

ORIGINAL RESEARCH

Patient-Provider Satisfaction and Combination Antiretroviral Therapy Adherence: An Analysis of the Association Between Health Care Satisfaction and Adherence, as Framed by the Health Belief Model

Grace Graham, B.S.¹ , Deanna Ware, M.P.H.², Michael Plankey, Ph.D.³

¹ Department of Health Management and Policy, Georgetown University, ² Georgetown University Medical Center, ³ Georgetown University School of Medicine

Keywords: HIV, Health Belief Model, healthcare satisfaction, behavioral model

<https://doi.org/10.52504/001c.127951>

Georgetown Medical Review

Vol. 8, Issue 1, 2024

Background

Health care satisfaction can be used as an indicator of beneficial health outcomes. For people living with HIV (PLWH), reduced morbidity and mortality depend on adherence to combination antiretroviral therapy (cART). It is integral to assess whether health care satisfaction improves outcomes in individuals with HIV through strengthening adherence. The goal of this study was to investigate the association between health care satisfaction and cART adherence as framed by the health belief model.

Methods

This analysis used data from the Multicenter AIDS Cohort Study, a longitudinal observational cohort study. Cross-sectional data were collected from the 656 participants in the Understanding Patterns of Healthy Aging Among Men Who Have Sex With Men substudy from October 2016 to March 2019. The association between health care satisfaction and adherence was examined using logistic regression. In the adjusted model, covariates were age, race and ethnicity, source of medical care, insurance status, comorbidity count, and education.

Results

Most participants in the study were highly adherent to treatment, with 87.96% of the sample having adherence levels of 95% or greater. Increased health care satisfaction was significantly associated with 95% or greater adherence in both a multivariate model (adjusted odds ratio per unit increase, 1.12 [95% CI, 1.04-1.21]).

Conclusions

Health care satisfaction was positively associated with treatment adherence. This suggests that interventions to improve health care satisfaction should focus on training physicians to facilitate trusting and supportive communication about patient adherence as a method of addressing potential barriers to consistent cART usage.

Introduction

Background

ADHERENCE

Adherence is a behavioral decision of a patient to engage in and form a habit of consistently taking medicine.¹ As such, adherence can be influenced by personal characteristics, social characteristics, health beliefs, and structural factors such as access to care and socioeconomic status.¹ Achieving viral suppression of HIV requires consistent treatment adherence. Combination antiretroviral therapy (cART) pill regimens are vital to achieving viral suppression and reducing morbidity and mortality.²⁻⁷ cART is a combination of several antiretroviral drugs with higher treatment efficacy and reduced pill burden compared with other forms of ART. The benchmark for adherence is commonly set at 95% or greater because this is estimated to be the level of adherence required to achieve maximal viral suppression. This benchmark was based on a study of people taking cART conducted from 1997 to 1999 and several other studies reporting similar levels needed to limit drug resistance and increase viral suppression.⁸⁻¹¹ Methods of assessing adherence include self-report, prescription claims/pill refill, electronic monitoring devices, or direct biochemical analysis of cART medication in bodily fluids.⁷ Self-report tends to be the most frequent method due to its inexpensive and easy implementation.⁷

PATIENT SATISFACTION

Because the continuum of care requires PLWH to interact with medical care, understanding health care satisfaction may be beneficial to improving outcomes. The measure of patient satisfaction is used as an explanatory factor of health outcomes, such as reduced mortality in medical settings, and as a monitor of quality improvement.^{12,13} Patient satisfaction assesses patient experiences by measuring their perceptions of care, most commonly related to dimensions such as provider satisfaction, accessibility or convenience of care, and technical quality.¹³ Provider satisfaction is centered on the satisfaction with individual providers involved in medical care, whereas other satisfaction dimensions are focused on more administrative aspects of care. General and provider satisfaction is more relevant to influencing behavioral decisions. Clinical providers most commonly refer to physicians,¹⁴ but may also include nurse practitioners, nurses, and medical assistants involved in providing care.^{15,16} Within populations living with HIV, the pathway through which health care satisfaction reduces mortality may be through improved adherence.

PATIENT SATISFACTION AND ADHERENCE

One way to embed health care satisfaction into the HIV continuum is by studying its relationship with achieving viral suppression through adherence. Because the prescription of cART and subsequent maintenance depends on retention in care, patient satisfaction is seen as a relevant factor for adherence to cART.^{17,18} Thus, patients' satisfaction with their providers is relevant to improving adherence. In a literature review of 20 articles that examined the link between satisfaction and adherence, Barbosa et al¹⁹ found that all studies demonstrated a positive association between higher satisfaction and higher adherence levels. Of these studies, most (80%) found a statistically significant positive association between satisfaction and adherence, compliance, or persistence.¹⁹ In this literature review, there was no consensus on definitions, with often interchangeable use between the terms *adherence*, *compliance*, and *persistence*. However, in theory, *compliance* implies that a patient has a passive role in taking medication, while *adherence* is seen as a more neutral expression of a similar concept.¹ Moving forward, only *adherence* will be used as a term herein. To justify whether patient satisfaction is associated with cART adherence, it must first be understood how the health belief model (HBM) explains adherence then, subsequently, how health care/provider satisfaction fits within the model's framing of adherence.

HEALTH BELIEF MODEL THEORY

Because behavioral motivations are complex, such behaviors may require a cognitive model such as the HBM to frame the various contributing aspects of individual action.^{20,21} The HBM combines important components that contribute to belief in health threat and belief in the effectiveness of the health behavior through balancing perceived benefits and barriers.²⁰ Because interactions with the health care system may be the basis for patient perception of the benefits and barriers to HIV treatment, patient satisfaction may be relevant to improving adherent behaviors.

HBM is a framework to comprehend individual health decisions regarding health conditions and diseases. HBM relies on patient values and expectations to influence subsequent behaviors²² (see the Figure for a basic visual description of the model). This model assumes that individuals will rationally assess barriers to and benefits of action in conjunction with demographic and sociopsychological factors that impact various framework components.²⁰ Currently, relevant dimensions of HBM are perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and occasionally self-efficacy.²¹ Various studies chose to include self-efficacy and other demographic, social, and structural barriers as influencing the central components of patient perceptions.^{20,22}



Figure. Health Belief Model

This model depicts the components the Health Belief Model theorizes to influence cART adherence, the health behavior of interest in this study. Perceived threat is comprised of both an individual's perceived susceptibility of the consequence of nonadherence, as well as the perceived severity of nonadherence.

Of the motives for pursuing health care, susceptibility and severity are labeled as the perceived threats. *Perceived susceptibility* refers to the perception of risk of contracting the illness or condition. *Perceived severity* is the predicted consequences of contracting an illness and the lack of treatment for the illness.²² The perceived threat is the impetus to seek out a behavior. However, such behavior will not be deemed necessary if the perceived benefits of a health action do not outweigh the perceived threat. Thus, for a patient to pursue a particular action, the perceived threat must be significant enough to induce an individual to act; they will not do so if such action is ineffective in addressing their beliefs of susceptibility and severity.²²

Other components of HBM relate to the actual implementation of such health action. Perceived barriers act as a block to an individual who has the motive to pursue a specified course of action. These barriers can be financial, time, physical, or emotional.²² Cues to action is a less-explored component that entails specific triggers that empower an individual to pursue a behavior. Finally, variations of HBMs have incorporated self-efficacy into their frameworks. *Self-efficacy* is defined as “the conviction that one can successfully execute the behavior required to produce the outcomes.”²² The incorporation of self-efficacy has improved the explanatory power of HBM.²² While perceived threats encompass the motives to pursue an action, perceived

barriers and self-efficacy explain one's capacity to act as already desired. As such, HBM provides valuable insight into areas of intervention to induce or support desired health actions, such as improving cART adherence.

LITERATURE FINDINGS OF HBM APPLIED TO CART ADHERENCE

When applied to antiretroviral therapy adherence, HBM demonstrates what health-related attitudes impact patients' adherence. A summary of identified articles relating to HBM and cART adherence can be found in the supplemental file. In a sample of 49.3% of completely adherent individuals, Ashraf and Virk²³ described the use of HBM aspects of perceived utility, severity, susceptibility, support and barriers, intentions to adhere, and subjective norms concerning medication adherence, as well as general HIV beliefs of participants as to the severity, benefit, and barriers of preventive methods to reduce HIV transmission. The perceived severity of nonadherence and disease progression was explained by an individual's perception of other diseases' seriousness as contrasted to the effects of HIV. This perceived severity had a statistically significant association with medication adherence. Perceived barriers to engaging in HIV-preventive behaviors or the struggle to use condoms due to fear of partner response, personal embarrassment, or loss of enjoyment were likewise positively associated with medication adherence.^{23,24} In another study among pregnant Guyanese women, perceived susceptibility, including expectations of being free of HIV in the future, the chance of HIV worsening, and the belief that their body would fight off HIV in the future, was skewed in the direction of supporting adherence, but was not statistically significant.²⁵ These findings suggest that perceived barriers to HIV preventive measures and the severity of skipping medications may have the capacity to induce change in adherence to medication.

Barclay et al²⁶ assessed self-efficacy in their application of HBM and found that in the younger subsection sample, the individual's perceived utility of medication treatment was positively associated with adherence when adjusted for significant univariate factors. Additionally, self-efficacy was a good predictor of adherence.²⁶ However, Barclay et al²⁶ did not find these associations between self-efficacy and HBM medication dimensions with adherence in older participants. These variations in significance dependent on age suggest that HBM may have reduced explanatory power in certain samples. This incongruency was corroborated by the nonstatistically but clinically significant findings in the study by Vitalis²⁵ among pregnant women. HBM could have reduced applicability in specific populations.

Several studies have created models using HBM components to determine whether these components have direct or indirect impacts on medication adherence. Yu et al²⁷ assessed correlations between perceived threats of transmitting HIV, benefits to medication usage, barriers of medication, cues

to take medication, and self-efficacy measures with medication adherence in a sample of older PLWH in China. At a multivariate level, self-efficacy was significantly associated with medication adherence in the past month as a mediator.²⁷ Yu et al²⁷ found that perceived benefits (feeling better, increasing health, protecting family from infection) and cues to action (family encouragement, satisfied with medicine's effect, effect meets expectations) were positively correlated with medication adherence in the last month, after adjustment. Barriers were significantly negatively associated with medication adherence.²⁷

Aspects of HBM also influenced other patient attitudes and self-efficacy. Cues to action were correlated with reduced perceived barriers (adverse effects, external stigma), while increasing an individual's perceived benefits and self-efficacy. Perceived barriers were negatively associated with perceived benefits and self-efficacy. Perceived benefits were positively associated with self-efficacy, while self-efficacy was significantly positively associated with adherence.²⁷ Diiorio et al,²⁸ in a sample of 236 PLWH in Atlanta, Georgia, found that self-efficacy was positively associated with adherence, and patient satisfaction was positively associated with self-efficacy. Self-efficacy also was negatively associated with depression, which had a negative relationship with adherence.²⁸ Patient motivation may not be enough to induce adherence, but rather, the belief in one's capability to be adherent may be more integral to behavior. See Supplemental Table 1 for a summary of literature on the Health Belief Model and cART adherence.

PATIENT SATISFACTION AND HBM

Beneficial patient-provider relationships can improve patient self-efficacy about cART adherence and better inform the patient on the management of HIV through medication. In a Canadian longitudinal study of adherence, Godin et al²⁹ found that high patient satisfaction was statistically significantly associated with self-efficacy. High self-efficacy was, in turn, associated with 95% adherence to cART over the previous year, where 95% adherence indicates individuals took 95% of their prescribed pills.²⁹ This suggests that one potential pathway for patient-provider interactions to improve adherence is through supporting the development of a patient's self-efficacy to take their medications. Beyond quantitative support for the role providers play, patients also qualitatively assessed providers as beneficial to their maintenance of cART usage.

LITERATURE FINDINGS: PATIENT SATISFACTION, ADHERENCE, AND HBM

Patient experiences with providers can improve contexts for enhanced adherence. In a qualitative study of interviews with patients, Roberts³⁰ found that patient-provider relationships could modify patients' perceived benefits of cART. Individuals who lacked trust in their provider felt less

likely to believe in the ability of antiretroviral medications to improve their health. Lack of trust reduces providers' ability to recognize and eliminate patients' concerns about the adverse effects of cART.³⁰ Other barriers that reduce adherence to antiretroviral medications include regimen complexity and medication timing issues.^{31,32} In another qualitative interview and observation study, Fehringer et al³² found that in cases where the provider did not provide empathetic support to patients, patients were less willing to discuss adverse effects and instances of nonadherence. Just as positive patient-provider interactions can promote patient adherence, poor communication can worsen patient outcomes. Good communication improved the perceived benefits of antiretroviral therapy and reduced the subsequent barriers to usage.³⁰ These treatment regimen modifications can better enable higher adherence levels among patients.

Rationale

Literature findings support the positive association between high patient-provider and general satisfaction with cART adherence in PLWH. Supplemental Table 2 provides the detailed findings.^{15,16,29-31,33-40} The supplement includes the literature search methodology and an overview of the articles' measures. Many of the articles assessed these relationships without identifying the theoretical foundation on which the relationship depends. Adherence as a social-behavioral concept depends on more than 1 factor and, thus, associations found between satisfaction and adherence may be more distally related than assumed so by studies. Likewise, improved adherence serves as a proxy for viral suppression, as the standard cutoff is the minimum adherence level required for viral suppression.⁸ While certain studies analyzed specific components of satisfaction, such as the patient's perception of the provider's responsiveness,²⁹ some studies aggregated individual components into a summed general satisfaction or patient-provider satisfaction score as the main explanatory variable.^{16,29,33,35,39} Godin et al,²⁹ for example, assessed patient satisfaction with their physician through a 6-question shortened version of the Patient Satisfaction Scale, while methods used by Pérez-Salgado et al³⁵ more comprehensively assessed patient-provider satisfaction through a 9-question modified scale and assessed the performance of the clinic as well through 4 questions.^{29,37} Summing of individual questions may mask differences in the measured construct. Likewise, one scale may not be a good fit for measuring a particular sample's satisfaction. Godin et al,²⁹ Oetzel et al,³⁹ and Bakken et al³³ assessed scale reliability in their samples to support usage of a summed overall score for their particular samples. Additionally, not all studies discussed variations in satisfaction or adherence as related to demographic characteristics^{16,29,34-36} or acknowledged these demographic variables in subsequent analysis.³⁹ Although Bakken et al³³ acknowledged that there were nonsignificant

differences in satisfaction as related to gender and race, leaving out of the analysis potential explanatory variables that could influence the outcome brings into question the study findings.

The current study seeks to define the relationship between patient-provider satisfaction and cART adherence in HBM. While literature findings have pointed to the success of this model in providing insight into a general sample of PLWH, there was less success in applying it to demographic-specific samples.^{25,26} The relationship between patient satisfaction and adherence will be investigated in the Multicenter AIDS Cohort Study (MACS) Healthy Aging Substudy, a longitudinal observational study in aging men living with HIV in Washington, DC.⁴¹ It is anticipated that increased provider satisfaction will be significantly positively associated with adherence in this cross-sectional analysis. This study seeks to strengthen findings by describing how satisfaction levels vary by demographic factors and control for these relevant demographic factors before assessing the effect of satisfaction on adherence and viral suppression. The study results will be beneficial to identify potential interventions that enable better patient-provider satisfaction and cART adherence in aging PLWH.

Methods

Study Population

The parent study, MACS, was a longitudinal observational cohort study to observe the natural and treated history of HIV among men who have sex with men with and without HIV. Since 1984, more than 7000 participants have been enrolled in MACS up until its conclusion in 2019. Study sites included Baltimore, Maryland/Washington, DC; Chicago, Illinois; Los Angeles, California; and Pittsburgh, Pennsylvania/Columbus, Ohio. Study visits were conducted on a biannual basis and at these clinic visits, medical history and behavioral assessments of participants were taken. Specimen collection was also conducted.⁴²⁻⁴⁴

Analytic Sample

The Understanding Patterns of Healthy Aging Among Men Who Have Sex With Men substudy aims to assess psychosocial resiliencies among middle-aged and aging sexual minority men. The substudy was synchronously conducted with the MACS core study with 6 semiannual visits from April 2016 to March 2019. To be eligible for the substudy, participants were at least 40 years old on or before April 2016, reported at least 1 incidence of sexual intercourse with another man since enrolling in the MACS, and completed 2 consecutive MACS visits prior to April 2016.⁴¹ A total of 1317 men were eligible for this substudy. The current analysis included cross-sectional data from 656 participants in the substudy who were living with HIV and had data on health care satisfaction between visits 65 and 70 (April 2016-March

2019). The most recently available visit data were used for participants who had more than 1 visit during this period. The institutional review boards at each study site approved this substudy and the MACS protocol, and written informed consent was collected from all participants.

Outcome

Adherence to antiretroviral medications was self-reported as either 100%, 95% to 99%, 75% to 94%, or less than 75%. These responses were further collapsed into dichotomous 95% or greater and less than 95% categories. This was done both because of the distribution of adherence and to be able to model this outcome as dichotomous as opposed to ordinal.

Independent Variable

Health care satisfaction was assessed through a modified version of the Patient Satisfaction Questionnaire. This scale included 6 questions related to general satisfaction and technical quality over the past 6 months. Patients assessed their agreement with the statements listed below using a 5-point Likert scale:

1. "When I go for medical care, they are careful to check everything when treating or examining me."
2. "I think my doctor's office has everything needed to provide complete care."
3. "I am dissatisfied with some things about the medical care I receive."
4. "I have some doubts about the ability of the doctors who treat me."
5. "The medical care I have been receiving is just about perfect."
6. "Sometimes doctors make me wonder if their diagnosis is correct."

Responses to each question included strongly disagree, disagree, neutral, agree, and strongly agree, where the values for questions 3, 4, and 5 as listed above were recoded such that a higher value (strongly agree) indicated higher patient satisfaction. Cronbach α values were calculated for each construct's internal reliability in this sample. The overall standardized Cronbach α value was .8440. This value meets generally accepted cutoff for internal credibility of greater than or equal to 0.70.⁴⁵ Once internal reliability was confirmed, question responses were summed for each participant into a health care satisfaction sum. The health care satisfaction sum is the independent variable of interest. Any missing answers for any of the 6 questions were coded as missing. Any participant with a missing value for a question would result in

a missing value for the scale. The maximum score was 30, with a higher score indicating higher satisfaction. As evidenced by questions 2, 4, and 6, health care satisfaction measured included patient satisfaction with their physician.

Covariates

DEMOGRAPHIC CHARACTERISTICS

The age of participants was calculated from self-reported birth date and visit date and was coded as a continuous variable. Race and ethnicity were categorized as Hispanic, non-Hispanic Black (hereafter Black), non-Hispanic White (hereafter White), and other. Education was categorized as less than a high school diploma, high school diploma, at least some college, and at least some graduate school.

HEALTH-RELATED CHARACTERISTICS

The source of participants' medical care was categorized as primary care provider, but not HIV specialist; HIV specialist or infectious disease physician; non-HIV specialist (eg, gastroenterologist, dermatologist); other health care; urgent care; none of these; prefer not to say, or not applicable. Responding with either the prefer not to say or not applicable options was coded as missing, while non-HIV specialist, other health care, and urgent care were collapsed into a single other health care category. The number of physician visits within the last 6 months was recorded as a count variable. A participant's insurance status was also coded as a categorical variable as insured or not insured. Comorbidities of the following conditions were summed as a count variable as recorded in the last 6 months: high blood pressure (systolic blood pressure ≥ 140 mm Hg or diastolic blood pressure ≥ 90 mm Hg or diagnosis and use of medication); diabetes (hemoglobin A_{1c} level $\geq 6.5\%$, or fasting plasma glucose ≥ 126 mg/dL, or diagnosed with diabetes and use of diabetes medications); dyslipidemia (high-density lipoprotein cholesterol level < 40 mg/dL, triglyceride level ≥ 150 mg/dL, or use of lipid-lowering medications); kidney disease (estimated glomerular filtration rate < 60 mL/min/1.73 m² or urine protein to creatine ratio ≥ 200); and liver disease (serum glutamic pyruvic transaminase or serum glutamic oxaloacetic transaminase > 150 U/L).

HIV-RELATED FACTORS

Viral suppression was assessed as virally suppressed (< 200 copies/mL) or not virally suppressed (> 200 copies/mL).

Statistical Analysis

Descriptive statistics of the outcome, the independent variable, and covariates were generated using percentages, medians, and IQRs, as appropriate. Logistic regression was used to assess the relationship between covariates and the independent variable with antiretroviral therapy adherence. The

adjusted model included social demographics and all covariates that met the statistical cutoff. In the adjusted model, a statistical cutoff *P* value less than .20 was used to determine covariate inclusion. Additionally, insurance status was included due to being related to the provision of care. We also examined the relationship between the independent variable, covariates, and viral suppression, adjusting for the same covariates in the adjusted model. The other race and ethnicity category (*n* = 12) and the none of these (*n* = 7) medical care source category were removed from the models due to small cell size and subsequent model instability when included due to complete or quasicomplete separation of data points on the outcome. We reported adjusted odds ratios (aORs), 95% CIs, and *P* values. Statistical significance was set at less than .05. Analyses were performed in JMP Pro 17.0.0 (Statistical Analysis Software Inc).

Results

Descriptive Statistics

There were 656 participants included in the analysis. The median age of participants was 59 years with an IQR of 11 years. Most participants reported being White (58.5%) and having completed at least some college (54.7%) ([Table 1](#)). Individuals were primarily insured (89.9%). The median number of comorbidities was 2, with an IQR of 2. Slightly more than half of the sample had high blood pressure (57.9%), while three-quarters of the sample had dyslipidemia (75.2%). Individuals with diabetes made up 17.4% of the sample. There was nearly no individuals with liver disease (0.5%), and only 28.5% of the sample had kidney disease. Of HIV-related measures, 43.8% of participants self-reported their adherence as 100%, while 44.2% reported an adherence level between 95% and 99%. Those with adherence levels ranging from 75% to 94% made up 6.3% of the entire sample, while those with levels below 75% comprised 1.8% of the sample. This sample indicated high levels of adherence. Most of the sample was virally suppressed (94.5%). Further details on covariate distribution are reported in [Table 1](#).

Most participants reported their main source of medical care as being from an HIV specialist or infectious disease physician (67.8%). Most participants also perceived their medical care as being just about perfect (agree/strongly agree: 78.5%) and their medical care as being comprehensive (agree/strongly agree: 86.4%). Likewise, most participants (agree/strongly agree: 73.9%) agreed that when they go for medical care, the providers check for everything during examination. Very few participants were dissatisfied with some component of their medical care (agree/strongly agree: 16.3%). Only 11.1% (strongly agree/agree) of the sample agreed with the statement that they had some doubts of the ability of their physicians. Some participants expressed significant concern about whether their providers correctly diagnosed them (agree/strongly agree:

Table 1. Patient Demographics (N = 656)

	No. (%) ^a
Race and ethnicity	
Black	179 (27.3)
Hispanic	81 (12.4)
White	384 (58.5)
Other	12 (1.8)
Age, y	
Median (IQR) [range]	59 (11) [42-84]
Adherence since last Visit, %	
100	287 (43.8)
95-99	290 (44.2)
75-94	41 (6.3)
<75	12 (1.8)
Missing	26 (4.0)
Adherence dichotomous	
>95%	577 (88.0)
<95%	53 (8.1)
Missing	26 (4.0)
No. of physician visits	
Median (IQR) [range]	3 (3) [1-99]
Missing	81
Viral suppression	
Virally suppressed	620 (94.5)
Not virally suppressed	36 (5.5)
Insured	
Yes	590 (89.9)
No	19 (2.9)
Missing	47 (7.2)
Education level	
Less than high school	33 (5.0)
High school	91 (13.9)
At least some college	359 (54.7)
Graduate school or higher	173 (26.4)
High blood pressure	
Yes	380 (57.9)
No	239 (36.4)
Missing	37 (5.6)
Diabetes	
Yes	114 (17.4)
No	496 (75.6)
Missing	46 (7.0)

	No. (%) ^a
Dyslipidemia	
Yes	493 (75.2)
No	127 (19.4)
Missing	36 (5.5)
Kidney disease	
Yes	187 (28.5)
No	433 (66.0)
Missing	36 (5.5)
Liver disease stages 3/4	
Yes	3 (0.5)
No	619 (94.4)
Missing	34 (5.2)
Comorbidities	
Median (IQR) [range]	2 (2) [0-5]

^aThe percentages for each category may not sum to 100% due to rounding.

20%). The median health care satisfaction score was 24, with an IQR of 6; the range was from 6 to 30. Further details on health care satisfaction are reported in [Table 2](#).

Associations Between Health Care Satisfaction/Other Predictors and Adherence

Univariate associations are provided in supplemental Table 3. Liver disease and high blood pressure both had *P* values close to this cutoff (liver disease: *P* = .23, high blood pressure: *P* = .22). However, instead of including liver disease and high blood pressure as covariates, the comorbidity count was included instead. When adjusting for age, race and ethnicity, source of medical care, education, insurance, and comorbidities, a unit increase in the Health Care Satisfaction score was associated with increased adherence (aOR, 1.12 [95% CI, 1.04-1.21]; *P* = .003). In the adjusted model, Black individuals had 0.40 times odds (95% CI, 0.19-0.85; *P* = .02) of 95% or greater adherence (vs White participants). No other statistically significant associations were found ([Table 3](#)).

Discussion

Review of Results

This analysis found a statistically significant positive association between health care satisfaction and adherence. This positive association remained statistically significant when controlling for age, race and ethnicity, insurance status, source of medical care, education level, and number of comorbidities. When compared with White participants, Black participants had reduced

Table 2. Distribution of Health Care Items

	No. (%) ^a
Source of main medical care	
Primary care provider, not HIV specialist	153 (23.3)
HIV specialist or infectious disease physician	445 (67.8)
Non-HIV specialist (eg, gastroenterologist)	10 (1.5)
Other health care	6 (0.9)
Urgent care clinic	1 (0.2)
None of these	7 (1.1)
Prefer not to say	5 (0.8)
Not applicable	2 (0.3)
Missing	27 (4.2)
The medical care I have been receiving is just about perfect	
Strongly disagree	9 (1.4)
Disagree	24 (3.7)
Neutral	78 (11.9)
Agree	241 (36.7)
Strongly agree	274 (41.8)
Missing	30 (4.6)
When I go for medical care, they are careful to check everything when treating or examining me	
Strongly disagree	9 (1.4)
Disagree	46 (7.0)
Neutral	82 (12.5)
Agree	259 (39.5)
Strongly agree	226 (34.5)
Missing	34 (5.2)
I think my doctor's office has everything needed to provide complete medical care	
Strongly disagree	12 (1.8)
Disagree	14 (2.1)
Neutral	33 (5.0)
Agree	226 (34.5)
Strongly agree	341 (52.0)
Missing	30 (4.6)
I am dissatisfied with some things about the medical care I receive	
Strongly disagree	223 (34.0)
Disagree	210 (32.0)
Neutral	77 (11.7)
Agree	87 (13.3)
Strongly agree	20 (3.1)
Missing	39 (6.0)
I have some doubts about the ability of the doctors who treat me	

	No. (%) ^a
Strongly disagree	241 (36.7)
Disagree	236 (36.0)
Neutral	66 (10.1)
Agree	61 (9.3)
Strongly agree	12 (1.8)
Missing	40 (6.1)
Sometimes doctors make me wonder if their diagnosis is correct	
Strongly disagree	158 (24.1)
Disagree	215 (32.8)
Neutral	111 (16.9)
Agree	103 (15.7)
Strongly agree	28 (4.3)
Missing	41 (6.3)
Health care satisfaction score	
Median (IQR) [range]	24 (6) [6-30]

^aThe percentages for each category may not sum to 100% due to rounding.

odds of 95% or greater adherence. We did not find a statistically significant association between the type of physicians, the complexity of the patient's care (comorbidity count), insurance status, or number of physician visits with adherence levels.

Comparison With Other Studies—Variations in Satisfaction Assessed

Existing literature corroborates this study's positive associations between health care satisfaction and cART adherence.³⁶ In a cross-sectional study among 554 primarily male (94.8%) PLWH (mean age, 41.6 years), Schneider et al¹² studied the association between patient-provider satisfaction and adherence. While comparable with the current sample in gender makeup, this sample was younger than ours (median age, 59 years). As a sample on cART regimens, adherence was measured by a 4-question scale that assessed self-reported adherence and how often the patient made small changes from what their physician prescribed, made major changes, or stopped taking 1 or more of their medications because of adverse effects. Schneider et al¹² used previously developed scales⁴⁶⁻⁴⁹ in combination with a newly created scale to categorize satisfaction into general communication, overall physician satisfaction, willingness to recommend a physician, HIV-specific information, participatory decision-making, physician trust, and adherence dialogue. This study found that all aspects of satisfaction, except for participatory decision-

Table 3. Multivariate Associations for Adherence

	Odds ratio (95% CI) for $\geq 95\%$ adherence	P value
Health care satisfaction score per unit increase	1.12 (1.04-1.21) ^a	.003
Age (per year increase)	1.00 (0.95-1.05)	.85
Race and ethnicity		
Black, non-Hispanic	0.40 (0.19-0.85) ^b	.02
Hispanic	0.62 (0.22-1.85)	.37
White	Reference	
Source of medical care		
Primary care provider, not HIV specialist	1.64 (0.73-4.11)	.24
Other health care	0.31 (0.08-1.61)	.15
HIV specialist or infectious disease physician	Reference	
Education		
Graduate school or higher	1.91 (0.46-8.47)	.37
At least some college	0.45 (0.14-1.17)	.11
Less than high school	0.58 (0.11-4.42)	.555
High school	Reference	
Insurance		
Insured	1.52 (0.22-6.21)	.62
Not insured	Reference	
Comorbidities (per unit increase)	1.01 (0.74-1.39)	.94

^a $P < 0.01$.^b $P < .05$.

making, had a statistically significant positive association with adherence.¹² The results from Schneider et al¹² of general satisfaction being positively associated with adherence matches our study's findings.

While the measure of health care satisfaction used by Schneider et al¹² explicitly measured specific components when compared with the current study, which only assessed general satisfaction, both provide relevant insights. We used the highly validated, shortened RAND Patient Satisfaction Questionnaire-18 to assess health care satisfaction.^{46,50} The questions in the current study correspond to specific components that Schneider et al assessed. Question 1 of the current study, which assessed the participant's belief that their medical care providers check everything during an examination, may implicitly measure if the provider initiated a dialogue on adherence. Questions 4 and 6, which respectively assess the participant's concern about their physician's abilities or doubt whether the provider provided the correct health diagnosis, may reflect a lack of HIV-specific information in discussions. Our study used descriptive analysis to represent participants' specific satisfaction levels while performing our logistic regression score with the summed health care satisfaction measure to represent both generalized and specific components of satisfaction. An individual's satisfaction with one

aspect of care may counteract dissatisfaction with another aspect of their care, which indicates the merits for a more generalized satisfaction scale such as the one used in this analysis. While understanding what specific components of care may improve adherence, the summation of these aspects into overall satisfaction is also necessary.

Comparison With Other Studies—Satisfaction as an Explanatory Variable

In some studies, adherence was explanatory rather than an outcome of interest. In a convenience sample of 707 nonhospitalized PLWH receiving HIV care across 7 US sites, Bakken et al³³ assessed patient satisfaction with the provider using a 13-question scale that measured satisfaction through questions on provider availability, information-sharing, helpfulness, engagement level, and respect for the patient. Bakken et al³³ measured nonadherence through a 4-question scale based on forgetfulness, carelessness, ceasing the drug when feeling better, or starting the medication when feeling worse. The sample in the Bakken et al³³ sample was primarily composed of men (77%) and was younger than ours, with an average age of 39.4 years as compared with the 59-year median in the current study. The study by Bakken et al³³ found that adherence was positively associated with patient engagement with their provider, which aligns with the results found from our analysis. This suggests that adherent individuals are more prone to be engaged with their care. Because our and nearly all other literature referenced^{15,16,34-36,38,39} are cross-sectional observational studies, the directionality between satisfaction and adherence cannot be confirmed as to determine whether satisfaction improves adherence or whether adherence improves satisfaction. This is a limitation of cross-sectional research.

Strengths

This study's strength is a result of its use of data from a well-established cohort of middle-aged and aging men who have sex with men. While our current analysis was cross-sectional, the data were pulled from a prospective longitudinal cohort, where the substudy necessitated at least a year (2 visits) of observation in the MACS core study to be eligible. As such, the participants included were well-characterized as middle-aged and aging men who have sex with men and who were not recently diagnosed with HIV.⁴¹⁻⁴⁴ The samples of other studies often included participants based on their HIV status alone, with no eligibility criteria relating to sexuality or age.^{15,16,29,33,35,37,38} For example, the eligibility requirements in the Bakken et al³³ study were simply described as being a convenience sample among people receiving health care for HIV with no required amount of time under the provision of such care. Pérez-Salgado et al³⁵ and Schneider et al¹² likewise included convenience samples selected based on participants' providers. Both studies allowed nearly any patient who was receiving HIV-related care to be

eligible for the study.^{12,35} The well-standardized and consistent sample due to using MACS substudy results serves as a strength to our findings due to both increased reliability and generalizability on the basis of variations in source of medical care. Our study addresses the lack of literature on health care satisfaction and adherence among middle-aged and aging men who have sex with men. Adherence behavior may be modified by the duration of time living with HIV as well as the age of an individual, and as such, literature findings from younger, more recently diagnosed individuals may not be generalizable to middle-aged and older individuals who have lived with HIV longer. Our findings demonstrate that even in older cohorts, health care satisfaction is positively associated with adherence.

Limitations

SURVIVORSHIP

This study had several limitations. The MACS cohort used for this analysis is comprised of highly adherent individuals. This limits the results' generalizability to all men who have sex with men. Because this analysis used a convenience sample nested within an extensive longitudinal cohort study, participants selected for this substudy are indicative of a survivorship cohort. *Survivorship bias* is the bias that occurs when in a longitudinal study, patients who die soon after disease onset are less likely to be included in the cohort. This ultimately leads to a sample that has a "disproportionately higher number of lower-risk patients."⁵¹ Within the context of PLWH, a survivor cohort is more prone to having better adherence, reducing variability in the outcome of interest. Another relevant consideration of potential bias is the Hawthorne effect, in which participants under observation may be prone to modifying their behavior when aware of observation by others.⁵² This effect is present when participants are aware of the research's expectations.⁵² Existing levels of self-reported adherence then may be partially influenced by social desirability to appear highly adherent, compounding the effects of survivor bias. In a sample with high adherence, one may expect to see smaller effect sizes such that associations are rendered statistically insignificant. However, the current study's findings being statistically significant, despite overall high adherence levels, strengthens the clinical significance of the relationship between health care satisfaction and adherence.

AGE AND ADHERENCE

This study was distinguishable in that this was an aging cohort, with a higher median age when compared with other samples in the literature. In contrast to the nonsignificant effects of age in our study sample, Schneider et al¹² found that age was associated with higher adherence levels. Yet this association was not found in our results. A major limitation of literature findings is the lack of studies in middle-aged and aging populations. The results of the current study are insufficient to conclude that age has no

association with adherence in middle-aged and older PLWH. The current study sample primarily represents middle-aged participants, with few participants in the older age range. Indeed, age may have a different association in middle-aged populations compared with older populations. Despite the gaps in the literature, discrepancies between the older population in the current study and younger literature samples suggest that the mechanisms that predict adherence may differ between younger and older populations.

One study did assess variations in adherence within the context of HBM in younger and older subsamples. In an assessment of various factors including health beliefs, health attitudes, self-efficacy, neurocognitive status, and demographic characteristics on cART, Barclay et al.²⁶ found nonsignificant associations between HBM components and self-efficacy to overall adherence in the older subsample (≥ 50 years) of their study, yet these significant findings between HBM components and adherence occurred in the younger subsample. Rather, the older sample's adherence was associated with their neurocognitive status. These findings suggest that reasons for adherence may be less based on perceptions of the disease and more based on an individual's capacity to maintain their habit of remembering to take their medication.²⁶ While younger PLWH may need to be given more reasons for the importance of adherence, and support in building their self-efficacy, older populations may need different support, such as cues to action like reminders to take medications. However, our findings cannot attest to the validity of the results of Barclay et al. While our current research works to reduce the gap in research on middle-aged and aging men who have sex with men and how their satisfaction relates to adherence levels, an increased understanding of the pathways by which adherence is impacted is required to develop effective interventions that can improve health outcomes.

Implications

The findings of the current study indicate a need for heightened efforts to elevate health care satisfaction levels of aging PLWH. Given the association between patient satisfaction and adherence, communicative training initiatives should be implemented to better guide HIV providers in supporting patients. The findings of Schneider et al.¹² that providers who have dialogue with their patients about adherence and provide HIV-specific information may help improve patient adherence indicates the need for providers to consistently engage in initiating such conversations. HIV-specific information shared by providers may contribute to a patient's perceptions of the severity of HIV and the benefits of cART usage. Adherence dialogue may create an opportunity for providers to address a patient's perceived barriers to cART adherence and reduce them.¹²

Fehringer et al³² found that while in more than half of observations of interactions conversations about adherence were initiated, many of these interactions had leading and close-ended questions that limited the discussion of patient concerns. Participants under observation included 10 women and 10 men living with HIV, with an average age of 37.3 years and an average length of time taking cART of 6.4 years. Providers should be encouraged to reframe their questioning to increase the openness and trust of patients in discussing their barriers to medication adherence.³² Trust is vital to supporting adherence. In a qualitative study, among 28 PLWH, about half of whom were White with an average age of 40 years, patients mentioned that gaining reassurance or support to resolve drug adverse effects from their provider was often enough for them to continue adhering despite their desire to stop taking their pills.³⁰ Because some PLWH may get care from a non-HIV specialist, it is integral that these providers have the necessary support to become experts in relaying HIV-specific information such that trust is maintained.³⁰

Establishing trust between patients and providers also necessitates patients consistently receiving care from the same provider if that relationship is satisfactory. Visits should be appropriately long enough that patients do not feel rushed, otherwise this could lead to decreased trust in their providers.³⁰ Likewise, in some instances, patients are misaligned with providers who communicate incongruently with the patient's communicative style. In these instances, transfer of care should be easily facilitated so that the patient is placed with a provider who they can learn to rely on for support.^{30,32} Increasing ease of patient-provider communication and facilitating adherence dialogue should be the focus of interventions.

The development of interventions to improve health care satisfaction may facilitate improved health outcomes. One existing intervention in literature entailed an hour-long training session for providers to engage in motivational interviewing and patient coaching sessions asking patients to engage in cART adherence-related conversation. This intervention occurred across 3 US outpatient clinics providing HIV care for a sample of patients with a history of nonadherence, where only 37% reported excellent adherence.⁵³ The patients in this study had a mean age of 45.1 years, with 33% of the patients being female.⁵³ Randomization occurred to categorize participants into intervention and control groups. The provider intervention entailed a 1-hour presentation on the principles of motivational interviewing and how to implement this in conversation with patients about their medication adherence. Components of motivational interviewing entailed limiting corrective/lecture-based responses, understanding motivations, listening to the patient, and empowering the patient by giving them a role in decision-making.⁵³ The patient intervention entailed a coaching session immediately before the scheduled appointment that explored patient barriers to adherence and assessed whether patients had any questions concerning their

medications. This used a structured algorithm to identify such barriers and questions. Resulting questions and concerns were written down on a card that was offered to the patient to use during the provider appointment.⁵³ This intervention in patients and providers improved adherence dialogue when compared with the visits of control patients and providers. Additionally, there was more brainstorming solutions and probing to garner patient opinion in the intervention group. While nonsignificant, patients in the intervention group had a trend towards higher satisfaction compared with those in the control group, with minimal effect on appointment length.⁵³ Focusing on improving patient satisfaction with their provider should aim to heighten patient motivation to engage in their treatment regimens while facilitating their capacity to do so. Further development of interventions that enable patient adherence is necessary.

Conclusions

The findings of this study provide insight on how interventions can be directed to promote adherence. Given the significant association between health care satisfaction and adherence, physicians and other providers should be the target of communication-based initiatives that seek to promote increased trust and discussions of patient adherence. Improving communication between patients and their providers ultimately contributes to heightened satisfaction and will likely have a positive influence on overall adherence levels.

Disclaimers

None reported.

Sources of Support

This study is funded by the National Institute on Minority Health and Health Disparities (grant R01 MD010680, Friedman and Plankey). The contents of this publication are solely the responsibility of the author and do not represent the official views of the National Institutes of Health (NIH). MACS/WIHS Combined Cohort Study (MWCCS) (principal investigators): Atlanta CRS (Ighovwerha Ofotokun, Anandi Sheth, and Gina Wingood), U01-HL146241; Baltimore CRS (Todd Brown and Joseph Margolick), U01-HL146201; Bronx CRS (Kathryn Anastos and Anjali Sharma), U01-HL146204; Brooklyn CRS (Deborah Gustafson and Tracey Wilson), U01-HL146202; data analysis and coordination center (Gypsyamber D'Souza, Stephen Gange, and Elizabeth Golub), U01-HL146193; Chicago–Cook County CRS (Mardge Cohen and Audrey French), U01-HL146245; Chicago-Northwestern CRS (Steven Wolinsky), U01-HL146240; Connie Wofsy Women's HIV Study, Northern California CRS (Bradley Aouizerat, Phyllis Tien, and Jennifer Price), U01-HL146242;

Los Angeles CRS (Roger Detels), U01-HL146333; Metropolitan Washington CRS (Seble Kassaye and Daniel Merenstein), U01-HL146205; Miami CRS (Maria Alcaide, Margaret Fischl, and Deborah Jones), U01-HL146203; Pittsburgh CRS (Jeremy Martinson and Charles Rinaldo), U01-HL146208; UAB-MS CRS (Mirjam-Colette Kempf, Jodie Dionne-Odom, and Deborah Konkle-Parker), U01-HL146192; and UNC CRS (Adaora Adimora), U01-HL146194. The MWCCS is funded primarily by the National Heart, Lung, and Blood Institute, with additional co-funding from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, National Institute on Aging, National Institute of Dental and Craniofacial Research (NIDCR), National Institute of Allergy and Infectious Diseases, National Institute of Neurological Disorders and Stroke, National Institute of Mental Health, National Institute on Drug Abuse, National Institute of Nursing Research, National Cancer Institute, National Institute on Alcohol Abuse and Alcoholism, National Institute on Deafness and Other Communication Disorders, National Institute of Diabetes and Digestive and Kidney Diseases, National Institute on Minority Health and Health Disparities, and in coordination and alignment with the research priorities of the National Institutes of Health, Office of AIDS Research. MWCCS data collection is also supported by UL1-TR000004 (UCSF CTSA), P30-AI-050409 (Atlanta CFAR), P30-AI-050410 (UNC CFAR), and P30-AI-027767 (UAB CFAR).

Conflicts of Interest

None reported.

Submitted: September 23, 2024 EST. Accepted: November 24, 2024 EST. Published: January 21, 2025 EST.

REFERENCES

1. Marks D, Murray M, Estacio EV. Medicine taking: adherence and resistance. In: *Health Psychology: Theory, Research and Practice*. 5th ed. SAGE; 2018.
2. HIV Care Continuum. HIV.gov. October 28, 2022. Accessed March 23, 2024. <https://www.hiv.gov/federal-response/policies-issues/hiv-aids-care-continuum>
3. US Department of Health and Human Services, Panel on Antiretroviral Guidelines for Adults and Adolescents. *Guidelines for the Use of Antiretroviral Agents in Adults and Adolescents With HIV*. US Department of Health and Human Services; 2023.
4. Palella FJ Jr, Delaney KM, Moorman AC, et al. Declining morbidity and mortality among patients with advanced human immunodeficiency virus infection: HIV Outpatient Study Investigators. *N Engl J Med*. 1998;338(13):853-860. doi:[10.1056/NEJMoa199803263381301](https://doi.org/10.1056/NEJMoa199803263381301)
5. Cohen MS, Chen YQ, McCauley M, et al. Prevention of HIV-1 infection with early antiretroviral therapy. *N Engl J Med*. 2011;365(6):493-505.
6. Kay ES, Batey DS, Mugavero MJ. The HIV treatment cascade and care continuum: updates, goals, and recommendations for the future. *AIDS Res Ther*. 2016;13(1):35. doi:[10.1186/s12981-016-0120-0](https://doi.org/10.1186/s12981-016-0120-0)
7. Stricker SM, Fox KA, Baggaley R, et al. Retention in care and adherence to ART are critical elements of HIV care interventions. *AIDS Behav*. 2014;18(5):465-475. doi:[10.1007/s10461-013-0598-6](https://doi.org/10.1007/s10461-013-0598-6)
8. Byrd KK, Hou JG, Hazen R, et al. Antiretroviral adherence level necessary for HIV viral suppression using real-world data. *J Acquir Immune Defic Syndr*. 2019;82(3):245-251. doi:[10.1097/qai.0000000000002142](https://doi.org/10.1097/qai.0000000000002142)
9. Paterson DL, Swindells S, Mohr J, et al. Adherence to protease inhibitor therapy and outcomes in patients with HIV infection. *Ann Intern Med*. 2000;133(1):21-30. doi:[10.7326/0003-4819-133-1-200007040-00004](https://doi.org/10.7326/0003-4819-133-1-200007040-00004)
10. Turner BJ. Adherence to antiretroviral therapy by human immunodeficiency virus-infected patients. *J Infect Dis*. 2002;185(suppl 2):S143-151. doi:[10.1086/340197](https://doi.org/10.1086/340197)
11. Harrigan PR, Hogg RS, Dong WW, et al. Predictors of HIV drug-resistance mutations in a large antiretroviral-naïve cohort initiating triple antiretroviral therapy. *J Infect Dis*. 2005;191(3):339-347. doi:[10.1086/427192](https://doi.org/10.1086/427192)
12. Schneider J, Kaplan SH, Greenfield S, et al. Better physician-patient relationships are associated with higher reported adherence to antiretroviral therapy in patients with HIV infection. *J Gen Intern Med*. 2004;19(11):1096-1103. doi:[10.1111/j.1525-1497.2004.30418.x](https://doi.org/10.1111/j.1525-1497.2004.30418.x)
13. Jaipaul CK, Rosenthal GE. Do hospitals with lower mortality have higher patient satisfaction? a regional analysis of patients with medical diagnoses. *Am J Med Qual*. 2003;18(2):59-65. doi:[10.1177/106286060301800203](https://doi.org/10.1177/106286060301800203)
14. Berger S, Saut AM, Berssaneti FT. Using patient feedback to drive quality improvement in hospitals: a qualitative study. *BMJ Open*. 2020;10(10):e037641. doi:[10.1136/bmjopen-2020-037641](https://doi.org/10.1136/bmjopen-2020-037641)
15. Marshall GN, Hays RD. *Patient Satisfaction Questionnaire-18 (PSQ-18)*. APA PsycTests; 1976. doi:[10.1037/t07124-000](https://doi.org/10.1037/t07124-000)
16. Russell J, Krantz S, Neville S. The patient-provider relationship and adherence to highly active antiretroviral therapy. *J Assoc Nurses AIDS Care*. 2004;15(5):40-47. doi:[10.1177/1055329004269283](https://doi.org/10.1177/1055329004269283)

17. Sekandi JN, Castellanos ME, Woldu H, Kakaire R, Mutembo S, Mutanga JN. Patient satisfaction among persons living with HIV/AIDS and receiving antiretroviral therapy in urban Uganda: A factor analysis. *PLoS One*. 2023;18(2):e0280732. doi:[10.1371/journal.pone.0280732](https://doi.org/10.1371/journal.pone.0280732)
18. Endalamaw A, Gilks CF, Ambaw F, Chatfield MD, Assefa Y. Dimensions, social and healthcare setting determinants of client satisfaction for HIV/AIDS services: a systematic review. *medRxiv*. Published online July 12, 2023. doi:[10.1101/2023.07.10.23292462](https://doi.org/10.1101/2023.07.10.23292462)
19. Barbosa CD, Balp MM, Kulich K, Germain N, Rofail D. A literature review to explore the link between treatment satisfaction and adherence, compliance, and persistence. *Patient Prefer Adherence*. 2012;6:39-48. doi:[10.2147/ppa.S24752](https://doi.org/10.2147/ppa.S24752)
20. Munro S, Lewin S, Swart T, Volmink J. A review of health behavior theories: how useful are these for developing interventions to promote long-term medication adherence for TB and HIV/AIDS? *BMC Public Health*. 2007;7(1):104. doi:[10.1186/1471-2458-7-104](https://doi.org/10.1186/1471-2458-7-104)
21. Adefolalu AO. Description of a framework to enhance antiretroviral therapy adherence using self-efficacy and belief about medicines. *Eur J Med Health Sci*. 2020;2(4). doi:[10.24018/ejmed.2020.2.3.357](https://doi.org/10.24018/ejmed.2020.2.3.357)
22. Rosenstock IM, Strecher VJ, Becker MH. The health belief model and HIV risk behavior change. In: DiClemente RJ, Peterson JL, eds. *Preventing AIDS: Theories and Methods of Behavioral Interventions*. Springer US; 1994:5-24. doi:[10.1007/978-1-4899-1193-3_2](https://doi.org/10.1007/978-1-4899-1193-3_2)
23. Ashraf M, Virk RN. Determinants of medication adherence in patients with HIV: application of the health belief model. *J Pak Med Assoc*. 2021;71(5):1409-1412. doi:[10.47391/jpma.1463](https://doi.org/10.47391/jpma.1463)
24. Zagumny MJ, Brady DB. Development of the AIDS Health Belief Scale (AHBS). *AIDS Educ Prev*. 1998;10(2):173-179.
25. Vitalis D. Predicting adherence to antiretroviral therapy among pregnant women in Guyana: utility of the health belief model. *Int J STD AIDS*. 2017;28(8):756-765. doi:[10.1177/0956462416665989](https://doi.org/10.1177/0956462416665989)
26. Barclay TR, Hinkin CH, Castellon SA, et al. Age-associated predictors of medication adherence in HIV-positive adults: health beliefs, self-efficacy, and neurocognitive status. *Health Psychol*. 2007;26(1):40-49. doi:[10.1037/0278-6133.26.1.40](https://doi.org/10.1037/0278-6133.26.1.40)
27. Yu B, Jia P, Huang YL, et al. Self-efficacy as a crucial psychological predictor of treatment adherence among elderly people living with HIV: analyses based on the health belief model. *AIDS Care*. 2022;34(8):1041-1047. doi:[10.1080/09540121.2021.1938964](https://doi.org/10.1080/09540121.2021.1938964)
28. Diiorio C, McCarty F, Depadilla L, et al. Adherence to antiretroviral medication regimens: a test of a psychosocial model. *AIDS Behav*. 2009;13(1):10-22. doi:[10.1007/s10461-007-9318-4](https://doi.org/10.1007/s10461-007-9318-4)
29. Godin G, Côté J, Naccache H, Lambert LD, Trottier S. Prediction of adherence to antiretroviral therapy: a one-year longitudinal study. *AIDS Care*. 2005;17(4):493-504. doi:[10.1080/09540120412331291715](https://doi.org/10.1080/09540120412331291715)
30. Roberts KJ. Physician-patient relationships, patient satisfaction, and antiretroviral medication adherence among HIV-infected adults attending a public health clinic. *AIDS Patient Care STDs*. 2002;16(1):43-50. doi:[10.1089/108729102753429398](https://doi.org/10.1089/108729102753429398)
31. Vincke J, Bolton R. Therapy adherence and highly active antiretroviral therapy: comparison of three sources of information. *AIDS Patient Care STDs*. 2002;16(10):487-495. doi:[10.1089/10872910260351267](https://doi.org/10.1089/10872910260351267)
32. Fehringer J, Bastos FI, Massard E, Maia L, Pilotto JH, Kerrigan D. Supporting adherence to highly active antiretroviral therapy and protected sex among people living with HIV/AIDS: the role of patient-provider communication in Rio de Janeiro, Brazil. *AIDS Patient Care STDs*. 2006;20(9):637-648. doi:[10.1089/apc.2006.20.637](https://doi.org/10.1089/apc.2006.20.637)

33. Bakken S, Holzemer WL, Brown MA, et al. Relationships between perception of engagement with health care provider and demographic characteristics, health status, and adherence to therapeutic regimen in persons with HIV/AIDS. *AIDS Patient Care STDS*. 2000;14(4):189-197. doi:[10.1089/108729100317795](https://doi.org/10.1089/108729100317795)
34. Bogart LM, Bird ST, Walt LC, Delahanty DL, Figler JL. Association of stereotypes about physicians to health care satisfaction, help-seeking behavior, and adherence to treatment. *Soc Sci Med*. 2004;58(6):1049-1058. doi:[10.1016/S0277-9536\(03\)00277-6](https://doi.org/10.1016/S0277-9536(03)00277-6)
35. Pérez-Salgado D, Compean-Dardón MS, Staines-Orozco MG, Ortiz-Hernández L. Satisfaction with healthcare services and adherence to antiretroviral therapy among patients with HIV attending two public institutions. *Rev Invest Clin*. 2015;67(2):80-88.
36. Dang BN, Westbrook RA, Black WC, Rodriguez-Barradas MC, Giordano TP. Examining the link between patient satisfaction and adherence to HIV care: a structural equation model. *PLoS One*. 2013;8(1):e54729. doi:[10.1371/journal.pone.0054729](https://doi.org/10.1371/journal.pone.0054729)
37. Somi N, Dear N, Reed D, et al. Perceived satisfaction with HIV care and its association with adherence to antiretroviral therapy and viral suppression in the African Cohort Study. *AIDS Res Ther*. 2021;18(1):89. doi:[10.1186/s12981-021-00414-3](https://doi.org/10.1186/s12981-021-00414-3)
38. Tran BX, Dang AK, Vu GT, et al. Patient satisfaction with HIV services in Vietnam: status, service models and association with treatment outcome. *PLoS one*. 2019;14(11):e0223723. doi:[10.1371/journal.pone.0223723](https://doi.org/10.1371/journal.pone.0223723)
39. Oetzel J, Wilcox B, Hill R, Archiropoli A, Ginossar T, Avila M. Patient-provider interaction, patient satisfaction, and health outcomes: testing explanatory models for people living with HIV/AIDS. *AIDS Care*. 2015;27(8):972-978. doi:[10.1080/09540121.2015.1015478](https://doi.org/10.1080/09540121.2015.1015478)
40. Burke-Miller JK, Cook JA, Cohen MH, et al. Longitudinal relationships between use of highly active antiretroviral therapy and satisfaction with care among women living with HIV/AIDS. *Am J Public Health*. 2006;96(6):1044-1051. doi:[10.2105/ajph.2005.061929](https://doi.org/10.2105/ajph.2005.061929)
41. Egan JE, Haberlen SA, Meanley S, et al. Understanding Patterns of Healthy Aging Among Men Who Have Sex With Men: protocol for an observational cohort study. *JMIR Res Protoc*. 2021;10(9):e25750. doi:[10.2196/25750](https://doi.org/10.2196/25750)
42. Farinpour R, Miller EN, Satz P, et al. Psychosocial risk factors of HIV morbidity and mortality: findings from the Multicenter AIDS Cohort Study (MACS). *J Clin Exp Neuropsychol*. 2003;25(5):654-670. doi:[10.1076/jcen.25.5.654.14577](https://doi.org/10.1076/jcen.25.5.654.14577)
43. Kaslow RA, Ostrow DG, Detels R, et al. The Multicenter AIDS Cohort Study: rationale, organization, and selected characteristics of the participants. *Am J Epidemiol*. 1987;126(2):310-318. doi:[10.1093/aje/126.2.310](https://doi.org/10.1093/aje/126.2.310)
44. MACS/WIHS Combined Cohort Study. 2022. Accessed February 28, 2024. <http://www.mwccs.org>
45. Tavakol M, Dennick R. Making sense of Cronbach's alpha. *Int J Med Educ*. 2011;2:53-55. doi:[10.5116/ijme.4dfb.8dfd](https://doi.org/10.5116/ijme.4dfb.8dfd)
46. Marshall GN, Hays RD. *The Patient Satisfaction Questionnaire Short Form (PSQ-18)*. RAND Corporation; 1994.
47. Kaplan SH, Gandek B, Greenfield S, Rogers W, Ware JE. Patient and visit characteristics related to physicians' participatory decision-making style: results from the Medical Outcomes Study. *Med Care*. 1995;33(12):1176-1187. doi:[10.1097/00005650-199512000-00002](https://doi.org/10.1097/00005650-199512000-00002)
48. Wilson IB, Kaplan S. Physician-patient communication in HIV disease: the importance of patient, physician, and visit characteristics. *J Acquir Immune Defic Syndr*. 2000;25(5):417-425. doi:[10.1097/00042560-200012150-00006](https://doi.org/10.1097/00042560-200012150-00006)

49. Davies AR, Ware JE. *GHAA's Consumer Satisfaction Survey and User's Manual*. Group Health Association of America; 1991.
50. Safran DG, Kosinski M, Tarlov AR, et al. The Primary Care Assessment Survey: tests of data quality and measurement performance. *Med Care*. 1998;36(5):728-739. doi:[10.1097/00005650-199805000-00012](https://doi.org/10.1097/00005650-199805000-00012)
51. Miller DP, Gomberg-Maitland M, Humbert M. Survivor bias and risk assessment. *Eur Respir J*. 2012;40(3):530-532. doi:[10.1183/09031936.00094112](https://doi.org/10.1183/09031936.00094112)
52. Paradis E, Sutkin G. Beyond a good story: from Hawthorne effect to reactivity in health professions education research. *Med Educ*. 2017;51(1):31-39. doi:[10.1111/medu.13122](https://doi.org/10.1111/medu.13122)
53. Beach MC, Roter DL, Saha S, et al. Impact of a brief patient and provider intervention to improve the quality of communication about medication adherence among HIV patients. *Patient Educ Couns*. 2015;98(9):1078-1083. doi:[10.1016/j.pec.2015.05.011](https://doi.org/10.1016/j.pec.2015.05.011)

SUPPLEMENTARY MATERIALS

Supplemental Methods

Download: <https://gmr.scholasticahq.com/article/127951-patient-provider-satisfaction-and-combination-antiretroviral-therapy-adherence-an-analysis-of-the-association-between-health-care-satisfaction-and-ad/attachment/260159.docx>
