CHAIN Report 2016-1

Medication Adherence Support Services

2001-2015

Key words: Medication Adherence • ART• Adherence Support Services

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5/29/2018
HRSA Grant # H89 00015

ACKNOWLEDGEMENTS

A Technical Review Team (TRT) provides oversight for the CHAIN Project. TRT members are Peter Messeri, PhD, Angela Aidala, PhD, and Maiko Yomogida, Mailman School of Public Health, Columbia University; Bisrat Abraham, MD, MPH, Mary Irvine, DrPH, Anna Thomas-Ferraioli, MPH, Graham Harriman, MA, Katherine Penrose, MS, Nadine Alexander, ScM, Melanie Lawrence, MPH, Jennifer Carmona, MPH, Ellen Wiewel, MPH, Darryl Wong, MPH, NYC DOHMH; Julie Lehane, PhD, Westchester County DOH; and Mary Ann Chiasson, DrPH (Chair) and Roberta Scheinmann, MPH, Public Health Solutions; H. Daniel Castellanos, DrPH, Partnership for the Homeless & Needs Assessment Committee of the Planning Council.

We are especially grateful to the staff of the agencies in New York City and the Tri-County Region who help introduce the project to their clients and patients. Lastly and most importantly, we thank the many persons living with HIV who have shared their time and experience with us as CHAIN Project participants since 1994.

This research was supported through a contract with the NYC DOHMH as part of its Ryan White HATEA grant, H89 HA00015, from the Department of Health and Human Services, Health Resources and Services Administration, HIV/AIDS Bureau (HRSA HAB). Its contents are solely the responsibility of the report authors and do not necessarily represent the official views of the U.S. Health Resources and Services Administration, the City of New York, Westchester Department of Health or Public Health Solutions.

Key Findings

The majority of CHAIN participants received adherence support services to help them take their HIV medications "on time and in the right way."

- 57% of New York City (NYC) participants and 53% of Tri-County (Westchester, Putnam and Orange Counties) participants received adherence support services at least once during the study period (2001-2015).

CHAIN participants received a mixture of cognitive and behavioral adherence support strategies.

- 59% of NYC participants and 29% of Tri-County participants reported receiving behavioral strategies (e.g., reminder devices).
    - Use of a pillbox was the most frequently reported behavioral strategy.
- 45% of NYC participants and 68% of Tri-County participants reported receiving cognitive strategies (e.g., education or counseling).
    - Information or advice was the most frequently reported cognitive strategy.
- 22% of participants received a combination of both behavioral and cognitive strategies.

Physicians were the most frequently reported providers of adherence support services.

- Participants seldom reported receiving adherence support services from specialized treatment adherence counselors or peer leaders.

Use of adherence support services was associated with a broad range of factors

- Demographic, psychosocial, and clinical factors that were associated with increased use of adherence support services included education less than high school, Latino race/ethnicity, female gender, poor mental health status, food insecurity, CD4 count less than 200, unsuppressed viral load, initial HIV diagnosis before 2001, and non-adherence.
- Features of health care associated with use of adherence services were access to comprehensive medical care, HIV standard of care, social services case management, care coordination, and patient navigation.

INTRODUCTION

Adherence to antiretroviral therapy (ART) is a key predictor of viral suppression and therefore long-term survival. Non-adherence can lead to poorer health outcomes and to the development of treatment resistant strains of HIV (Gross, Bilker, Friedman, & Strom, 2001; Yeni et al., 2004). According to a World Health Organization (WHO) (2003) report, adherence to HIV regimens is determined by a complex interplay of five dimensions—social and economic factors, health care team and system-related factors, condition-related factors, therapy-related factors, and patient-related factors. Barriers in one or more of these dimensions may compromise patients' capacities to follow the demanding regimens required to manage HIV infection.

Given the importance of ART adherence for effective HIV medical care, we investigated the extent to which medication adherence services are an integral component of health care received by members of the CHAIN cohort. This report describes the type of adherence services used by CHAIN cohort members, the healthcare workers who provide these services, and the variation in service utilization across cohort subgroups that correspond to the WHO dimensions.

Literature Review

Several systematic reviews and meta-analyses have been published that summarize the primary research on adherence support services (Amico, Harman, & Johnson, 2006; Côté & Godin, 2005; Rueda et al., 2006; Simoni, Amico, Pearson, & Malow, 2008; Simoni, Pearson, Pantalone, Marks, & Crepaz, 2006). The review literature reports that most adherence interventions are delivered one-on-one, but group adherence support is not uncommon. Multidisciplinary teams often deliver adherence support that combines healthcare professionals—psychologists, nurses, pharmacists, and physicians—with paraprofessional and

nonmedical community intervention staff—peers, health advocates, counselors, and social workers.

The research literature groups adherence support interventions into three clusters (1) didactic or educational information about HIV, its treatment, and the importance of adherence to successful therapy; (2) interactive discussions or counseling to address cognition, motivation, behavior, support, and expectations surrounding ART use; and (3) practical medication-management skills including the use of pillboxes, external reminders, and other adherence support technology. Other characteristics reviewed included intensity, frequency, length and duration of the support, staff positions delivering the support, and characteristics of the target population. It is difficult to summarize the general pattern of results as the review articles often draw contradictory conclusions about the results of the primary research literature.

The authors of these reviews and meta-analyses consistently agree; however, that a broad range of evidenced-based intervention strategies improve ART adherence. Simoni et al. (2006) suggest that individuals who received any of the interventions included in their analysis were 1.5 times more likely to report 95% adherence and 1.25 times more likely to achieve an undetectable viral load, when compared with those in study control arms.

The review literature also describes variation in components associated with improved outcomes, but has not reached consensus about best practices. Simoni et al. (2006) conclude that interventions that included didactic information and/or interactive discussion about cognition, motivation, and expectations regarding adherence results in larger effect sizes than those that did not. Similarly, Côté and Godin (2005) find a combination of cognitive and behavioral strategies to be effective. The meta-analysis by Roter et al. (1998) and the systematic review by Haynes et al. (2002) focusing on chronic conditions in general, support this notion. The authors conclude

that comprehensive interventions that combine cognitive, behavioral, and affective components are associated with superior outcomes compared to single-component support services. In contrast, Rueda et al. (2006) conclude that practical medication management skills result in better adherence outcomes than cognitive, behavioral, or motivational approaches. Fairley et al. (2003) and Levy et al. (2004) find that strategies that provide tools and aids with training or instruction tailored to a patient's lifestyle and potential barriers are associated with improved adherence. Kalichman et al. (2005) find that pillbox users are more likely to have an undetectable viral load and are less likely to be non-adherent than non-users. However, Simoni et al. (2006) conclude that behavioral strategies or external reminders are no more effective than adherence support services not including these components.

Most, but not all, reviews conclude that both one-on-one and group formats are effective in improving medication adherence, although at least one review concludes that individual counseling is more effective than a group format (Rueda et al., 2006). Most reviews conclude that the intervention intensity, frequency, length, and/or duration, are not strongly associated with improved adherence. Contrary to the general consensus, Rueda et al. (2006) find that the intensity of the intervention is related to improved adherence.

All of the reviews comment on the diversity of the providers administering the intervention. Côté and Godin (2005) point out the importance of a team, multidisciplinary approach. With respect to targeting optimal client characteristics, results are contradictory. Amico et al. (2006) report that interventions focusing on those with a history of or risk for non-adherence are more effective than non-population-specific interventions. However, Rueda et al. (2006) report just the opposite: interventions directed at marginalized groups are not as effective as unrestricted interventions.

This literature review suggests that there is no best approach to adherence support. The one point of consensus is an emphasis on utilization of a multifaceted approach by a multidisciplinary team that tailors interventions to each patient's needs and barriers. In short, there are no easily summarized recommendations for optimal design of adherence support interventions.

It is against this background— a large but inconclusive literature on adherence support services—that we describe the features of adherence support services used by CHAIN participants.

METHODOLOGY

Cohort Recruitment and Study Sample

The CHAIN Project is an ongoing study of PLWH in NYC and the Tri-County region to its north that encompasses Westchester, Putnam, and Rockland Counties. Study participants were recruited through a two-stage sampling procedure. We first invited medical and social service agencies with 20 or more HIV-positive clients or patients to serve as recruitment sites. We then recruited individuals from participating sites in one of two ways: onsite sequential enrollment or sampling from a list of PLWH clients/patients. To protect patient/client privacy, agency staff always made the initial contact with potential participants. For sequential onsite recruitment, CHAIN staff scheduled one or more recruitment days at a participating agency, at which time agency staff were instructed to approach HIV+ clients or patients waiting for a scheduled appointment or participating in a group activity. The agency staff briefly described the CHAIN study, and those expressing an interest in participating in the study were referred to the onsite CHAIN recruiters for enrollment and scheduling of baseline interviews. For list-based recruitment, agencies prepared a list of anonymous IDs of their HIV+ clients/patients. CHAIN

staff randomly selected a small number of anonymous IDS and instructed agency staff to contact the clients or patients associated with the sampled IDs. Patients or clients who expressed interest in participating in the CHAIN project were asked for a preferred means by which CHAIN staff could contact them to complete enrollment and schedule a baseline interview. The number of clients/patients recruited from each site was proportional to the size of the agency's HIV caseload. Sample sizes for recruitment sites typically ranged between 15 and 25.

The NYC cohort eligible for this study included 625 individuals recruited between 2002 and 2003. We augmented the original cohort with 302 individuals recruited between 2009 and 2010. In all, the NYC data came from 3,634 interviews conducted with 927 individuals completed between 2002 and 2015. The Tri-County data came from 1,633 interviews conducted with 414 participants in the cohort phase of Tri-County fieldwork *(*2001-2007), and another 339 participants completing interviews at one or more repeated cross-sectional surveys conducted between 2008 and 2013. To be included in this study, CHAIN participants must have reported at one or more interviews that they were currently taking an ART combination.

Measures

CHAIN interviewers obtained self-reported information on support services designed to improve ART medication adherence. They asked participants at each interview, "Some agencies are now providing to their clients assistance with taking their HIV medications in the right way. Has anyone suggested ways to help you remember to take your HIV medicine on time and in the right way?" Those who reported receiving adherence services were then asked, "Which of the following people helped you?" Responses included medical provider/physician, nurse; case manager/social worker, mental health professional, drug/alcohol counselor, treatment adherence counselor, care coordinator/navigator, peer/health educator, member or leader of support group,

and other professional. We combined these responses into broader categories for analysis: professional counselors (case manager/social worker, treatment adherence counselor, care coordinator/navigator, and drug/alcohol counselor) and peer or support group leaders (peer/health educator and member or leader of support group).

In Rounds 1-3 and 6-8, participants who reported receiving adherence services were also asked, "What kind of help were you given in taking your medication in the right way?" Responses included: information or advice in a one-on-one setting; information or advice in a group setting; written material, such as brochures or booklets; devices to help keep track of dosages and time, such as a beeper, a watch that beeps, or a calendar; help in arranging meals; help in storing medications; pillbox or container designed to organize pills by dosing time and frequency; and directly observed therapy (DOT). Following the distinction in the adherence support literature, we divided adherence support strategies into behavioral (pillbox, device to keep track of dosages and time, help keeping/storing medications, DOT, and help arranging meals) and cognitive (information and advice in one-on-one setting, information and advice in group setting, and written material). Additional questions were asked at some rounds to determine the "helpfulness" of interventions received and the frequency of one-on-one, group, and DOT interventions. Refer to the Appendix for a complete listing of medication adherence interventions and service providers elicit in CHAIN interviews.

We investigated subgroup differences in use of adherence services by sociodemographic characteristics: education level, ethnicity and gender; risk factors: problem drug use, housing status, mental health status, and food insecurity; HIV clinical measures: CD4 count, viral load suppression, year of infection, and HIV medication adherence; and organizational features of medical care: comprehensive medical care, HIV standard of care, quality of the provider-patient

Table 1: Study Variables

Variable	Indicator
Problem Drug Use (Past Year and Former)	Use of heroin, cocaine, and/or crack on five or more occasions
Housing Status in Past Six Months	*Stable* (always residing in an apartment or house); *Unstable* (doubled up, temporary/transitional housing such as drug treatment, mental health treatment, hospital, nursing home, hospice); *Homeless* (episode of living on the street, a public place, shelter, drop-in center, SRO).
Poor Mental Health Functioning	A score below 38 on the SF-12 mental health component scale
Food Insecurity	Sometimes or often not having enough to eat; not enough money in the household for food in the past six months; or going one full day in the past 30 days without anything to eat
Comprehensive Medical Care	Receives medical care from a primary care physician or practice that (1) provides routine check-ups, vaccinations, blood tests, and information, (2) advices about health concerns, and (3) is available 24 hours/day for emergency calls
HIV Standard of Care Scale	Receives essential HIV healthcare services that included blood test, physical exam, hepatitis C test, substance use counseling, sexual health counseling, and CD4 test results
HIV Patient-Provider Encounter Scale	Four-item additive scale that combines information on 1) waiting time, 2) time provider spends with participant, 3) the participant's perceptions of provider level of understanding, interest and concern, and 4) the participant's overall satisfaction with the medical care received
Care Coordination	Providers other than the primary care physician are involved in the participant's HIV medical care
Patient Navigation	Patient focused service that involves a participant receiving referrals, being contacted by outreach workers, or accompanied to medical appointments

encounter, appropriate HIV medical care, coordination of care, and patient navigation. Table 1 presents operational measures of the more complex study variables. At each round of interviews, we also distinguished recent encounters with three types of case management services—medical, social services, and counseling. Table 2 lists the specific interview items used to describe the type of case management services they received.

Table 2: Case Management Services

Type of Case Management	Participant Reported Receiving One or More of the Following CM Services
Medical Case Management	Help in arranging a referral for medical services; or help in keeping an appointment for medical care with a primary care provider or medical specialist; or help in developing a plan to take HIV medications in the right way
Social Service Case Management	Develop or revise a plan for dealing with your needs; or help getting or referring you to specific social services; or help filling out forms for benefits or entitlements; or help keeping an appointment for social services

Statistical Analysis

We tested for statistically significant relationships between type of adherence support strategy (cognitive, behavioral or combination) and each independent variable.

RESULTS

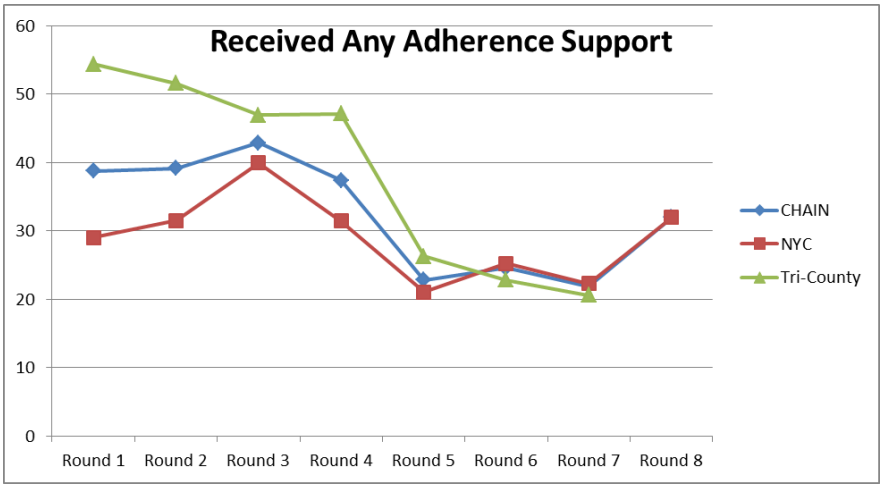
Medication Adherence Support Services

The majority of CHAIN participants, 57% of those living in NYC and 53% of those living in Tri-County, received some form of medication adherence support services during the study period. They mentioned receiving help in taking their medications "on time and in the right way" in 32% of the interviews conducted between 2001 and 2015 (28% of NYC interviews, 40% of Tri-County interviews).

Trends in medication adherence support

The percentage of participants receiving help in taking their medications on time and in the right way has declined since the early rounds of interviews (Figure 1). During the first four rounds of interviews, the percentage of CHAIN participants who mentioned adherence support service ranged between 37% and 43% (2001-2008). During the fifth through eighth rounds of interviews (2008-2015), the percentage of participants reporting medication adherence support services declined to between 22% and 32%. Despite differences in study design, reports of medication adherence support declined in both NYC and Tri-County, but the decline was steeper in Tri-County. In NYC, the percentage of CHAIN participants who mentioned receiving medication adherence support during the first four rounds of interviews ranged between 29% and 40%; however, during the four most recent rounds of interviews, medication adherence support declined to between 21% and 32%. In the Tri-County region, medication adherence support during the first four rounds of interviews ranged between 47% and 54%; during the three most recent rounds of interviews, medication adherence support declined to between 21% and 26%.

Figure 1: Received Any Medication Adherence Support by Cohort and Round



Types of medication adherence support services

Table 3 lists the kinds of formal support that CHAIN participants received to take medications "in the right way." When participants mentioned receiving help for adherent medication use, 55% of the time it took the form of a *behavioral* strategy. The most frequent behavioral strategy was a pillbox (52%). A device to keep track of dosages and timing of administration was mentioned in about a quarter (27%) of all instances of adherence support. Among interviews in which adherence support services were mentioned, NYC participants were significantly more likely than Tri-County participants to mention a pillbox (55% vs 35%); whereas, NYC residents were significantly less likely than Tri-County residents to report a device to help track dosage and timing (21% vs 36%). As Table 3 shows, CHAIN participants reported other behavioral strategies with far less frequency.

Cognitive strategies were mentioned in just under half of all CHAIN interviews (44%) in which adherence support services were reported. Individual counseling session involving information or advice was the most frequently kind of cognitive strategy (mentioned in 37% of all reported instances of adherence support services) and the second most frequently reported

strategy, overall, trailing only the pillbox. Tri-County participants were significantly more likely than NYC participants to report one or more cognitive strategies (61% versus 32%), and in particularly individual counseling (53% compared to 25%). There was a substantial decline in individual counseling over the course of the study period from between 50% and 56% of interviews in the first three rounds of interviews to only 3% and 9% of interviews in the two most recent rounds (results not shown). Distribution of written material was infrequently mentioned (12%). Adherence support services were described as a combination of behavioral and cognitive strategies 16% of the time.

Table 3: Medication Adherence Support Strategies

Type of Medication Adherence Support	% of CHAIN Interviews Reporting Services[a] (n=1,112)	% of NYC Interviews Reporting Services (n=648)	% of Tri-County Interviews Reporting Services (n=464)
Behavioral Strategies**	55	59	49
Pillbox**	52	55	35
Device***	27	21	36
Help keeping/storing medications	14	13	14
Directly observed therapy	4	4	2
Help arranging meals	1	1	1
Cognitive Strategies***	44	32	61
Info/advice (one-on-one)***	37	25	53
Written material***	12	9	16
Info/advice (group)	5	4	6
Combination of Behavioral and Cognitive Strategies**	16	13	20

Regional differences: * p <0.05, **p<0.01, ***p<0.001

[a] More than one adherence support service can be reported in an interview, and the same individual can report the same service at multiple interviews.

Sources of medication adherence support services

A professional with other clinical responsibilities generally provided adherence support services. Physicians were the most frequently mentioned source of medication adherence support services. They were mentioned in half the interviews in which participants identified the staff member providing this service (Table 4). Nurses and counselors were mentioned much less frequently (Table 4). Participants seldom received adherence support services from specialized treatment adherence counselors or from a peer (peer/health educator or member or leader of support group). The proportion of interviews in which physicians were reported as providing medication adherence support was similar in the two study regions. NYC participants were more likely than Tri-County participants to mention nurses and peers or support group leaders.

Table 4: Staff Member Providing Medication Adherence Support

Staff Position	% of CHAIN Interviews Reporting a Provider (n=1575)	% of NYC Interviews Reporting a Provider (n=968)	% of Tri-County Interviews Reporting a Provider (n=607)
Physician	51	51	50
Nurse***	12	15	7
Counselor	12	13	11
Case manager/social worker	10	10	9
Treatment adherence counselor*	3	2	6
Care coordinator/navigator	1	1	1
Drug/alcohol counselor	1	1	0
Other professional person***	10	13	6
Peer or support group leader ***	6	8	2
Peer/Health educator***	4	5	1
Member or leader of support group*	2	3	1
Mental health professional	2	2	1

Statistically significant regional differences: * p <0.05, **p<0.01, ***p<0.001

The frequency with which physicians provided adherence support has remained steady over time, at about half of all providers mentioned. However, other providers have become increasingly prominent source of adherence support. Reports of nurses providing adherence support services increased from 8% in Round 1 to 22% in Round 5. Similarly, reports of support from case managers/social workers increased from a low of 4% in Round 2 to a high of 24% in Round 7.

Helpfulness of services

CHAIN participants were generally satisfied with the adherence support services they received (Table 5). In the first three rounds, participants were asked, "How helpful was the help or advice you were given…?" 69% of participants reported that the assistance extended was "very helpful," and an additional 19%, participants reported that it was "somewhat helpful."

Table 5: How helpful were these services? (Asked at Rounds 1 through 3)

	% of CHAIN Interviews (n=622)	**% of NYC Interviews** (n=245)	**% of Tri-County Interviews** (n=377)
Very Helpful	69	70	69
Somewhat Helpful	19	20	19
Of Little Help	6	5	5
Not at all Helpful	6	5	7

Regional differences are not statistically significant

Subgroup analysis of adherence support services

The next set of tables summarizes differences in adherence support services utilization by sociodemographic characteristics (Table 6), HIV clinical measures (Table 7), and type and quality of medical care (Table 8). Among sociodemographic characteristics, Table 6 shows that

support services were more likely to be used by participants who were Latino, were women, had less than a high school education, were in poor mental health, or experienced food insecurity.

Table 6: Medication Adherence Support Services by Sociodemographic Characteristics & Risk Factors

	% of All Interviews Reporting Any Type of Medication Adherence Support Services (N=4,932)	% of Interviews Reporting Medication Adherence Support Services (N=1,112)		
		Behavioral Strategies	Cognitive Strategies	Combination of Behavioral & Cognitive Strategies
Sociodemographic characteristics				
Education	**			
Less than High School	35	56	41	16
High School or Beyond	30	54	46	17
Ethnicity	***		***	
Latino	38	56	36	14
Black	30	56	49	18
White	26	47	48	13
Gender	**			
Female	34	56	44	15
Male	30	55	44	18
Risk factors				
Drug Use				
Current	32	57	40	15
Past	30	53	48	17
Never	34	54	44	17
Housing Status				
Homeless	33	48	52	16
Unstable	32	53	46	14
Stable	32	55	44	17
Mental Health Status	*	**		*
Poor Mental Health	34	61	46	20
Good Mental Health	31	52	43	15
Food Insecurity	***			
Food Insecure	40	58	42	17
Not Food Insecure	27	53	46	16

Percentages are based on number of interviews

As might be expected, adherence support services targeted individuals who reported medication non-adherence or unsuppressed current or past viral load (Table 7). Low CD4 counts and longer duration of HIV infection were also associated with higher utilization of adherence support services (Table 7).

Table 7: Medication Adherence Support Services by HIV Clinical Measures

	% of All Interviews Reporting Any Type of Medication Adherence Support Services (N=4,932)	% of Interviews Reporting Medication Adherence Support Services (N=1,112)		
		Behavioral Strategies	Cognitive Strategies	Combination of Behavioral & Cognitive Strategies
HIV Clinical Measures				
CD4 count	***			
<200	38	58	50	20
≥200	30	55	43	16
Viral Load	***		**	
Not Suppressed	38	51	53	18
Suppressed	30	55	41	16
Viral Load at Previous Interview	*	*	**	
Not Suppressed	34	50	47	14
Suppressed	30	59	33	14
Year of HIV Diagnosis	**		*	
1973-1989	31	49	48	14
1990-1995	34	57	47	19
1996-2000	33	56	42	16
2001-2012	27	34	34	10
HIV Medication Adherence	***	*		*
Non-adherent	53	59	45	20
Completely adherent	26	53	44	14

Differences by clinical factors: * p <0.05, **p<0.01, ***p<0.001

Various measures of quality and organization of medical care were related to use of adherence support services, as well (Table 8). Adherence support services were associated with access to comprehensive medical care and receipt of a greater number of clinical services measured on the HIV standard of care scale. HIV medical care provided by a care coordination team was associated with higher utilization of behavioral strategies and a combination of

Table 8: Medication Adherence Support Services by Organization of Medical Care

	% of All Interviews Reporting Any Type of Medication Adherence Support Services (N=4,932)	% of Interviews Reporting Medication Adherence Support Services (N=1,112)		
		Behavioral Strategies	Cognitive Strategies	Combination of Behavioral & Cognitive Strategies
Organizational features of medical care				
Comprehensive Medical Care	*	*		
No	29	47	45	15
Yes	33	57	44	17
HIV Standard of Care	*	*	***	
Below median	30	59	36	15
Above median	33	52	50	18
Patient-Provider Encounter Scale	*		**	
Below median	33	55	41	16
Above median	29	55	50	18
Medical Case Management			***	***
No	32	55	38	14
Yes	33	56	57	22
Social Services Case Management	***	***	***	
No	26	45	53	14
Yes	35	59	40	17
Counseling Case Management				
No	32	56	42	12
Yes	32	55	44	17
Care Coordination	***	***		*
No	10	35	31	4
Yes	39	65	25	11
Patient Navigation	***	***		**
No	21	46	44	10
Yes	42	59	41	18

* p <0.05, **p<0.01, ***p<0.001

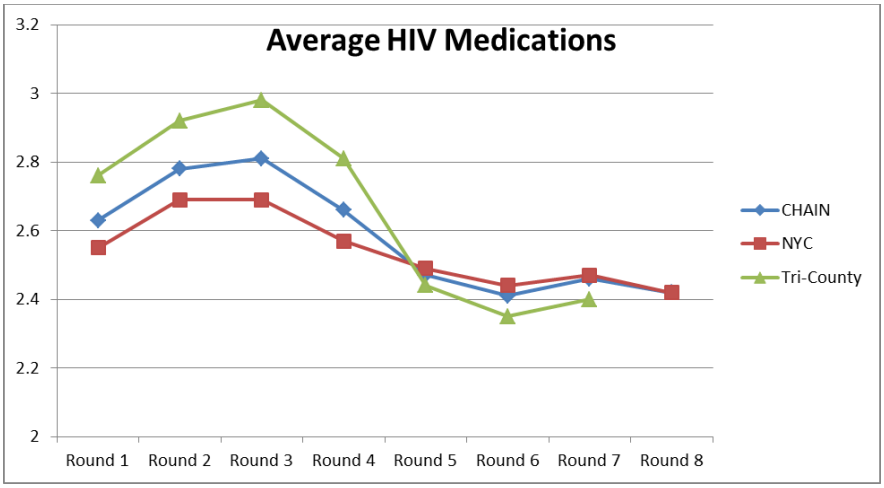
behavioral and cognitive strategies. Finally, those who received adherence support services at their primary care provider's office were more likely to receive cognitive strategies and a combination of behavioral and cognitive strategies than were participants who received adherence support services in a different setting**.** The one exception to this positive association

between use of adherence support service and the quality of medical care was a modest inverse association between use of adherence support services and the medical care encounter scale: 29% of participants with encounter scores above the median (more satisfied) used adherence support services compared to 33% with encounter scores below the median (less satisfied).

DISCUSSION

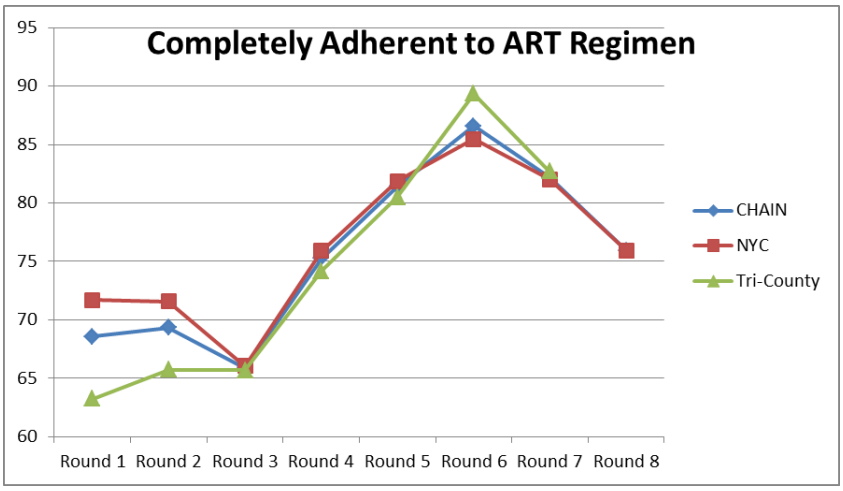
The experience of the CHAIN cohort suggests that medication adherence support is a well-established feature of HIV medical care in NYC and the Tri-County region. The majority of CHAIN participants received medication adherence support services at some point during the 15-year study period. However, the proportion of CHAIN participants receiving these services has declined since the early rounds of interviews. There is no obvious explanation for this general decline in adherence support services during the course of the study. Perhaps, as the CHAIN cohort aged and/or through earlier experiences with adherence support services, the cohort members' ability to self-manage their medical regimens improved. Another possibility is that HIV medication regimens have become less complex. Combination regimens can now be administered with fewer pills and fewer side effects, there are fewer barriers to adherence, and thus lessen the need for adherence support services (Cohen, Meyers, & Davis, 2013; Thompson et al., 2010). Consistent with this speculation, Figure 2 shows the average number of medications CHAIN participants take for HIV has declined from a peak of 2.81 in Round 3 to 2.4 in Round 6, while Figure 3 shows a corresponding rise in adherent medication use. Results from studies conducted by Langebeek et al. (2014) and Cohen et al. (2013) support this claim in other HIV patient populations.

Figure 2: Average Number of HIV Medications by Cohort and Round



NOTE: Each round represents unique responses from participants.

Figure 3: HIV Medication Adherence by Cohort and Round



NOTE: Each round represents unique responses from participants.

Study participants received both behavioral and cognitive adherent support strategies. Among CHAIN participants, who have ever received adherence support services, 63% received behavioral strategies, 55% received cognitive strategies, and 22% received a combination of

behavioral and cognitive strategies. The pillbox was the most widely used behavioral strategy and individual counseling was the most widely used cognitive strategy. Physicians were the staff most often identified as the provider of adherence support. Reports of adherence support from other staff was well below that received from physicians. It is possible that the large difference between reports of physicians versus other providers is partly inflated due to recall bias connected to a greater deference participants might give to physicians. This may result in closer attention given to advice or information coming from physicians compared to supporting staff.

There were few notable regional differences. Tri-County CHAIN participants were more likely than NYC participants to receive any form of adherence support services, particularly during the early rounds of interviews. Although, this difference has disappeared in recent rounds of interviews. NYC participants were more likely to receive behavioral strategies; whereas, Tri-County participants were more likely to receive cognitive strategies and a combination of behavioral and cognitive strategies.

The subgroup analysis found that individuals with a history of non-adherence, more advanced stages of HIV disease and membership in a marginalized sociodemographic group were more likely to receive adherence services. These findings support the expectation that adherence services tend to be directed to individuals who would appear most in need of these services.

The findings presented in this report for the CHAIN cohort are generally consistent with the published literature. Adherence support is generally delivered by a single provider; for the CHAIN cohort, reports suggest that this is typically the physician. Although the published literature generally concludes that multi-component interventions work better than single component interventions, CHAIN participants are most likely to report that they received either

cognitive or behavioral adherence support, not both. As an aid for adherence, the large majority of the CHAIN cohort used pillboxes or other devises used to dispense the correct dosage of medications. The experiences of the CHAIN cohort are also consistent with the published literature that adherence support is directed toward marginalized populations and those with a history of non-adherent use. Finally, this study investigated the relationship between the organization of medical care and medication adherence support that has yet to be reported in the published literature. Features of medical care that are generally treated as indicators of better quality of care (e.g. comprehensive medical care, receiving HIV standard of care) are also associated with greater provision of adherence support services.

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APPENDIX: CHAIN Interview Data on Type and Provider of Medication Adherence Support Services

Interview Round:	1	2	3	4	5	6	7	8
Types of Medication Adherence Support								
Help keeping/storing medications	x	x	x					
Help arranging meals	x	x	x					
Device	x	x	x			x	x	x
Info/advice one-on-one	x	x	x			x	x	x
Info/advice group	x	x	x			x	x	x
Written material	x	x	x			x	x	x
Pillbox						x	x	x
Directly observed therapy						x	x	x
Staff Members Providing Medication Adherence Support								
Medical provider/physician	x	x	x	x	x	x	x	x
Nurse	x	x	x	x	x	x	x	x
Case manager/social worker	x	x	x	x	x	x	x	x
Drug/alcohol counselor	x	x	x	x	x	x	x	x
Other professional person	x	x	x	x	x	x	x	x
Peer/Health educator	x	x	x	x	x	x	x	x
Member or leader of support group	x	x	x	x	x	x	x	x
Mental health professional	x	x	x	x	x	x	x	x
Treatment adherence counselor						x	x	x
Care coordinator/navigator						x	x	x
Additional adherence questions								
How helpful was the help or advice you were given?	x	x	x					
If selected information/advice in one-on-one or group setting: Specify # of times per month?						x	x	x
If selected information/advice in one-on-one or group setting: Specify for how long?						x	x	x
If selected DOT: Where?						x	x	x
If selected DOT: How often did a nurse or other care provider watch you take your medications?						x		