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Original Research

Preventive Care Counseling Practices of HIV Medical Care Providers: Relationships Between Empirically-derived Composite Measures of Performance

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ABSTRACT

Background: Preventive care services and risk-reduction counseling are routinely offered to HIV patients during their routine clinic visits. However, assessment of clinicians' performance on these practices has been difficult because of the use of many single indicators. This study attempts to evaluate the relationships between empirically-derived composite measures of preventive care counseling practices by HIV medical care providers (HMCP) in outpatient clinical care settings. **Methods:** Data used in this study were obtained from the Centers of Disease Control and Prevention Medical Monitoring Project HMCP' survey conducted in Houston/Harris County, Texas between June and September of 2009. Six domain-specific composite preventive care counseling indices developed were subjected to descriptive and correlation analyses. **Results:** All preventive care counseling indices developed produced significant ($P \leq 0.05$) Cronbach's alpha coefficients that ranged from 0.64 to 0.91. The overall prevention counseling index was significantly ($P < 0.001$) correlated with all the domain-specific indices across patient status ($r = 0.67$-0.89). There were greater correlations between risk-reduction index (RRi) and disease screening index (DSi), mental health, and substance use index (MSi) and social and family support index in established patients ($r = 0.55$-0.73, $P \leq 0.01$) compared to those in newly-diagnosed patients ($r = 0.44$-0.56, $P \leq 0.05$). Although medication and adherence index was significantly associated with RRi ($r = 0.50$, $P < 0.001$) and DSi ($r = 0.46$, $P < 0.001$) in the sample population, these associations, disappeared ($P > 0.05$) during by-group analysis based on patient status. **Conclusions:** Understanding the magnitude, direction, and probability of relationships between the preventive care counseling indices may help with providers' self-assessment and prioritization of efforts in areas that will produce better health outcomes and prevent transmission of HIV/sexually transmitted diseases.

KEY WORDS: Composite index, HIV/AIDS, HIV medical care provider, preventive counseling, relationship

INTRODUCTION

Advances in antiretroviral therapy (ART) and medical care have led to increased survival for patients living with HIV [1-3], resulting in an increased number of patients requiring preventive care. Centers for disease control and prevention (CDC) estimates that 1,144,500 persons aged 13 years and older are living with HIV infection, including 180,900 (15.8%) who are unaware of their infection [4]. In Houston/Harris County, Texas, between 2007 and 2012, an annual estimated HIV incidence of 1,159 new cases (28.5/100,000 population) per year has been reported [5], with an estimated 22,939 persons living with HIV infection in the Houston metropolitan statistical area as of 2014 [6].

Providing prevention interventions that reduce the risk of HIV transmission or acquisition of other sexually transmitted diseases (STDs), in addition to HIV treatment and care for improving the health of people living with HIV (PLWH) are critical components of the US National HIV/AIDS strategy (NHAS) [7]. Essential

elements of the national prevention strategies in the medical care settings of persons living with HIV stipulate that patients should be screened for HIV-risk behaviors at least once annually and should receive behavioral interventions at least twice annually [1]. Similarly, evidence-based guidelines recommend providing risk-reduction counseling to all HIV-infected patients during their routine clinic visits [1,8,9]. Despite these guidelines, only 44%, of HIV-infected persons who were diagnosed for at least 1 year and received medical care in the United States, reported receiving HIV/STD prevention counseling from their healthcare providers [10]. Brief prevention messages delivered by medical providers can change patients' behaviors in ways that decrease their risk for transmitting HIV [11]. The clinical setting provides a unique opportunity to deliver prevention messages and help prevent HIV transmission [2,3,12] because it allows for repeated access to a large proportion of PLWH.

Several studies have described the actual processes of implementing a provider-based HIV prevention counseling program [13,14], but only few have provided data on the extent to which such an HIV prevention program was actually delivered and how patients perceived the program [15,16]. Since the HIV care providers play a central role in this effort, it is important to assess providers' prevention counseling practices and determine the best methods to promote these practices in order to reduce high-risk behaviors among persons living with HIV [13]. Creating a personalized risk profile of the client is an important first step in the process and can allow clients to receive prevention messages tailored to their circumstances. Sometimes, the patient's risk behaviors can be very complex because of several associated factors such as mental health and social and family support issues among others. Thus, understanding the patient's risk profile and the relationships between these factors can provide a blueprint for intervention strategies that can guide health care providers during prevention counseling.

Although, preventive care services and risk-reduction counseling are offered to HIV patients during their routine clinic visits, assessment of clinician's practice performance has been difficult because of the use of many single indicators. Despite the efforts at developing policy frameworks and standards [17-20], inconsistent measures and total lack of alignment still constitute a major obstacle in the effort to improve preventive care counseling for patients. A composite measure which is a combined metric that incorporates multiple individual measures to provide a single score [17], can facilitate system-level changes by highlighting the need for better care coordination and accountability across multiple providers [19].

In an attempt to assess HIV medical care providers (HMCP)' preventive care counseling performance in 13 outpatient facilities in the Houston/Harris County, Texas we developed domain-specific empirically-derived composite preventive care counseling indices [21]. Findings from this study showed that significant variation existed in the frequency and determinants of preventive care counseling by providers in favor of newly-diagnosed patients compared to the established ones [21]. This outcome supported the results from several earlier studies [11,13,15,22,23].

To the best of our knowledge, there is currently no known study that has attempted to evaluate the relationships between empirically-derived HIV preventive care counseling indices. Understanding the magnitude, direction, and probability of relationship between the preventive care counseling indices may help with providers' self-assessment and prioritization of prevention efforts in areas that will produce better health outcomes in HIV patients. The objective of this study was to evaluate the relationships between domain-specific empirically-derived composite measures of preventive care counseling practices of HMCP in outpatient clinical care settings in Houston/Harris County, Texas.

METHODS

Design, Participants, and Data Collection

The survey participants consisted of medical care providers from 13 HIV care facilities in Houston/Harris County, Texas who participated in the CDC's medical monitoring project (MMP) provider survey. The survey was from June through September 2009. HIV care providers eligible for this survey included physicians, physician assistants, or nurse practitioners at the MMP sampled facilities/providers who have provided care to, ordered CD4+ or HIV viral load testing for, and/or prescribed ART to HIV-infected adults ≥18 years of age. Physicians who were interns, residents, fellows, and others in training programs were not eligible. A detailed description of the MMP providers' survey design and data collection procedures can be found in McNaghten *et al.* [24] and Mgbere *et al.* [25]. The study sample comprised of 51 HMCP and recorded a response rate of 45% ($n = 23$). The demographic and medical practice characteristics of participating HMCP in Houston/Harris County, Texas have been described in detail previously [21,25].

Preventive Care Counseling Indices

The domain-specific preventive care counseling indices used in the current study were developed and evaluated previously by Mgbere *et al.* [21,23]. These measures cover items related to medication and adherence, risk-reduction counseling, mental health and substance use, disease screenings, and support services. Using the scoring scheme that ranged from 4 (always discuss) to 1 (almost never discuss), 20 preventive care counseling items were used to develop six composite counseling indices (CCIs) such that a higher score indicates provider's likelihood to engage in preventive care counseling activities, while a lower score represents less likelihood to engage in preventive care counseling activities. The indicator variables were not transformed since they all had a common unit of measurement. However, to indicate their relative importance, differential weights based on conceptual rationale [26] were applied as follows: 0.250 for medication and adherence, risk-reduction, mental health, and substance use indicators; and 0.125 for disease screenings and support services. The weights summed up to 1.0. The weights were then multiplied by the actual performance values for each indicator and then summed to produce the composite score or index.

In its simplest form, the CCI takes a linear form as follows:

$$CCI_n = W_1Y_{1n} + W_2Y_{2n} + ... + W_pY_{pn} = \sum_i W_iY_{in}$$

Where CCI_n is the composite score for unit n; y_{in} is the individual performance measure for attribute *i* in unit n, and W_1 is the weight attached to attribute *i* [26].

The empirically-derived composite indices developed, and used in the current study includes the following: Medication and adherence index (MAi), risk-reduction index (RRi), disease screening index (DSi), mental health and substance use index (MSi), Social and family support index (SSi), and overall prevention care counseling index (OPCi). Detailed information on the procedures associated with the development of the preventive care counseling performance indices are available in earlier reports by Mgbere and others [21,23].

Statistical Analysis

The multi-item six composite preventive care counseling indices developed were tested for internal consistency reliability using Cronbach's alpha coefficient. Descriptive statistics of the domain-specific preventive care counseling indices was conducted. Mean and 95% confidence intervals of the mean scores were obtained along with quantiles of the sample population. Variability charts were used to evaluate the individual HMCP OPCi in relation to other domain-specific counseling indices by patient status (newly-diagnosed vs. established patients). Using means chart, we compared the mean of each domain-specific composite measure against the overall mean for OPCi. The relationships across the six different composite measures based on the overall sample population and by patient status were determined using Pearson's product-moment correlation analysis. For all tests performed, the $P = 0.05$ was used as a threshold for determining statistical significance level. Data management and statistical analysis were performed using JMP statistical discovery.™ Software version 11.1 (SAS Institute, Cary, NC, USA).

Human Subject Protection

The US CDC National Center for HIV/AIDS, Viral Hepatitis, STD, and Tuberculosis prevention has determined that MMP is public health surveillance and is considered a non-research activity used for disease control program or policy purposes. Given the non-research determination, it is not subject to human participants' regulations including federal institutional review board (IRB). As an amendment to MMP, the MMP Provider Survey is covered under the same non-research determination. No local IRB was required for the Houston project area.

RESULTS

Summary of preventive care counseling domain-specific internal consistency reliability estimates and descriptive statistics of domain-specific preventive care counseling indices of HMCP by patients' status are presented in Table 1. Moderate to high Cronbach's alpha coefficients that ranged from 0.64 (SSi) to 0.91 (DSi) were obtained for the overall scale and subscales. The Cronbach's alpha coefficients for the overall patients sample were slightly higher than those of the subgroups (newly-diagnosed vs. established patients). The domain-specific mean index scores for newly-diagnosed HIV patients were generally higher than those recorded for established patients. The variability of the individual HMCP OPCi performance score in relation to other domain-specific indices by patient status is presented in Figure 1. The results indicate that HMCP' counseling performance tends to improve when newly-diagnosed patients are counseled compared to the established ones. There also exists a linear relationship between OPCi and other composite indices, where an increase in OPCi resulted in a corresponding increase in most of the other preventive care counseling measures.

The means charts showing the pattern of bivariate associations between OPCi and the domain-specific indices are displayed in Figure 2a-f. In general, the results show more clustering and/or spread of providers' scores for the domain-specific measures above the mean of OPCi for newly-diagnosed patients compared to the mean scores for the established patients, which tended to be below the OPCi mean value. Similarly, all the domain-specific indices tend to increase with increase OPCi, depicting positive linear relationships.

The correlation coefficients for the domain-specific preventive care counseling measures by patient status are displayed in

Table 1: Internal consistency reliability estimates and descriptive statistics of domain-specific preventive care counseling performance indices of HMCP

Domain index$^{\Phi}$/ patient status	Cronbach's alpha coefficient	Index mean	95% confidence interval		Quantiles (%)		
			Lower	Upper	25	50	75
All patients							
OPCi	0.79	12.76	12.08	13.44	11.09	12.81	14.28
MAi	0.88	4.26	4.05	4.46	3.69	4.38	5.00
RRi	0.90	4.45	4.14	4.75	3.75	4.25	5.25
DSi	0.91	1.85	1.71	1.99	1.38	1.88	2.25
MSi	0.80	1.46	1.34	1.57	1.25	1.50	1.75
SSi	0.64	0.75	0.69	0.81	0.63	0.75	1.00
Newly-diagnosed patients							
OPCi	0.73	13.88	13.12	14.63	12.63	13.88	15.38
MAi	0.75	4.61	4.41	4.81	4.25	4.75	5.00
RRi	0.68	4.89	4.52	5.26	4.25	5.0	5.75
DSi	0.75	2.03	1.88	2.20	1.75	2.00	2.50
MSi	0.74	1.55	1.39	1.72	1.50	1.50	2.00
SSi	0.78	0.79	0.71	0.87	0.63	0.75	1.00
Established patients							
OPCi	0.76	11.65	10.67	12.62	10.38	11.25	13.00
MAi	0.74	3.91	3.59	4.23	3.25	3.75	4.75
RRi	0.68	4.00	3.56	4.44	3.50	4.00	5.80
DSi	0.76	1.66	1.46	1.87	1.38	1.75	1.88
MSi	0.76	1.36	1.19	1.52	1.00	1.50	1.50
SSi	0.79	0.71	0.63	0.79	0.63	0.75	0.75

$^{\Phi}$Domain index: OPCi: Overall preventive counseling index, MAi: Medication and Adherence index, RRi: Risk-reduction index, DSi: Disease screening, MSi: Mental health and substance use index, SSi: Social and family support index, HMCP: HIV medical care providers

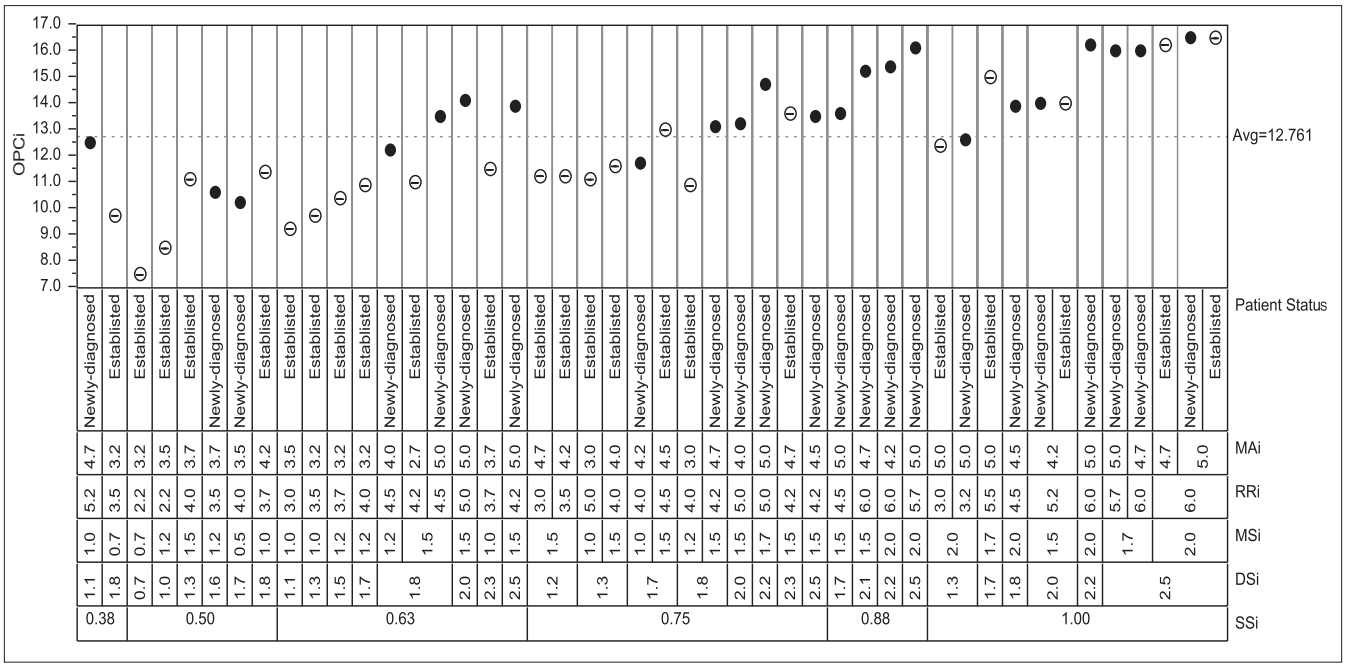

Figure 1: Variability chart showing the individual HIV medical care provider OPCi Mean score in relation to other domain-specific indices$^{\Phi}$ by Patient Status ($^{\Phi}$Domain index: OPCi: Overall preventive counseling index, MAi: Medication and Adherence index, RRi: Risk-reduction index, DSi: Disease screening, MSi: Mental health and substance use index, SSi: Social and family support index, HMCP: HIV medical care providers), • Newly-diagnosed ◦ Established

Table 2. Based on the overall patient population, there were positive and significant ($P < 0.001$) correlations among the preventive care composite measures with r values ranging from 0.46 to 0.89. MAi was moderately correlated with RRi, DSi, MSi, and SSi ($r = 0.46$-0.68; $P < 0.001$) in the overall sample. There was no significant ($P > 0.05$) correlation between MAi and RRi and DSi for both newly-diagnosed and established patients. However, MAi was significantly correlated with MSi ($r = 0.60$-0.73, $P \leq 0.01$) in the two subpopulation. Also, the RRi was highly correlated with DSi for established patients ($r = 0.73$, $P < 0.001$) compared to the newly-diagnosed patients ($r = 0.56$, $P < 0.001$). There were no statistically significant correlations between providers who counseled established patients on DSi, and MSi and SSi, even though a positive and medium level relationships ($r = 0.49$ and 0.47, $P < 0.05$; respectively) existed for newly-diagnosed patients. Highly significant correlations ($P < 0.001$) were reported between MSi and SSi at all levels, for All ($r = 0.80$), newly-diagnosed ($r = 0.77$) and established ($r = 0.81$) patients, respectively.

DISCUSSION

Implementation of HIV Prevention interventions among PLWH in clinical settings are now considered a priority, especially with the emphasis on prevention activities for HIV-infected persons in the NHAS for the United States [7]. Since HMCP plays central role in this effort, our study attempted to assess their preventive care counseling practices and the relationships across domain-specific measures of performance. Our finding indicates that generally more preventive care counseling was provided by HMCP in all the domains for newly-diagnosed patients compared to established patients. This outcome supports earlier studies, where it was reported that more providers tend to counsel their patients during the initial visit but provided less ongoing prevention counseling thereafter [11,15,22]. There has been substantial improvement in the proportion of HMCP providing prevention counseling in recent times [13]. This may be a reflection of providers' awareness and adoption of the recommendations on incorporating HIV prevention into the medical care of PLWH [1].

The moderate to high Cronbach's alpha coefficients obtained in our study indicate that the items that made up the domain-specific empirical measures had good internal consistency and thus, measure the same concept or construct intended. Further analysis revealed high positive and significant ($P < 0.001$) correlations between OPCi and other domain-specific preventive care measures. Since OPCi represents a full constellation of preventive care counseling needs of HIV patients, an improvement in this value represents corresponding improvements in other domain-specific measures and, therefore, overall quality of preventive care received by patients. According to the previous study [23], the overall preventive care performance measure used in the current study met the empirical validity in its three forms (construct, predictive, and concurrent validity) [27]. Thus, the robust relationships noted across the domain-specific preventive care measures could have broad implications for care coordination by providers, pay-for-performance, health care costs, and health outcomes of PLWH.

Improving medication adherence has been identified as a crucial step toward improving health outcomes [28,29]. Findings from our study revealed that counseling patients on medication

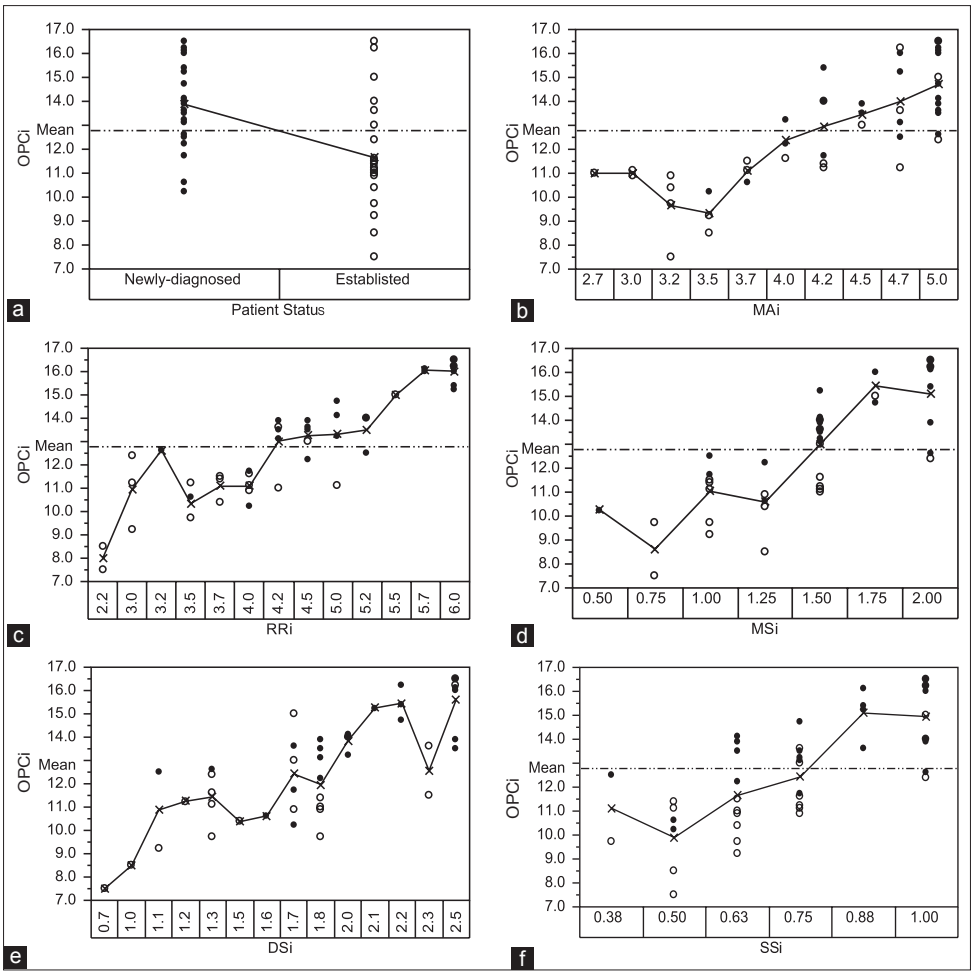

Figure 2: Means charts showing the relationships between OPCi and Other domain-specific indices$^{\Phi}$ for Newly-diagnosed and established HIV patients, (a) Mean of OPCi by patient status, (b) Mean of OPCi by MAi, (c) Mean of OPCi by RRi, (d) Mean of OPCi by MSi, (e) Mean of OPCi by DSi, (f) Mean of OPCi by SSi, ($^{\Phi}$Domain index: OPCi: Overall preventive counseling index, MAi: Medication and Adherence index, RRi: Risk-reduction index, DSi: Disease screening, MSi: Mental health and substance use index, SSi: Social and family support index, HMCP: HIV medical care providers) •Newly-diagnosed ◦Established

adherence was only moderately correlated with HIV risk reduction, substance use, and social and family support in the study population. This outcome seems to reflect earlier study findings [21], where despite the fact that 83% of the HMCP counseled patients on medication adherence; only about 48%, 26%, and 35% of them correspondingly counseled their patients on HIV risk reduction, substance use, and social and family support needs. Although, not all patients may have need for certain preventive care counseling, studies have consistently shown that active alcohol use and substance abuse makes it more difficult for HIV patients to adhere to treatment [30-33]. It has been reported that HIV/AIDS patients that used alcohol are 50-60% less likely to adhere to their prescribed medications [34]. A high degree of adherence is necessary for the maintenance of drug efficacy, especially as it is closely tied to virologic, immunologic, and clinical outcomes. Our findings reinforce the need for a consistent multidimensional approach to HIV prevention [11].

In a related study, mental health and substance abuse problems received less attention from some HMCP with 43.5% and 17.4%, and 34.8% and 17.4% of them agreeing to counseling newly-diagnosed and established patients, respectively, on these measures [25]. Weddle reported that in Ryan White Part C program, about 37% of patients had mental health problems, and 35% had a substance abuse disorder [35]. These new challenges reinforce the importance of coordinated HIV care involving a multiplicity of providers, and the importance of prevention care services to address a host of complications and comorbid conditions associated with HIV treatment. The strong positive correlation recorded between MSi and SSi (r = 0.77-0.81) and a fairly moderate correlation between MSi and RRi (r = 0.44-0.55) implied that increased counseling on mental health or substance abuse problems by care providers will result in increased counseling and discussion of social and family support needs and HIV risk behaviors, respectively. It is important to note that provision of HIV risk reduction counseling has been reported to vary with providers' profession and patient type (newly-diagnosed vs. established) [21,22], and also depends on providers' knowledge, skills, comfort, and patient needs [36].

Table 2: Relationships among HMCP preventive care counseling performance indices for HIV positive patients

Domain index$^{\Phi}$/ patient status	MAi	RRi	DSi	MSi	SSi
OPCi					
All	0.79***	0.89***	0.79***	0.79***	0.75***
Newly-diagnosed	0.67***	0.85***	0.73***	0.78***	0.70***
Established	0.74***	0.88***	0.75***	0.80***	0.82***
MAi					
All	1.00	0.50***	0.46***	0.68***	0.57***
Newly-diagnosed	1.00	0.34^{ns}	0.30^{ns}	0.60**	0.39^{ns}
Established	1.00	0.37^{ns}	0.34^{ns}	0.73***	0.63***
RRi					
All		1.00	0.72***	0.54***	0.58***
Newly-diagnosed		1.00	0.56**	0.44*	0.44*
Established		1.00	0.73***	0.55**	0.66***
DSi					
All			1.00	0.48***	0.46***
Newly-diagnosed			1.00	0.49*	0.47*
Established			1.00	0.38^{ns}	0.40^{ns}
MSi					
All				1.00	0.80***
Newly-diagnosed				1.00	0.77***
Established				1.00	0.81***

Significant levels: *=$P<0.05$; **=$P<0.01$; ***=$P<0.001$; ns=Not significant ($P>0.05$), $^{\Phi}$Domain index: OPCi: Overall preventive counseling index, MAi: Medication and Adherence index, RRi: Risk-reduction index, DSi: Disease screening, MSi: Mental health and substance use index, SSi: Social and family support index, HMCP: HIV medical care providers

HMCP performance outcome on HIV risk reduction counseling was significant ($P \leq 0.01$) and positively correlated ($r = 0.56$-0.73) with disease screening. Consequently, about 31.4% and 53.3% of the variations in DSi were associated with RRi in newly-diagnosed and established patients. People with HIV are at increased risk for common health conditions due to the infection itself, ART or traditional risk factors. The new guideline of the Infectious Diseases Society of America [8], recommends that providers should consistently discuss and counsel patients on their sexual history (current and past) and any risky behaviors such as illicit drugs use, and screen for STDs and other diseases in all who may be at risk. No significant correlations were reported between DSi, and MSi and SSi for established patients. This may be associated with the fact that newly-diagnosed patients are more likely to undergo a more detailed screening process during their initial visits compared to the established patients. It is important to determine how established patients are coping with living with HIV infection, and if they have sufficient support network. Studies [37,38] have shown that family, friends, and relatives are important sources of social support. These supports may help increase adherence to treatment and prevent transmission of HIV infection.

Strengths and Limitations of Study

The strength of this study lies in the use of empirically-derived composite indices that met construct, predictive, and concurrent validity; and attained statistical stability and capability [23], to assess preventive care practices of HMCP in Houston/Harris County, Texas. Understanding the magnitude, direction, and probability of relationships between the domain-specific measures of performance would help with providers' self-assessment and prioritization of preventive care efforts, especially in areas that will produce better health outcomes in patients and support NHAS and prevention strategy goals. Our findings also have important clinical and preventive care implications that can help guide future research efforts.

However, our study findings should be interpreted in the context of a set of potential limitations. Although the probability proportional to size sampling method was used to select participating facilities, it was not possible to "weight" the survey data because of the low response rate (45%) [21,25]. Thus, the estimates may be subject to nonresponse bias, and the outcome may not be fully representative of the providers in Houston/Harris County, Texas. Data on preventive care counseling delivery were dependent on providers' self-report and thus subject to recall and social desirability bias. It is possible that the preventive care counseling was over or under-reported. The differential weights used for calculating the preventive care counseling indices as described in the previous study were based on conceptual rationale [26], and not the comparative importance of the care process or counseling quality and contents [21]. Furthermore, the HMCP practices and awareness may have evolved since the data were collected in 2009.

CONCLUSIONS

Findings from our study indicate that significant positive relationships exist between preventive care counseling measures and suggest that providers' overall performance improvement may be attained by consistently conducting series of HIV-related prevention and risk-reduction counseling for patients. Understanding factors that are associated with discussions of HIV prevention issues [13,21] can assist in developing appropriate training curricula for providers. Such training program will enhance care providers' skills, motivation, and lead to an increase in the proportion of patients who receive preventive care counseling with improved health outcomes. Similarly, the nature of the relationships across the composite performance measures has important implications for the quality of preventive care provided by providers or health institutions. These could facilitate system-level changes by highlighting the need for better care coordination and accountability across multiple providers [19], especially in the light of the new payment models for services in the Affordable Care Act that now provides Americans with better health security.

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AUTHORS' NOTE

OM, conceived and designed the study, conducted the data analysis and interpretation of the results, prepared the initial draft of the article, and participated in critical review of article; MS and SK interpreted the study findings and participated in the critical review of article for important intellectual contents in their respective areas of specialty; RA, EJE, and MW played advisory roles in all aspects of the study and participated in the critical review of the article. All authors read and approved the final version of the article. The CDC conceived the project, developed project-associated materials including data collection instrument and provided oversight on the survey implementation in Houston/Harris County, Texas, and other participating sites. This work was presented in part at the 2014 Texas HIV/STD Conference held in Austin, Texas, USA on August 19-21, 2014. The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the US CDC.

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