse involvement; and a (c) usual care (UC) intervention condition, which included minimal PC

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and nurse involvement. Further, we assessed predictors of vaccine completion among this targeted sample.

Methods—A randomized control trial was conducted with 600 recently paroled men to assess the impact of the three intervention conditions (PC-NCM vs. PC vs. UC) on reducing drug use and recidivism; of these, 345 seronegative, vaccine-eligible subjects were included in this analysis of completion of the Twinrix HAV/HAB vaccine. Logistic regression was added to assess predictors of completion of the HAV/HBV vaccine series and chi-squared analysis to compare completion rates across the three levels of intervention.

Results—Vaccine completion rate for the intervention conditions were 75.4% (PC-NCM), 71.8% (PC), and 71.9% (UC) ($p =. 78$). Predictors of vaccine noncompletion included being Asian and Pacific Islander, experiencing high levels of hostility, positive social support, reporting a history of injection drug use, being released early from California prisons, and being admitted for psychiatric illness. Predictors of vaccine series completion included reporting six or more friends, recent cocaine use, and staying in drug treatment for at least 90 days.

Discussion—Findings allow greater understanding of factors affecting vaccination completion in order to design more effective programs among the high-risk population of men recently released from prison and on parole.

Keywords

With 1.6 million men and women behind bars, the United States (U.S.) has one of the largest numbers of incarcerated persons when compared to other nations (Pew Charitable Trusts, 2008). In California, over 130,000 are in custody and over 54,000 are on parole (California Department of Corrections and Rehabilitation, 2013b). Incarcerated populations are at significant risk for homelessness. When compared to the general population, those who were in jail were more likely to be homeless (Greenberg & Rosenheck, 2008). In one study, homeless inmates were more likely to have past criminal justice system involvement for both nonviolent and violent offenses, to have mental health and substance abuse problems, and a lack of personal assets (Greenberg & Rosenheck, 2008).

Globally, incarcerated populations encounter a host of public health care issues; two such issues—hepatitis A virus (HAV) and hepatitis B virus (HBV) diseases—are vaccine preventable. In addition, viral hepatitis disproportionately impacts the homeless due to increased risky sexual behaviors and drug use (Stein, Andersen, Robertson, & Gelberg, 2012), along with substandard living conditions (Hennessey, Bangsberg, Weinbaum, & Hahn, 2009). Other risk factors include, but are not limited to, injection drug use (IDU), alcohol use and older age, which place the population at risk for being seropositive (Stein et al., 2012).

As a member of the hepatovirus family, HAV is primarily transmitted via the fecal-oral route (Zuckerman, 1996). The rate of acute hepatitis in the US is 0.5 per 100,000 (Centers for Disease Control and Prevention, 2010). While the rate among paroled populations is hard

to ascertain, data suggest that HAV infection is related to unsanitary living conditions, i.e., poor water sanitation (World Health Organization, 2014), for which homeless populations are at risk.

A member of the hapdnavirus family, HBV (Immunization Action Coalition, 2013; Zuckerman, 1996) disproportionately burdens homeless (Nyamathi, Liu, et al., 2009; Nyamathi, Sinha, Greengold, Cohen, & Marfisee, 2010) and incarcerated populations (Immunization Action Coalition, 2013; Khan et al., 2005), leading to fulminant liver failure, chronic liver disease, hepatocellular carcinoma, and death (Rich et al., 2003). HBV can be transmitted through unprotected sexual activity, needle sharing, IDU (Diamond et al., 2003; Maher, Chant, Jalaludin, & Sargent, 2004), and percutaneous blood exposure. National prevalence statistics indicate that HBV affects between 13% to 47% of U.S. prison inmates (Centers for Disease Control and Prevention, 2004). Illicit drug use is a major contributor to incarceration and homelessness among ex-offenders (McNeil & Guirguis-Younger, 2012; Tsai, Kasprow, & Rosenheck, 2014), placing ex-offenders who use drugs at high risk for HBV infection.

Despite the availability of the HBV vaccine, there has been a low rate of completion for the three-dose core of the accelerated vaccine series (Centers for Disease Control and Prevention, 2012). Among incarcerated populations, HBV vaccine coverage is low; in a study among jail inmates, 19% had past HBV infection, and 12% completed the HBV vaccination series (Hennessey et al., 2009). While HBV vaccination is well accepted behind bars—due to a lack of funding and focus on prevention as a core in the prison system—few inmates may complete the series (Weinbaum, Sabin, & Santibanez, 2005). In addition, prevention may not be a priority for those who are struggling with managing mental health, drug use, and dependency issues, along with the need to meet basic necessities (Nyamathi, Shoptaw, et al., 2010). Authors contend that while the HBV vaccine is cost effective, it is underutilized among high-risk (Rich et al., 2003) and incarcerated populations (Hunt & Saab, 2009).

For homeless men on parole, vaccination completion may be affected by level of custody; generally, the higher the level of custody, the higher the risk an inmate poses. In addition, various contract types, such as drug treatment-related, and length of time in residential drug treatment (RDT)—for those with drug histories—may also affect completion of the vaccine series. For those transitioning into the community, stress, family reunification issues, and the potential for relapse and recidivism may represent real challenges (Seiter & Kadela, 2003), and may influence vaccine completion.

Until 1981, the HBV vaccine was not licensed in the U.S. (Centers for Disease Control and Prevention, 2012). Twenty years later, in 2001, a combination of the HAV and HBV vaccine, *Twinrix*, was developed by GlaxoSmithKline and approved by the Food and Drug Administration (FDA) (Centers for Disease Control and Prevention, 2012). The standard dosing for this regimen is 0, 1, and 6 months. An alternative dosing schedule (core doses at 0, 7, and 21–31 days and a booster dose 12 months) was approved by the FDA in 2007 (Centers for Disease Control and Prevention, 2012). Thus, many individuals, particularly older individuals, may not have been vaccinated.

One strategy to improve vaccination for HAV and HBV among high-risk populations has been to utilize the accelerated Twinrix HAV/HBV vaccination which provides the core doses at 0 days, 7 days, and 21–30 days (Nyamathi, Liu, et al., 2009). The Twinrix recombinant vaccination is administered intramuscularly (GlaxoSmithKline, 2011) by a licensed nurse. In a randomized controlled trial (RCT) comparing vaccination completion among incarcerated IDUs in Denmark—using the accelerated versus a standard vaccine schedule (0, 1 and 6 months)—63% completed the three accelerated dose series compared to 20% of those who received the nonaccelerated series (Christensen et al., 2004). In another RCT conducted among 297 homeless adults with a history of incarceration, findings revealed that 50% completed the Twinrix vaccine series. Logistic regression analysis revealed that those who were more likely to complete the HBV vaccination were over 40 years of age ($p = .02$), partnered ($p = .02$), homeless more than one year ($p = .025$), recent binge drinkers ($p = .03$), and had attended recent alcohol anonymous or narcotic anonymous meetings ($p = .006$) (Nyamathi, Marlow, Branson, Marfisee, & Nandy, 2012). In another RCT focused on improving HAV/HBV vaccine completion among 256 homeless adults who were on methadone maintenance, a greater percentage of participants who completed the vaccine series also reduced their alcohol consumption by 50% as compared to those who were unsuccessful in reducing their alcohol consumption (74.4% vs. 64.1%) (Nyamathi, Shoptaw, et al., 2010).

Finally, in a larger, three-group RCT with 865 homeless adults in shelters located in Los Angeles, individuals were randomly assigned to one of three groups: (a) nurse case managed sessions plus hepatitis education, incentives, and tracking; (b) standard hepatitis education plus incentives and tracking; and (c) standard hepatitis education and incentives only. Findings reveal that those who were in the nurse case management education, incentives, and tracking program were significantly more likely to complete a standard three-series Twinrix vaccination or core of the accelerated dosing schedule (68% vs. 61% vs. 54%, respectively; $p = .01$) compared to those who were in the other two programs (Nyamathi, Liu, et al., 2009). While accelerated vaccination programs have shown success in RCT studies, including those utilizing nurse case management, little is known about vaccine completion among an ex-offender population using varying intensities of nurse case management and peer coaches.

Theoretical Framework

The comprehensive health seeking and coping paradigm (CHSCP) (Nyamathi, 1989), adapted from a coping model (Lazarus & Folkman, 1984) and the health seeking and coping paradigm (Schlotfeldt, 1981) guided this study and the variables selected (See Figure 1.). The CHSCP has been successfully applied by our team to improve our understanding of HIV and HBV/HCV protective behaviors and health outcomes among homeless adults (Nyamathi, Liu, et al., 2009)—many of whom had been incarcerated (Nyamathi et al., 2012).

In this model, a number of factors are thought to relate to the outcome variable, completion of the HAV/HBV vaccine series. These factors include sociodemographic factors, situational, personal, and social factors, and health seeking and coping responses.

Sociodemographic factors that might relate to completion of the vaccine series among incarcerated populations include age, education, race/ethnicity, and marital and parental status (Hennessey, Kim, et al., 2009; Salem et al., 2013). Situational factors such as being homeless (Nyamathi et al., 2012), history of criminal activities, and severity of criminal history (level of custody and contract type) may likewise influence interest in completing a vaccination series. Similarly personal factors, such as history of psychiatric and drug use problems (Hennessey, Kim, et al., 2009; Salem et al., 2013), having hostile tendencies (Nyamathi et al., 2014), or dealing with physical and mental health problems (Nyamathi et al., 2011) may interfere with health protective strategies while having social factors present, such as social support, may facilitate health promotion. Finally, health seeking and coping strategies may also be known to impact health promotion (Nyamathi, Stein, Dixon, Longshore, & Galaif, 2003) and compliance with hepatitis vaccine completion.

Purpose

Despite knowledge of awareness of risk factors for HBV infection, intervention programs designed to enhance completion of the three-series Twinrix HAV/HBV vaccine and identification of prognostic factors for vaccine completion have not been widely studied. The purpose of this study was to first assess whether seronegative parolees previously randomized to any one of three intervention conditions were more likely to complete the vaccine series, as well as to identify the predictors of HAV/HBV vaccine completion.

Methods

Design

An RCT where 600 male parolees from prison or jail and participating in a RDT program were randomized into one of three intervention conditions aimed at assessing program efficacy on reducing drug use and recidivism at six and 12 months, as well as vaccine completion in eligible subjects: (a) six-month intensive peer coaching and nurse case management (PC-NCM) intervention condition; (b) an intensive peer coaching (PC) intervention condition, with minimal nurse involvement; and (c) the usual care (UC) intervention condition, which had minimal PC and nurse involvement. Of these 600, 345 were eligible for the vaccine (seronegative) and constitute the sample for this report. Data were collected from February 2010 to January 2013. The study was approved by the University of California, Los Angeles Institutional Review Board and registered with Clinical Trials.gov (NCT01844414).

Sample and Site

There were four inclusion criteria for recruitment purposes in assessing program efficacy on reducing drug use and recidivism: (a) history of drug use prior to their latest incarceration; (b) between ages of 18 and 60; (c) residing in the participating RDT program; and (d) designated as homeless as noted on the prison or jail discharge form. A homeless individual was defined as one who does not have a fixed, regular, and adequate nighttime residence (National Health Care for the Homeless Council, 2014). Exclusion criteria included: (a) monolingual speakers of languages other than English or Spanish; and (b) persons judged to

be cognitively impaired by the research staff. A total of 42 men were screened out due to the following reasons: age, not being on parole, had not been released from jail or prison within six months prior to entering the study, or had not used drugs 12 months prior to their most recent incarceration. Eligibility for receiving the HAV/HBV vaccine series was not considered an inclusion criterion regarding drug use and recidivism. Among those eligible and interested, urn randomization (Stout, Wirtz, Carbonari, & Del Boca, 1994) was used to allocate participants. The variables used in the urn randomization included: age (18–29 and 30 and over), level of custody (1–2 vs. 3–4), HBV vaccine eligibility (HBV seronegative or seropositive), and level of substance use prior to prison time (low vs. moderate/high severity). For the present analysis, only vaccine-eligible subjects were included.

Amistad De Los Angeles (Amity) served as the main research site. For the last three decades, Amity, a nonprofit organization located in California, Arizona, and New Mexico has been focused on substance abuse treatment, and works with individuals and families (Amity Foundation, 2014) utilizing a therapeutic environment.

The State of California Assembly passed criminal justice realignment legislation (AB109) on October 1, 2011 allowing low-level offenders (non-violent, non-serious and non-sex offenders) to serve their sentence in county jails instead of state prisons (California Department of Corrections and Rehabilitation, 2011). Post-realignment offenders were more likely to be convicted of a felony for drug and property crimes (California Department of Corrections and Rehabilitation, 2013a).

Power analysis—With at least 114 men in each intervention condition, there was 80% power to detect differences of 15 to 20 percentage points (for example, 50% vs. 70%, 75% vs. 90%) for vaccine completion between either of the two intervention conditions, and the usual care intervention condition at $p = .05$.

Vaccine eligibility—Vaccine eligibility included being HBV seronegative and no absolute contraindications (having an allergy to yeast or neomycin, history of neurological disease [e.g., Guillian-Barre]), prior anaphylactic reaction to HAV/HBV vaccine, a fever of over 100.5 degrees Fahrenheit, and reporting any moderate or severe acute illness beyond mild cold symptoms (e.g., nonproductive cough, rhinorrhea, or other upper respiratory symptoms). Of the total sample of 600 study participants, 345 men were eligible for the HAV/HBV vaccine. Figure 2 (CONSORT diagram) reflects both the larger sample and the subsample of vaccine eligible participants.

Interventions

Building upon previous studies, we developed varying levels of peer-coached and nurse-led programs designed to improve HAV/HBV vaccine receptivity at 12-month follow up among homeless offenders recently released to parole.

Peer coaching–nurse case management (PC-NCM)—The peer coach interacted weekly for about 45 minutes with their assigned participants in person, and for those who left the facility, interacted by phone. Their focus was on building effective coping skills, personal assertiveness, self-management, therapeutic nonviolent communication (NVC), and

self-esteem building. Attention was given to supporting avoidance of health-risk behaviors, increasing access to medical and psychiatric treatment and improving compliance with medications, skill-building, and personal empowerment. Discussions also centered on strategies to assist in seeking support and assistance from community agencies as parolees prepare for completion of the drug treatment program. Integrated throughout, skill building in communication and negotiation and issues of empowerment were highlighted.

Peer coaches were also trained to deliver nonviolent communication (NVC), the goal of which was to increase participants' mastery of empathic communication skills via a specific process. The intervention comprised a series of interactive exercises and role playing, based on conflict in social situations, as identified by the participants. In our study, peer coaches were former parolees who successfully completed a similar RDT program; as paraprofessionals, they were positive role models with whom the parolees could identify and have successfully reintegrated into society. The peer coachers were selected based on having excellent social skills and found joy helping recent parolees to be successful. The assigned coach worked with up to 15 parolees at any given time. The coaches in the PC-NCM and PC intervention conditions were trained in: (a) understanding the needs and challenges faced by parolees discharged to the community; (b) gaining information about the resources that are available in the community; and (c) normalizing parolee experiences, setting realistic expectations and helping the parolee to problem solve with day-to-day events and build on strengths. The training period for coaches took about one month and consisted of mock role plays of coaching sessions—with many simulations of problematic and challenging participants and situations.

Case management, provided by a dedicated nurse (about 20 minutes) was delivered in a culturally competent manner weekly over eight consecutive weeks. Case management focused on health promotion, completion of drug treatment, vaccination compliance, and reduction of risky drug and sexual behaviors. Furthermore, the nurse engaged participants in role-playing exercises to help them identify potential barriers to appointment keeping, and asked them to identify personal risk triggers that may hinder vaccine series completion, and successful HAV, HBV, HCV, and HIV risk reduction. Nurses were trained by experts in nurse case management, hepatitis infection and transmission, and barriers which impede HAV/HBV vaccination.

Peer coaching (PC)—Participants assigned to the PC intervention condition received weekly peer coaching interaction similar to the PC component of the NCM-PC intervention condition. However, while nurse case management was not included, an intervention-specific nurse encouraged the HAV/HBV vaccination and provided a brief 20-minute education session on hepatitis and HIV risk reduction.

Usual care (UC)—Participants assigned to the UC intervention condition received the encouragement by a nurse to complete the three series HAV/HBV vaccine. In addition, they received a brief 20-minute session by a peer counselor about health promotion. They did not receive any intensive peer coaching sessions or nurse case management sessions.

At the RDT site, all participants received recovery and rehabilitation services traditionally delivered for the parolee population, such as residential substance abuse services, assistance with independent living skills, job skills assistance, literacy, individual, group (small and large) and family counseling, and coordinated discharge planning. Residents receive highly structured curriculum and aftercare services in this generally six-month, 24-hour per day, and seven-day per week community. All coordination for services took place through the efforts of the in-prison treatment staff, RDT community-based staff, and the parole office.

Procedure

This RCT was conducted in a setting close to the one participating RDT program from which all participants were enrolled. Posted flyers announced the study to all incoming residents, and research staff visited the RDT frequently to respond to questions and provide information in group sessions and individually to those interested in a private location in the RDT setting. Among interested participants, an informed consent was signed that allowed the research staff to administer a brief screening questionnaire to assess eligibility criteria. Among participants who met eligibility criteria, a second informed consent allowed administration of a baseline questionnaire; a detailed locator guide allows participants to fill out contact information, addresses and phone numbers in order for research staff to follow up.

Vaccine administration—After pretest counseling, the research nurses collected serum for testing HBV, HCV, and HIV (hepatitis B core antibody, hepatitis B surface antibody, hepatitis C antibody, and human immunodeficiency virus antibodies) and provided test results one week later. Based upon the HBV test result, participants were educated regarding the timeline for the HAV/HBV vaccine series, provided consent regarding administration, were inoculated intramuscularly using three doses of the Standard Twinrix (Hepatitis A Inactivated and Hepatitis B Recombinant Vaccines) for the accelerated dosing schedule of 0 days, 7 days, and 21–30 days. The recommended series of three intramuscular injections of 1.0 ml of Twinrix was administered in the deltoid muscle of the nondominant arm. All eligible study participants were encouraged to accept the HAV/HBV vaccine; however, this was not coercive. The nurse documented refusal for vaccination.

Vaccine tracking—On a weekly basis, the research nurse or peer coach reviewed the vaccine dosing and tracked progress. In order to encourage participants to complete the vaccine series, participants were reminded regarding their next dose by the nurse or peer coach and provided appointment cards. Further, they were called if not present any longer at the RDT facility as a reminder. A detailed locator guide, completed by the participant and interviewer, supported follow up to be successful. Information included contact information to be used by the research staff for vaccine scheduling, as well as administration of structured questionnaires at six- and 12-month follow up.

Measures

Vaccine completion—Receipt of three core doses on the accelerated schedule was considered completion. This was assessed by the vaccine tracking system.

Sociodemographics—Sociodemographic information was collected by a structured questionnaire assessing age, education, race/ethnicity, marital status, and parental status.

Situational factors—included being homeless, history of criminal activity and severity, of criminal history such as level of custody and contract type. Contract type was measured by asking participants whether they were in custody drug treatment program (ICDTP), residential multiservice center (RMSC), or parolee substance abuse program (SAP). Time in RDT was assessed by the total time participants resided at the RDT study site after discharge from jail/prison to RDT placement. RDT site was dichotomized at the median of 90 days for analysis.

Personal factors—Personal factors included drug, alcohol, and tobacco use. A modified version of the Texas Christian University (TCU) Drug History form (Simpson & Chatham, 1995) was used to measure use six months preceding the latest incarceration. Information regarding the frequency of use of alcohol, tobacco, and seven other drugs was collected, allowing us to review the use of these drugs and selected combinations of these drugs in terms of use by injection and orally, as well as to extract information about lifetime drug and alcohol use.Anglin et al. (1996) have verified the reliability and validity of this format. History of hospitalization for psychiatric and substance use problems, and past treatment for alcohol or drug problems (number of times in formal treatment for alcohol and for drugs) was also obtained.

General health was assessed by a single item which asked participants to rate their overall health on a five-point scale (Stewart, Hays, & Ware, 1988). Responses included poor, fair, good, very good, and excellent—with a higher score indicating better perceived health. General health was dichotomized at fair/poor versus good/very good/excellent.

Hostility was measured by the five-item hostility subscale of the Brief Symptom Inventory (Derogatis & Melisaratos, 1983), in which participants rated the extent to which they have been bothered (0 = *not at all* to 4 = *extremely*) by selected issues. Cronbach's alpha for the hostility scale in this sample was .81. The cut-point for hostility was the upper quartile of 2. Depressive symptoms were assessed by the 10-item, short form of the Center for Epidemiological Studies Depression scale (CES-D; Radloff, 1977), which was previously used to assess depressive symptoms in homeless populations (Nyamathi, Christiani, Nahid, Gregerson, & Leake, 2006; Nyamathi et al., 2008). The 10-item, self-report CES-D questionnaire measures the frequency of 10 depressive symptoms in the past week on a 4-point response scale from 0 = *rarely* or *none of the time (less than 1 day)* to 3 = *all of the time (5–7 days).* Scale scores range from 0 to 30, with higher scores indicating greater severity of depressive symptoms. Reliability in this sample was .80.

Social factors—Social factors included ever having been removed from their parents as children and having spent time in juvenile hall. In addition, social support was measured by the Medical Outcomes Study (MOS) Social Support Survey (Sherbourne & Stewart, 1991). This 18-item scale includes four subscales: emotional support (eight items, reliability in this sample .95), tangible support (three items, reliability .88), positive support (three items, reliability .89), and affective support (three items, reliability .90). Items had 5-point, Likert-

type response options ranging from 1 = *none of the time* to 5 = *all of the time*. Responses were summed for subscale formation with higher scores indicating more support. Respondents were also asked how many close friends they had outside of prison, which was dichotomized at the upper quartile of 6 for analysis.

Health seeking and coping were captured by history of drug use and treatment style, as well as coping. The Carver Brief Cope instrument (Carver, 1997) was used to measure six dimensions. Coping were assessed with two items for each; planning, instrumental support, religious, disengagement, denial, and self-blame. Item responses ranged from 1 = *I do not do this at all* to 4 = *I do this a lot*. Coping subscales were dichotomized at their medians for analysis.

Data Analysis

Sample characteristics were described with frequencies and percentages or means, and standard deviations and continuous variables were evaluated for normality. Due to highly skewed distributions that were not resolved by transformations, some variables had to be categorized for analysis. Associations of sample characteristics with intervention condition and vaccine noncompletion were assessed with chi-squared tests or analysis of variance (ANOVA) and two-sample tests. Since IDU may have confounded the relationship between intervention condition and vaccine noncompletion, we examined the impact of intervention condition on vaccine noncompletion controlling for IDU using multiple logistic regression analysis. The model contained IDU and dummy variables for each intervention condition; the only significant predictor of noncompletion was IDU (p-values for the PC-NCM and PC intervention conditions were .70 and .79, respectively).

In examining other potential predictors of vaccine noncompletion, we emphasized noncompletion since individuals who did not complete the vaccine series are the ones who need to be targeted for future interventions. Variables that were related to vaccine noncompletion at the .10 level in unadjusted analyses were used as predictors in multiple logistic regression modeling of noncompliance. Although the overall significance level for race/ethnicity did not meet this inclusion criterion, it was included in the modeling because subgroupings (African American, "'other' race/ethnicity") did so. Predictors that were not significant at the .10 level were removed one by one in descending order of significance. The final model was checked for multicollinearity and the Hosmer-Lemeshow test was used to assess model goodness of fit.

Results

In terms of sociodemographic characteristics, the 345 participants who were eligible for the HAV/HBV vaccine reported a mean age of 42.0 ($SD = 9.5$) and were predominantly African American (51%) or Latino (31%), as shown in Table 1. The small subsample of men from "other" ethnicities comprised mostly Asian-Americans and Pacific Islanders. The mean education was 11.6 ($SD = 1.4$). Over half of the participants had never been married (59%). The distribution of participant characteristics was similar across the three intervention conditions.

Vaccine Completion Rates by Intervention Condition

In total, there were 345 individuals who were eligible for the Twinrix recombinant vaccine (NCM-PC: n = 114; PC: n = 117; and UC: n = 114). The vaccine completion rate for three or more doses was 73% among all three intervention conditions. Using chi-squared tests (group × vaccine completion), findings revealed no differences in vaccine completion across groups (p = .780); PC-NCM: n = 86 [75.4%]; PC: n = 84 [71.8%]; and UC: n = 82 [71.9%]).

Associations With Vaccine Noncompletion

A number of social, personal, coping, and situational factors were found to be related to vaccine noncompletion (Table 2). In particular, having six or more friends and high instrumental coping were related to vaccine completion, while having been taken away from parents or spending time in juvenile hall were related to noncompletion. A history of alcohol treatment was associated with vaccine completion while having been hospitalized for mental health problems was related to noncompletion. In terms of drug use, cocaine use within six months prior to the last incarceration was associated with vaccine completion, while the opposite was true for IDU ever. Being HCV positive was also associated with not completing the vaccine series. No association was found between vaccine noncompletion and childhood physical abuse, whereas a very weak association was found with childhood sexual abuse.

Finally, those who were released following prison realignment and those tested positive for HCV at baseline were both related to vaccine noncompletion. Those who spent 90 days or more in a residential drug treatment facilities following release were more likely to complete the vaccine series. On the other hand, incarceration location (prison vs. jail) and contract type had no relationship with vaccine completion, as shown in Table 2.

Table 3 presents the findings of logistic regression analysis. Asian/Pacific Islander ethnicity (compared to White), higher levels of hostility, higher levels of positive social support, and history of IDU were related to vaccine noncompletion. Moreover, having been admitted for a psychiatric illness was related to noncompletion of the HAV/HBV vaccine. Alternatively, reporting six or more friends was a protective factor. Any alcohol treatment in the past and recent cocaine use were also found to be related to vaccine completion. Being part of post-realignment was related to vaccine noncompletion, whereas having been in RDT for at least 90 days was a strong predictor of completion. Although there were no multicollinearity problems, and the zero-order correlation between having six or more friends and positive social support was low (.23), we performed sensitivity analyses alternatively dropping one and then the other variable from the regression model. The direction of the effect of the social support variable that remained in the model did not change, but the significance was no longer below the $p < .05$ level.

Discussion

Although homeless men on parole from California jails and prisons are at high risk for Hepatitis A and B infection (Weinbaum et al., 2005), few studies have focused on improving HAV/HBV vaccination completion for this population. This paper presents findings of

varying levels of peer coaching and nurse-delivered intervention that encouraged all participants—regardless of intervention condition assignment—to complete the three-series HAV/HBV accelerated Twinrix vaccine among those eligible. While no treatment differences were found in terms of vaccine completion rates—due to the bundled nature of the programs—it is not possible to say whether the peer coaching or nurse-delivered intervention resulted in the overall successful 73% completion rate of the three series vaccine. Clearly, an intensive nurse case management approach did not necessarily result in a greater vaccine completion rate for the PC-NCM intervention condition. Further, regardless of level of interaction by peer coaches or nurses, encouragement of vaccine completion was helpful across all intervention conditions (PC-NCM vs. PC vs. UC). However, we must acknowledge that more than one quarter (27%) did not complete the vaccine series, despite being informed of their risk for HBV infection.

The fact that Asian American/Pacific Islander (AA/PI) ethnicity was found to be related to noncompletion of the HAV/HBV vaccine is novel. Minimal work has been done understanding vaccination compliance among various races and ethnicities within homeless populations. AA/PIs are a large umbrella group composed of many subgroups; thus, it is somewhat challenging to decipher why AA/PIs had a higher level of noncompletion. However, in one study focused on ethnic-specific influences and barriers among AA/PI children, speaking limited English at home, length of time in the U.S., and not discussing HBV vaccination with a healthcare provider were found to be barriers to vaccination (Pulido, Alvarado, Berger, Nelson, & Todoroff, 2001). Despite these findings, the authors contended that greater understanding of nuances between groups is necessary to understand barriers (Pulido et al., 2001).

Interestingly, this was not the case for African Americans or Hispanics. In one study, understanding psychosocial predictors of HAV/HBV vaccination among young African American men in the south ($N = 143$), data reveal that increased vaccination was related to decreased barrier perception, increased perceived medical severity, and perceived barriers of HBV infection (Rhodes & Diclemente, 2003).

High levels of hostility and having a history of psychiatric hospitalization were likewise related to noncompletion of the HAV/HBV vaccine series. Adequate assessment of psychiatric comorbidity may be necessary to improve HAV/HBV vaccine completion by helping individuals to contend with hostility. Further, adequate mental health referral may enable homeless ex-offenders to improve vaccine receipt. Future intervention work should focus on reducing hostility by providing additional group sessions that may aid in managing the hostility and, ultimately, increasing vaccine receptivity. Furthermore, anger management has been shown to likewise result in improved outcomes such as sustained reduction in feeling of anger and physical aggression (Wilson et al., 2013), and improved behavioral and cognitive coping mechanisms (Tang, 2001).

A history of IDU was also related to vaccine noncompliance. For those struggling with drug and alcohol addiction, prevention of infection may not be a high priority as meeting the challenges of overcoming addiction becomes paramount. Despite these findings, recent cocaine use was found to be related to vaccine completion. It may be that cocaine was not

used heavily or that it served as a proxy for unmeasured variables associated with vaccine completion. Daily crack users were less likely to initiate the HBV vaccine series (Ompad et al., 2004). In this study, however, men who refused the vaccine were counted as not having completed it.

Increased social support in terms of self-report of having six or more friends was a protective factor for noncompletion, while the positive social support subscale predicted noncompletion. Another study found that partner support was predictive of vaccine completion (Nyamathi et al., 2012); therefore, social support does appear to play a role in vaccine compliance. When either six or more friends or positive social support was dropped from the model, the effect of the remaining measure was reduced. Thus, more information related to the individuals providing social support and the nature of their support is needed to understand how social support influences HAV/HBV vaccine completion. However, it seems likely that vaccine completion would be enhanced by interventions aimed at improving positive social support networks. There was also a trend for those who had any alcohol treatment to be more likely to complete the vaccine series, perhaps due to increased access to health education and care. However, drug treatment was unrelated.

Length of time at the RDT site was positively associated with vaccine completion. In fact, in our sample, homeless men on parole who spent at least three months in RDT programs were far more likely to complete the vaccination series. Other studies have found that those who complete RDT are less likely to relapse and use drugs; in addition, they may be less likely to recidivate (Condelli & Hubbard, 1994; Conner, Hampton, Hunter, & Urada, 2011). Preventive care, such as vaccination, may be further improved by RDT sites with access to healthcare practitioners such as public health nurses.

Policies enacted in the California state prison system, in particular, realignment (or reducing state prison population by transferring inmates to county jails), may affect vaccination completion. Realignment has shifted responsibility for the custody, treatment, and supervision of individuals convicted of nonviolent, nonserious, nonsex crimes from the state to counties (California Realignment, 2013). Our study sample included individual's pre- and post- realignment and our findings show that following realignment, vaccination completion dropped markedly. As this is a relatively new policy enacted in California, it is challenging to ascertain the possible causes; however, contract types may have been altered for some individuals at the RDT site, while others may have been shifted from RDT to community supervision. Thus, the long-term impact of realignment will need to be assessed in the near future. Findings in this study point to the need for greater understanding of the ramifications of major criminal justice policies and their effect on preventive care.

This study provides preliminary evidence of the need to incorporate public health nurses along with peer coaches at RDT sites to improve health promotion, education, and prevention; and in particular, HAV/HBV vaccination. In fact, RDT facilities are in a prime position to address the healthcare needs of homeless ex-offenders who are exiting prison and jail. Partnering with nurses may improve HAV/HBV vaccination rates, but may also promote health in general. In particular, it would be important for nurses to understand

predictors of vaccine completion in this targeted population, and to promote greater attention and focus in the screening process to those individuals less likely to complete.

Equally important, future studies need to incorporate more therapeutic resources and medical resources for a population which emerges from penitentiaries having experienced abuse, victimization, and a history of drug use and dependency issues. This study points to the need for a greater awareness of the needs of IDUs and of the efficacy of tailored programs focused on these issues. Likewise we propose that more effort be spent on understanding the thought process of IDU users regarding their beliefs of HAV/HBV prevention.

Limitations

Homeless men on parole constitute a population with unique health concerns and life issues affected by the laws and penal practices in their areas. The degree to which findings from Los Angeles County generalize to other jurisdictions is unknown. Further, self-report is liable to distortion and impression management. To enhance the vaccination efforts of ex-offenders, more research is needed to better understand how homeless men on parole perceive their health, report their health behaviors, and access health care.

Conclusion

Vaccine completion rates were similar to those reported by others and did not differ according to level of intervention delivered. Asian/Pacific Islander ethnicity, having been admitted for a psychiatric illness, having higher levels of hostility, higher levels of positive social support, having a history of IDU, and being part of post realignment were independently associated with noncompletion, while recent cocaine use, having six or more friends, and RDT stay of at least 90 days were predictive of completion. Findings advocate for special attention to screening and enhanced intervention focused among these high-risk individuals.

Acknowledgments

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FIGURE 1.
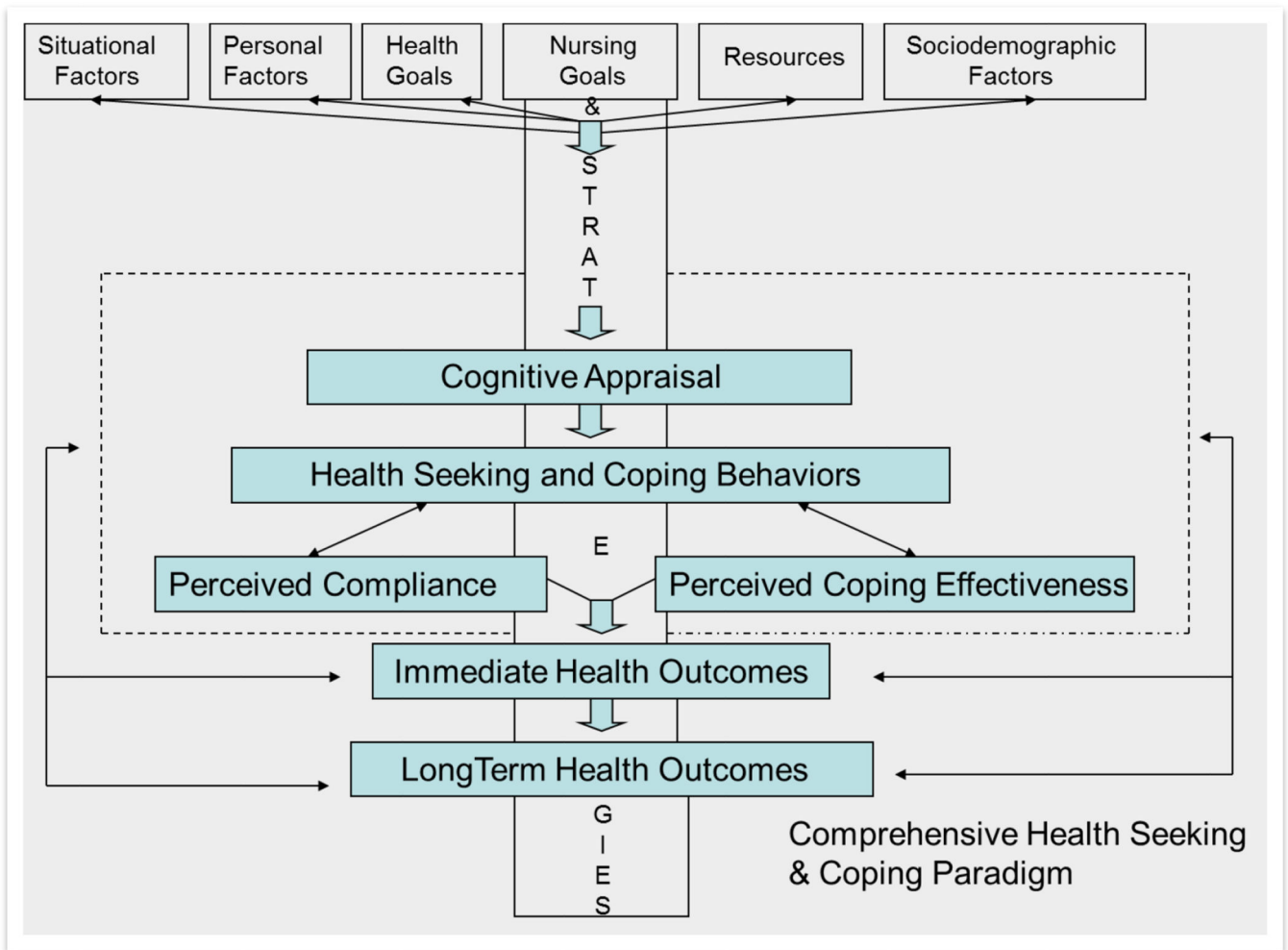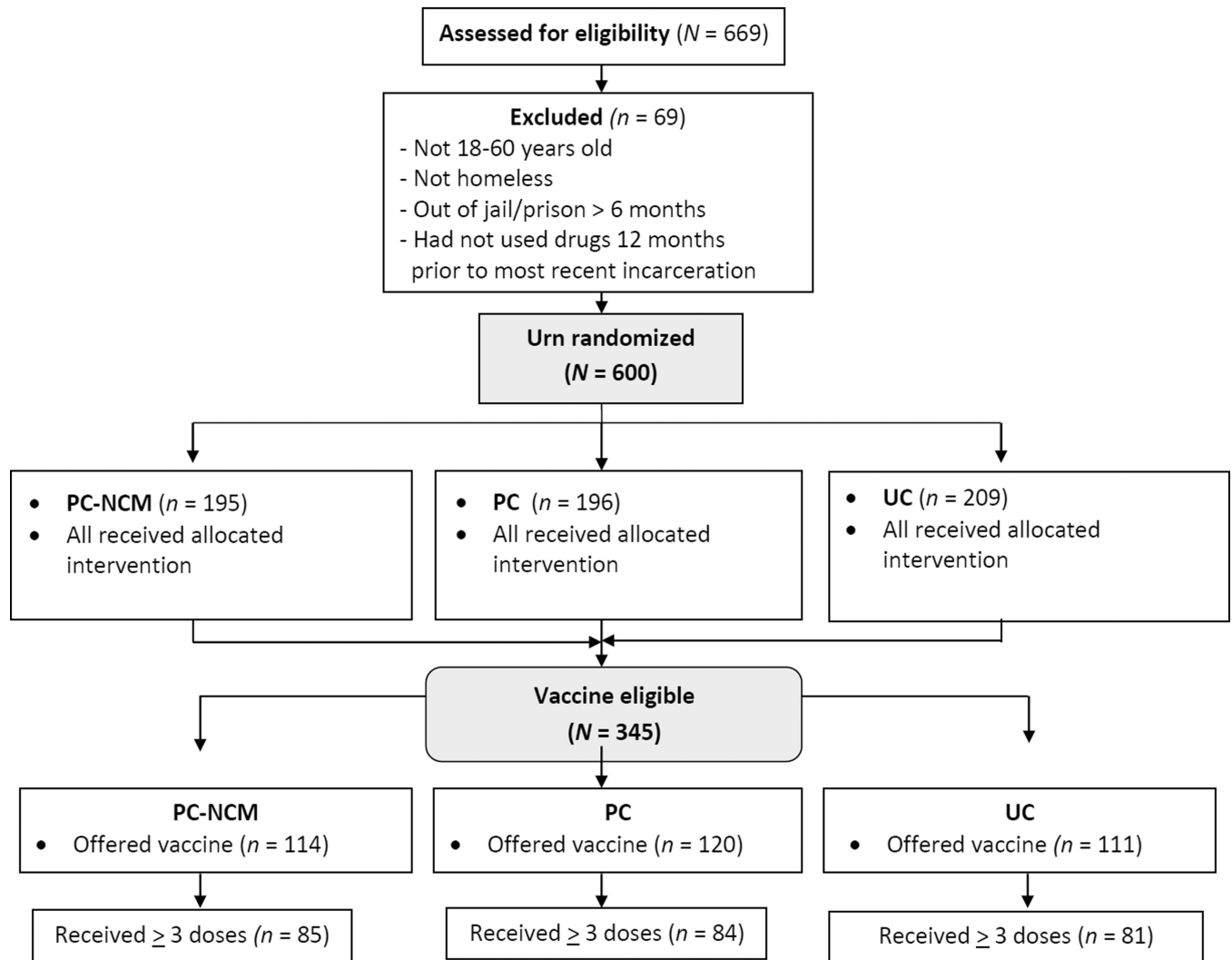Comprehensive health seeking and coping paradigm. Note for Production/Karina: FETCH FROM EM

FIGURE 2.
CONSORT diagram. PC = peer coaching; PC-NCM = peer coaching-nursing case management; UC = usual care.

NOTE for Production/Karina: additional arrows added fro, PC-NCM and UC to flow into vaccine eligible. This version of the figure should be used (not version in EM). (Objects are not grouped.)

TABLE 1

Demographic, Social, Situational, Coping and Personal Characteristics by Intervention Condition

Type	Characteristic	All (N = 345) M (SD)		PC-NCM (n = 114) M (SD)		PC (n = 120) M (SD)		UC (n = 111) M (SD)		p
		n	(%)	n	(%)	n	(%)	n	(%)	
Demographic	Age	42.0	(9.5)	41.3	(10.1)	42.3	(9.4)	42.6	(8.9)	.57
	Race/ethnicity									.30
	African American	175	(50.7)	51	(44.7)	70	(59.8)	54	(47.4)	
	Latino	107	(31.0)	40	(35.1)	29	(24.8)	38	(33.3)	
	Asian/Pacific Islander	16	(4.6)	6	(5.3)	3	(2.6)	7	(6.1)	
	White	47	(13.6)	17	(14.9)	15	(12.8)	15	(13.2)	
	Marital status (never)	204	(59.1)	66	(57.9)	71	(60.7)	67	(59.3)	.91
Social	Partners (2 = yes)[a]	199	(57.7)	64	(56.1)	76	(65.0)	59	(51.8)	.12
	Removed from parents (yes)	189	(54.8)	64	(56.1)	69	(59.0)	56	(49.1)	.30
	Childhood sexual abuse (yes)	56	(16.2)	14	(12.3)	22	(18.8)	20	(17.5)	.36
	Childhood physical abuse (yes)	120	(34.8)	38	(33.3)	44	(37.6)	38	(33.3)	.73
	Friends (6 = yes)[a]	101	(29.3)	33	(29.0)	41	(35.0)	27	(23.7)	.17
	Instrumental coping (high)[b]	112	(32.5)	42	(36.8)	40	(34.2)	30	(26.3)	.21
	Religious coping (high)[b]	138	(40.0)	45	(39.5)	55	(47.0)	38	(33.3)	.10
	Juvenile hall (any time)	192	(55.7)	67	(58.8)	69	(59.0)	56	(49.2)	.23
Situational	Discharged from jail	193	(55.9)	59	(52.2)	64	(54.7)	70	(61.4)	.35
	Discharged from prison	151	(43.8)	54	(47.8)	53	(45.3)	44	(38.6)	
	Contract									.49
	ICDTP	105	(30.4)	32	(28.1)	31	(26.5)	42	(36.8)	
	RMSC	203	(58.8)	71	(62.3)	72	(61.5)	60	(52.6)	
	SAP	35	(10.1)	11	(9.7)	12	(10.3)	12	(10.5)	
	Pre/post realignment (yes)	158	(45.8)	52	(45.6)	55	(47.0)	51	(44.7)	.94
	RDT time (days)									.67
	1–49	86	(24.9)	30	(26.3)	34	(29.1)	22	(19.3)	

Type	Characteristic	All (N = 345)		PC-NCM (n = 114)		PC (n = 120)		UC (n = 111)		p
		M	(SD)	M	(SD)	M	(SD)	M	(SD)	
	50–89	93	(27.0)	27	(23.7)	31	(26.5)	35	(30.7)	
	90–178	67	(19.4)	23	(20.2)	20	(17.1)	24	(21.1)	
	179	99	(28.7)	34	(29.8)	32	(27.4)	33	(29.0)	
Coping	Alcohol treatment (any)	103	(29.9)	31	(27.2)	38	(32.5)	34	(29.8)	.68
	Drug treatment (any)	290	(84.1)	94	(82.5)	101	(86.3)	95	(83.3)	.70
	Crack use (recent)[c]	153	(44.4)	44	(38.6)	54	(46.2)	55	(48.3)	.30
	Cocaine use (recent)[c]	94	(27.3)	26	(22.8)	35	(29.9)	33	(29.0)	.42
	Binge drinking (recent)[c]	132	(38.3)	43	(37.7)	48	(41.0)	41	(36.0)	.72
Personal	Health (fair/poor)	99	(28.7)	34	(29.8)	23	(20.0)	42	(37.2)	.01
	Hostility (high)[a]	67	(19.4)	28	(24.6)	21	(18.0)	18	(15.8)	.22
	Injection drug use (ever)	112	(32.5)	33	(29.0)	33	(28.2)	46	(40.4)	.09
	Methamphetamine use (ever)	171	(49.6)	61	(54.0)	53	(45.7)	57	(50.4)	.45
	Psychiatric hospitalization (ever)	63	(18.3)	18	(15.8)	27	(23.1)	18	(15.8)	.25
	HIV (positive)	7	(2.0)	0	(0)	4	(3.9)	3	(3.2)	.15
	HCV (yes)	97	(28.1)	32	(8.1)	30	(25.6)	35	(30.7)	.69
		M	(SD)	M	(SD)	M	SD	M	SD	
	CES-D (total)	20.8	(14.2)	9.0	(6.6)	8.7	(5.4)	9.2	(6.5)	.85
	Positive social support	24.2	(14.3)	10.5	(9.6)	10.5	(3.6)	9.7	(3.6)	.12

Note. N = 345. CES-D = Center for Epidemiological Studies–Depression; HCV = hepatitis virus; HIV = human immunodeficiency virus; ICDT*P* = in custody drug treatment program; PC = peer coaching; PC-NCM = peer coaching–nursing case management; RDT = residential drug treatment; RMSC = residential multiservice service center; SAP = substance abuse program; *SD* = standard deviation; UC = usual care.

[a] Upper quartile.

[b] Score above median.

[c] Within 6 months prior to most recent incarceration.

TABLE 2

Associations Between HAV/HBV Vaccine Completion Status and Selected Variables

Type	Characteristic	Noncompleters (n = 93) M	(SD)	Completers (n = 252) M	(SD)	p
Demographic	Age	40.8	(9.9)	42.5	(9.3)	.13
	Education	11.4	(1.4)	11.7	(1.4)	.09
		n	(%)	n	(%)	
	Race/Ethnicity					.16
	African-American	39	(41.9)	136	(54.0)	
	Latino	33	(35.5)	74	(29.4)	
	White	14	(15.1)	33	(13.1)	
	Asian/Pacific Islander	7	(7.5)	9	(3.6)	
Intervention	Peer coach-nurse case management	28	(30.1)	86	(34.1)	.78
	Peer coach	33	(35.5)	84	(33.3)	
	Usual care	32	(34.4)	82	(32.5)	
Social	Partners (2 or < 2)	46	(49.5)	153	(60.7)	.06
	Removed from parents (yes or no)	59	(63.4)	130	(51.6)	.05
	Juvenile hall (any time or never)	60	(64.5)	132	(52.4)	.04
	Friends (6 or < 6)	18	(19.4)	83	(32.9)	.01
	Instrumental coping (high or low)	19	(20.4)	88	(34.9)	.01
	Religious coping (high or low)	27	(29.0)	101	(40.1)	.06
Situational	Discharged from jail	59	(63.4)	133	(53.2)	.09
	Discharged from prison	34	(22.5)	117	(77.5)	
	Contract Type					.38
	ICDTP	30	(32.3)	76	(30.4)	
	RMSC	57	(61.3)	145	(58.0)	
	SAP	6	(6.5)	29	(11.6)	
	Post realignment[a]	60	(64.5)	97	(38.8)	.001
	RDT Time 90[b]	10	(10.8)	155	(62.0)	.001

Type	Characteristic	Noncompleters (n = 93)		Completers (n = 252)		p
		M	(SD)	M	(SD)	
	HCV (positive)	34	(36.6)	63	(25.2)	.03
	HIV (positive)[c]	1	(1.2)	6	(2.8)	.68[d]
Coping	Alcohol treatment (any or none)	19	(20.4)	84	(33.3)	.02
	Drug treatment (any or none)	80	(86.0)	210	(83.3)	.55
	Crack use (recent or not)	34	(36.6)	119	(47.2)	.08
	Cocaine use (recent or not)	15	(16.1)	79	(31.4)	.005
	Binge drinking (recent or not)	41	(44.1)	91	(36.1)	.18
Personal	Hostility (high)	27	(29.0)	51	(20.2)	.08
	Injection drug use (ever or never)	39	(41.9)	73	(29.0)	.02
	Methamphetamine use (ever or never)	51	(54.8)	120	(48.2)	.27
	Psychiatric hospitalization (yes)	25	(26.9)	38	(15.1)	.01
		M	(SD)	M	(SD)	
	CES-D (total)	9.87	(6.4)	8.62	(6.1)	.09
	Positive social support	10.82	(3.3)	10.01	(3.6)	.06

Note. HCV = hepatitis virus; HIV = human immunodeficiency virus; ICDT = in-custody drug treatment program; RDT = residential drug treatment; RMSC = residential multi-service center; SAP = substance abuse program; *SD* = standard deviation.

[a] October 1, 2011.

[b] Time in RDT program (days).

[c] Based on 298 men.

[d] Fisher's exact test.

TABLE 3

Logistic Regression Model for Non-Completion of HAV/HBV Vaccine Series

Type	Predictor	Adjusted *OR*	95% CI	*p*
Intervention*a*	PC-NCM	0.59	[0.27, 1.28]	.18
	PC	0.83	[0.39, 1.76]	.63
Demographics	Race*b*			
	African American	1.80	[0.68, 4.78]	.24
	Latino	2.33	[0.87, 6.21]	.09
	Asian/Pacific Islander	5.86	[1.23, 27.92]	.03
Social	Friends (6 = yes)	0.46	[0.22, 0.95]	.04
Situational	Post realignment (yes)	2.21	[1.19, 4.09]	.01
	RDT stay (at least 90 days)	0.06	[0.03, 0.13]	.001
Coping	Alcohol treatment (any)	0.50	[0.24, 1.03]	.06
	Cocaine use (any)	0.34	[0.16, 0.73]	.006
Personal	Hostility (high)	2.24	[1.06, 4.73]	.04
	Injection drug use (ever)	2.19	[1.07, 4.47]	.03
	Psychiatric hospitalization (any)	2.58	[1.22, 5.46]	.01
	Positive social support (yes)	1.10	[1.00, 1.21]	.04

Note. *N* = 345. CI = confidence interval; *OR* = odds ratio; PC = peer coaching; PC-NCM = peer coaching-nursing case management; RDT = residential drug treatment.

*a*Reference class is usual care.

*b*Reference class is White.