Screening With Patient-Reported Outcomes (PRO) Assessments to Identify Risk Factors for Suboptimal Adherence in Routine HIV Care

Duncan Short,[1] Xueqi Wang,[2] Shivali Suri,[3] Thomas K. Hsu,[2] Bryn Jones,[1] Rob J. Fredericksen,[4] Heidi M. Crane,[4] Alexandra Musten,[5] Jean Bacon,[5] Yongwei Wang,[2] Kevin A. Gough,[3] Moti Ramgopal,[6] Jeff Berry,[7] William B. Lober[4]

[1]ViiV Healthcare, Brentford, UK; [2]ViiV Healthcare, Durham, NC, USA; [3]St Michael's Hospital, Toronto, ON, Canada; [4]Center for AIDS Research, University of Washington, Seattle, WA, USA; [5]Ontario HIV Treatment Network, Toronto, ON, Canada; [6]Midway Specialty Care Center, Fort Pierce, FL, USA; [7]TPAN, Chicago, IL, USA

Disclosures

- Duncan Short is an employee of ViiV Healthcare and owns stock in GSK

17th International Conference on HIV Treatment and Prevention Adherence; November 7-9, 2022; Virtual and Washington, DC

Short et al. Adherence 2022; Virtual and Washington, DC. Slides ADH221043.

2

Adherence to ART Is Critical for Maintaining Virologic Suppression But Identifying Risk Factors for Adherence Can Be Challenging

- Modern ART regimens are highly effective at achieving virologic suppression, thereby reducing HIV-associated morbidity and mortality and increasing HRQoL among PWH[1,2]

- Suboptimal adherence to ART is associated with increased rates of virologic failure[2,3]

- Adherence to ART is associated with multiple behavioral, social, and clinical factors[4-7]

- However, identifying and addressing all factors potentially contributing to suboptimal ART adherence in individual patients can be challenging for healthcare providers during brief clinic visits[8]

- **For this analysis, we explored the relationship between self-reported adherence and risk factors obtained using PROs administered pre-consultation, as part of the larger PROgress study**

ART, antiretroviral therapy; HRQoL, health-related quality of life; PRO, patient-reported outcomes assessment; PWH, people with HIV.

1. Arts and Hazuda. *Cold Spring Harb Perspect Med*. 2012;2:a007161. **2.** Altice et al. *Patient Prefer Adherence*. 2019;13:475-490. **3.** Bezabhe et al. *Medicine*. 2016;95:e3361. **4.** Billoro et al. *J AIDS Clin Res*. 2018;9:774. **5.** Joseph et al. *AIDS Care*. 2015;27:1128-1136. **6.** Lee et al. *J Acquir Immune Defic Syndr*. 2019;80:103-109. **7.** Carvalho et al. *Cien Saude Colet*. 2019;24:2543-2555. **8.** Suri et al. *Int J STD AIDS*. 2021;2021:9564624211032796.

17th International Conference on HIV Treatment and Prevention Adherence; November 7-9, 2022; Virtual and Washington, DC

Short et al. Adherence 2022; Virtual and Washington, DC. Slides ADH221043.

3

PROgress Study: Prospective, Hybrid Type 3 Implementation-Effectiveness Study

- The PROgress study evaluated **the added value of PROs** into routine HIV care at 2 outpatient HIV clinics in North America between August 2018 and July 2020
  - Eligible participants were PWH aged ≥18 years

St Michaels Hospital,
Toronto, Ontario, Canada

Midway Specialty Care Center,
Fort Pierce, Florida, USA

PRO, patient-reported outcomes assessment; PWH, people with HIV.

17th International Conference on HIV Treatment and Prevention Adherence; November 7-9, 2022; Virtual and Washington, DC

Short et al. Adherence 2022; Virtual and Washington, DC. Slides ADH221043.

4

PROs Can Be Successfully Implemented Within Routine Care to Screen for Patient Needs, Behaviors, and Preferences to Support HIV Management

The PROgress study demonstrated that PROs[1]

Can be implemented into routine care without disrupting clinic flow

Identified otherwise hidden patient needs
eg, mental health issues

Were highly acceptable to patients and providers

May aid providers in identifying barriers to ART adherence

Improved patient–provider communication

Objective: examine the association between factors obtained through PROs and suboptimal ART adherence among PWH

17th International Conference on HIV Treatment and Prevention Adherence; November 7-9, 2022; Virtual and Washington, DC

Short et al. Adherence 2022; Virtual and Washington, DC. Slides ADH221043.
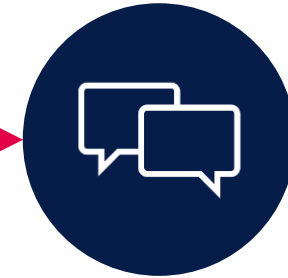
5

Process for Administering PROs to PWH at Routine Care Visits in the PROgress Study

Patient checks in and is given a PRO tablet in an appropriate location to self-administer PRO (~9 minutes)

Instant summary report available for provider (1 page)

Provider has consultation with patient

PRO, patient-reported outcomes assessment; PWH, people with HIV.

PROs in the PROgress Study

ART adherence
Visual analog scale[1]

Substance use
Modified ASSIST[2]

Alcohol use
AUDIT-C[3]

Smoking status
CNICS Smoking Questionnaire[4]

Depression
Patient Health Questionnaire 9[5,6]

Satisfaction with ART
Endorsement of burden or normal life HATQoL items[7]

Difficulty meeting housing costs
Single yes/no question

Intimate partner violence
Intimate Partner Violence 4 Questionnaire[8]

Risk of malnutrition
Canadian Nutrition Screening Tool[9]

ART, antiretroviral therapy; ASSIST, Alcohol, Smoking, and Substance Involvement Screening Test; AUDIT-C, Alcohol Use Disorders Identification Test Consumption Questionnaire; CNICS, Center for AIDS Research Network of Integrated Clinical Systems; HATQoL, HIV/AIDS-targeted quality of life; PRO, patient-reported outcomes assessment.

1. Walsh et al. *AIDS*. 2002;16:269-277. **2.** Newcombe et al. *Drug Alcohol Rev*. 2005;24:217-226. **3.** Bush et al. *Arch Intern Med*. 1998;158:1789-1795. **4.** Cropsey et al. *J Addict Med*. 2016;10:13-19. **5.** Kroenke et al. *J Gen Intern Med*. 2001;16:606-613. **6.** Spitzer et al. *JAMA*. 1999;282:1737-1744. **7.** Holmes and Shea. *Med Care*. 1998;36:138-154. **8.** Fitzsimmons et al. ISOQOL 2019; San Diego, CA. Poster. **9.** Laporte et al. *Eur J Clin Nutr*. 2015;69:558-564.

17th International Conference on HIV Treatment and Prevention Adherence; November 7-9, 2022; Virtual and Washington, DC

Short et al. Adherence 2022; Virtual and Washington, DC. Slides ADH221043.

7

Statistical Analyses

- Demographics and disease characteristics were obtained using chart reviews of medical records for a subset of participants

- Potential risk factors obtained from PROs and associated with suboptimal adherence of <95% and <80% were identified

- **Unadjusted analyses using univariate logistic regression models**
  - Variables that yielded *P* values <0.15 were included in multivariate logistic regression analyses

- **Adjusted analyses using multivariate logistic regression models**
  - Each multivariate logistic regression model included either the burden HATQoL item alone, the normal life HATQoL item alone, or both HATQoL items combined as variables
  - *P* values <0.05 were considered statistically significant

HATQoL, HIV/AIDS-targeted quality of life; PRO, patient-reported outcomes assessment.

17th International Conference on HIV Treatment and Prevention Adherence; November 7-9, 2022; Virtual and Washington, DC

Short et al. Adherence 2022; Virtual and Washington, DC. Slides ADH221043.

8

Demographics and Disease Characteristics of PWH Included in Chart Reviews

Parameter, n (%)	PWH (N=596)
Age, y	
<30	68 (11)
30 to <40	117 (20)
40 to <50	109 (18)
50 to <60	135 (23)
≥60	165 (28)
Male sex at birth	409 (69)
Race and ethnicity	
Black	254 (43)
White	222 (37)
Asian	24 (4)
Other races/Not specified[a]	86 (14)
Ethnicity	
Hispanic	42 (7)

Parameter, n (%)	PWH (N=596)
CD4+ cell count, cells/mm^3	
≤350	107 (18)
351 to <500	101 (17)
≥500	388 (65)
Undetectable viral load	487 (82)
Transmission risk category[b]	
Bisexual (either gender)	43 (7)
Blood product transfusion	17 (3)
Endemic area	54 (9)
Heterosexual	283 (47)
Injection drug user	31 (5)
Men who have sex with men	243 (41)
Unknown	19 (3)

PWH, people with HIV.

[a]Including aboriginal, First Nations, Middle Eastern, mixed race, and Native American. [b]Categories are not mutually exclusive.
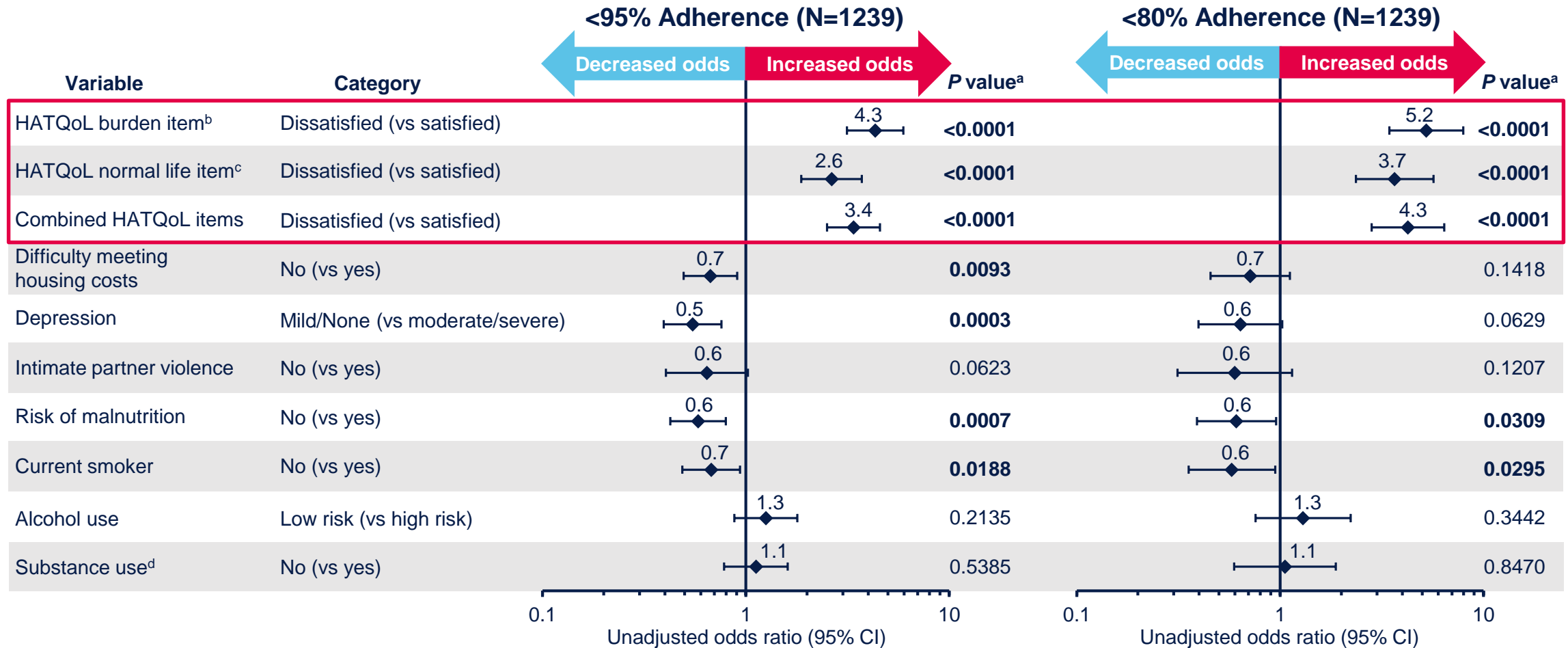
Sociodemographic and Health-Related Characteristics of PWH Obtained From PROs

Variable	Category	Respondents, n (%)[a]	PWH with characteristic, n (%)[b]
ART adherence	<95%	1239 (76)	268 (22)
	<80%		106 (9)
HATQoL burden item[c]	Dissatisfied	1527 (94)	272 (18)
HATQoL normal life item[d]	Dissatisfied	1555 (95)	243 (16)
Combined HATQoL items	Dissatisfied	1580 (97)	354 (22)
Difficulty meeting housing costs	No	1539 (94)	561 (36)
Depression	Mild/None	1533 (94)	1235 (81)
Intimate partner violence	No	1295 (79)	1175 (91)
Risk of malnutrition	No	1608 (99)	1243 (77)
Current smoker	No	1131 (69)	747 (66)
Alcohol use	Low risk	1620 (99)	1309 (81)
Substance use (past 3 months)	No	988 (61)	373 (38)

ART, antiretroviral therapy; HATQoL, HIV/AIDS-targeted quality of life; PRO, patient-reported outcomes assessment; PWH, people with HIV.

[a]Percentage of the total number of PWH included in the analysis (N=1632). [b]Percentage of respondents for each variable. [c]In the past 4 weeks, taking my [HIV] medicine has been a burden. [d]In the past 4 weeks, taking my [HIV] medicine has made it hard to live a normal life.

Dissatisfaction With ART Was Significantly Associated With Suboptimal Adherence in Unadjusted Analyses

Variable	Category	<95% Adherence (N=1239) OR	P value[a]	<80% Adherence (N=1239) OR	P value[a]
HATQoL burden item[b]	Dissatisfied (vs satisfied)	4.3	**<0.0001**	5.2	**<0.0001**
HATQoL normal life item[c]	Dissatisfied (vs satisfied)	2.6	**<0.0001**	3.7	**<0.0001**
Combined HATQoL items	Dissatisfied (vs satisfied)	3.4	**<0.0001**	4.3	**<0.0001**
Difficulty meeting housing costs	No (vs yes)	0.7	**0.0093**	0.7	0.1418
Depression	Mild/None (vs moderate/severe)	0.5	**0.0003**	0.6	0.0629
Intimate partner violence	No (vs yes)	0.6	0.0623	0.6	0.1207
Risk of malnutrition	No (vs yes)	0.6	**0.0007**	0.6	**0.0309**
Current smoker	No (vs yes)	0.7	**0.0188**	0.6	**0.0295**
Alcohol use	Low risk (vs high risk)	1.3	0.2135	1.3	0.3442
Substance use[d]	No (vs yes)	1.1	0.5385	1.1	0.8470

Unadjusted odds ratio (95% CI)

ART, antiretroviral therapy; HATQoL, HIV/AIDS-targeted quality of life.

[a]Bold values denote P values <0.05. [b]In the past 4 weeks, taking my [HIV] medicine has been a burden. [c]In the past 4 weeks, taking my [HIV] medicine has made it hard to live a normal life. [d]Past 3 months.
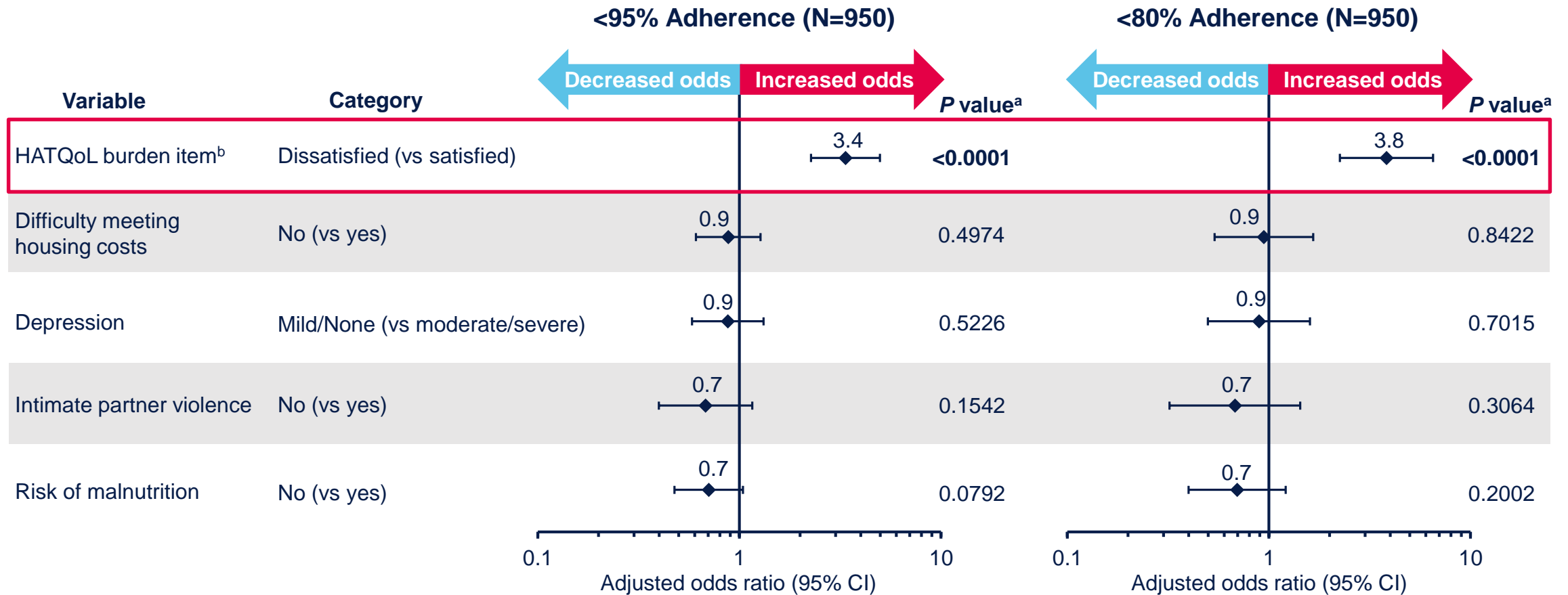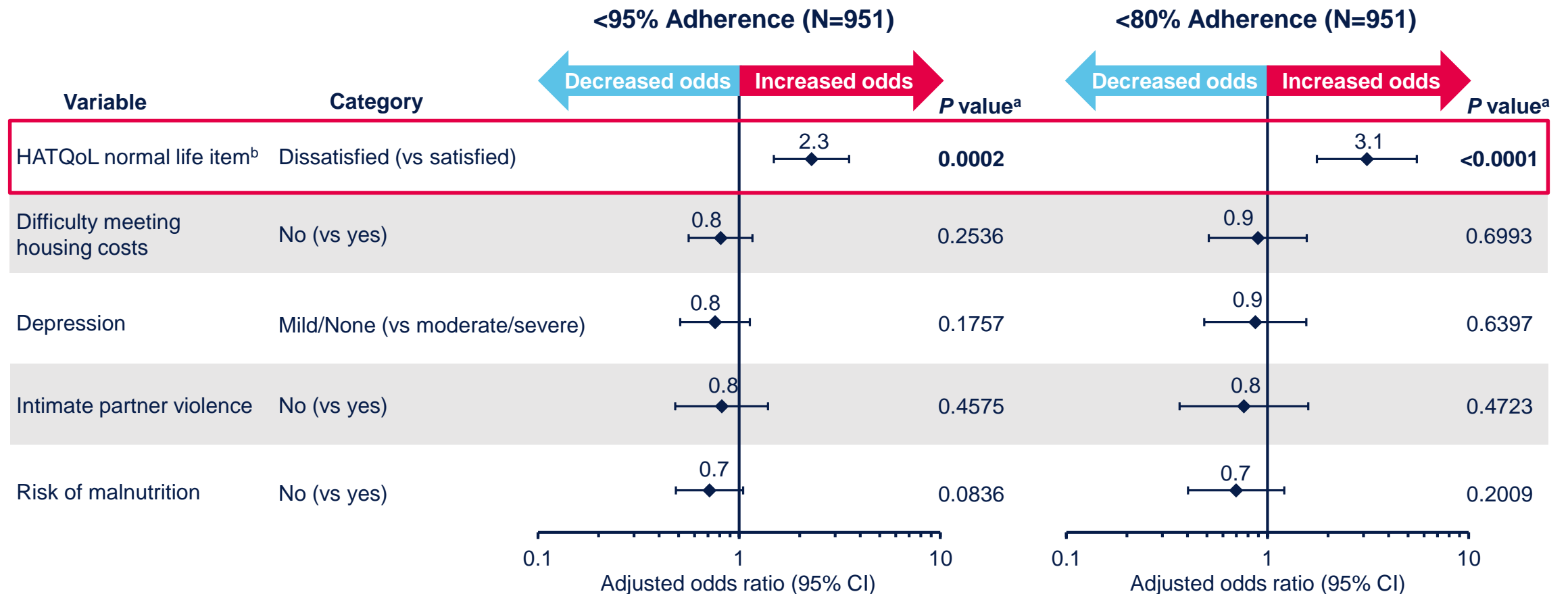
17th International Conference on HIV Treatment and Prevention Adherence; November 7-9, 2022; Virtual and Washington, DC

Short et al. Adherence 2022; Virtual and Washington, DC. Slides ADH221043.

11

Using 1 HATQoL Item, Dissatisfaction With ART ('Burden') Was Significantly Associated With Suboptimal Adherence in a Multivariate Model

<95% Adherence (N=950)

<80% Adherence (N=950)

Variable	Category	Decreased odds ← → Increased odds	P value[a]	Decreased odds ← → Increased odds	P value[a]
HATQoL burden item[b]	Dissatisfied (vs satisfied)	3.4	**<0.0001**	3.8	**<0.0001**
Difficulty meeting housing costs	No (vs yes)	0.9	0.4974	0.9	0.8422
Depression	Mild/None (vs moderate/severe)	0.9	0.5226	0.9	0.7015
Intimate partner violence	No (vs yes)	0.7	0.1542	0.7	0.3064
Risk of malnutrition	No (vs yes)	0.7	0.0792	0.7	0.2002

Adjusted odds ratio (95% CI)

ART, antiretroviral therapy; HATQoL, HIV/AIDS-targeted quality of life.

[a]Bold values denote *P* values <0.05. [b]In the past 4 weeks, taking my [HIV] medicine has been a burden.
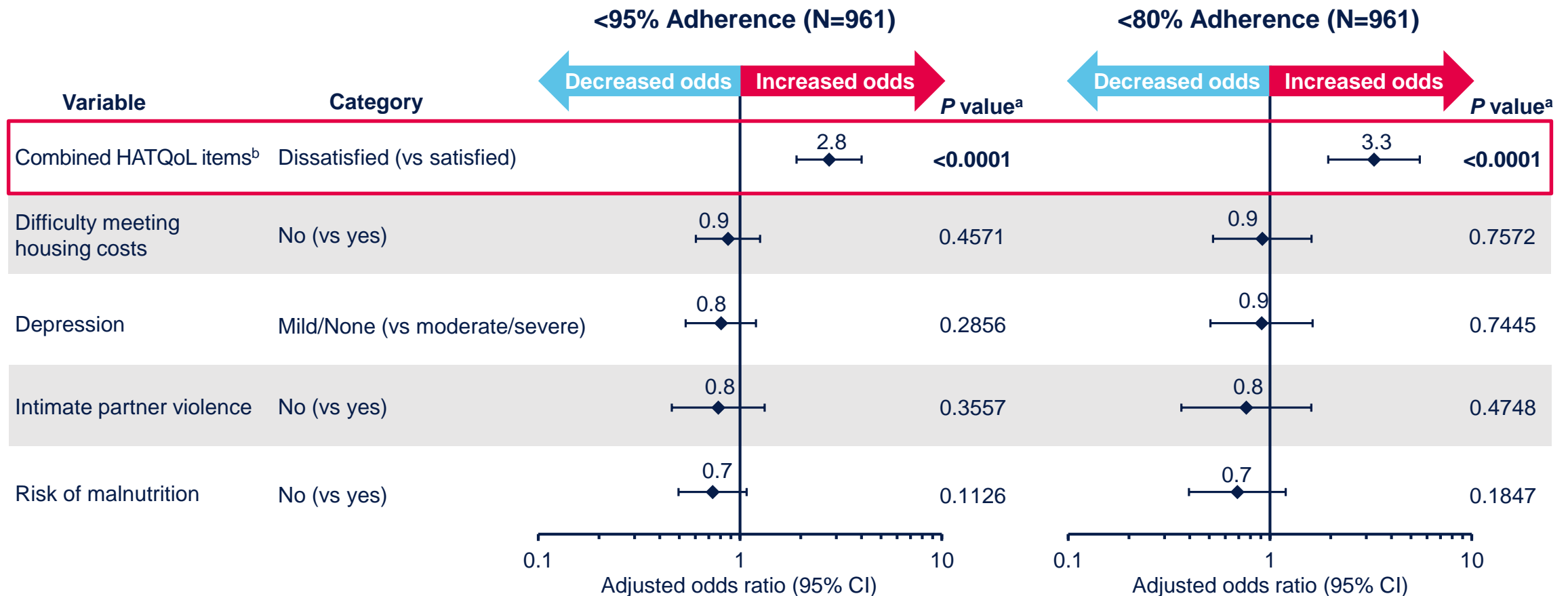
Using 'Hard to Live a Normal Life' HATQoL Item, Dissatisfaction With ART Remained Significantly Associated With Suboptimal Adherence

<95% Adherence (N=951)

Decreased odds | Increased odds

<80% Adherence (N=951)

Decreased odds | Increased odds

Variable	Category		*P* value[a]		*P* value[a]
HATQoL normal life item[b]	Dissatisfied (vs satisfied)	2.3	**0.0002**	3.1	**<0.0001**
Difficulty meeting housing costs	No (vs yes)	0.8	0.2536	0.9	0.6993
Depression	Mild/None (vs moderate/severe)	0.8	0.1757	0.9	0.6397
Intimate partner violence	No (vs yes)	0.8	0.4575	0.8	0.4723
Risk of malnutrition	No (vs yes)	0.7	0.0836	0.7	0.2009

0.1   1   10
Adjusted odds ratio (95% CI)

0.1   1   10
Adjusted odds ratio (95% CI)

ART, antiretroviral therapy; HATQoL, HIV/AIDS-targeted quality of life.

[a]Bold values denote *P* values <0.05. [b]In the past 4 weeks, taking my [HIV] medicine has made it hard to live a normal life.

Dissatisfaction With ART Was Also Significantly Associated With Suboptimal Adherence When Both HATQoL Items Were Combined

<95% Adherence (N=961)

<80% Adherence (N=961)

Decreased odds | Increased odds

Decreased odds | Increased odds

Variable	Category	<95% Adherence	P value[a]	<80% Adherence	P value[a]
Combined HATQoL items[b]	Dissatisfied (vs satisfied)	2.8	**<0.0001**	3.3	**<0.0001**
Difficulty meeting housing costs	No (vs yes)	0.9	0.4571	0.9	0.7572
Depression	Mild/None (vs moderate/severe)	0.8	0.2856	0.9	0.7445
Intimate partner violence	No (vs yes)	0.8	0.3557	0.8	0.4748
Risk of malnutrition	No (vs yes)	0.7	0.1126	0.7	0.1847

Adjusted odds ratio (95% CI)

Adjusted odds ratio (95% CI)

ART, antiretroviral therapy; HATQoL, HIV/AIDS-targeted quality of life.

[a]Bold values denote *P* values <0.05. [b]In the past 4 weeks, taking my [HIV] medicine has (1) been a burden and (2) made it hard to live a normal life.

17th International Conference on HIV Treatment and Prevention Adherence; November 7-9, 2022; Virtual and Washington, DC

Short et al. Adherence 2022; Virtual and Washington, DC. Slides ADH221043.

14

Associations Observed in Analyses After Multiple Imputation and Stepwise Selection

- After multiple imputation to account for missing data due to non-responses in the multivariate logistic regression analyses
  - Dissatisfaction with ART remained significantly associated with suboptimal adherence of <95% and <80% across all 3 models ($P<0.0001$)
  - No risk of malnutrition was significantly associated with reduced odds of <95% adherence in the models including the normal life HATQoL item alone ($P=0.0377$) or both HATQoL items combined ($P=0.0481$)

- Before and after multiple imputation in 3 multivariate stepwise selection models including 1 or both HATQoL items
  - Dissatisfaction with ART was significantly associated with <95% adherence ($P<0.0001$)
  - PWH with no risk of malnutrition were significantly less likely to have <95% adherence ($P<0.05$)
  - No results from stepwise multivariate analyses were available for <80% adherence because the only variables remaining after stepwise selection were HATQoL factors

ART, antiretroviral therapy; HATQoL, HIV/AIDS-targeted quality of life; PWH, people with HIV.

17th International Conference on HIV Treatment and Prevention Adherence; November 7-9, 2022; Virtual and Washington, DC

Short et al. Adherence 2022; Virtual and Washington, DC. Slides ADH221043.

15

Associations Observed by Study Site

- In analyses by study site,[a] dissatisfaction with ART was significantly associated with suboptimal adherence in several models, including

  - For **<95% adherence at St Michael's Hospital** after multiple imputation in all multivariate logistic regression and stepwise selection models

  - For **<95% adherence at Midway Specialty Care Center** before and after multiple imputation in all multivariate logistic regression models

  - For **<80% adherence at St Michael's Hospital** after multiple imputation in all multivariate logistic regression models

ART, antiretroviral therapy.

[a]No results were available from multivariate logistic regression models for <80% adherence or stepwise selection models for <95% or <80% adherence at Midway Specialty Care Center because HATQoL factors were the only variables included in the model.

17th International Conference on HIV Treatment and Prevention Adherence; November 7-9, 2022; Virtual and Washington, DC   Short et al. Adherence 2022; Virtual and Washington, DC. Slides ADH221043.

16

Conclusions

- PROs can provide important information about a patient's adherence and related risk factors to healthcare providers in real-time

- Dissatisfaction with ART was significantly associated with suboptimal adherence in PWH who completed PROs during routine HIV care visits at 2 North American clinics
  - Using either HATQoL item or both HATQoL items combined, PWH who were dissatisfied with ART were
    - 3.1 to 3.8 times more likely to have suboptimal adherence of <80% and
    - 2.3 to 3.4 times more likely to have suboptimal adherence of <95% than those who were satisfied with their ART medications

- An association between ART dissatisfaction and suboptimal adherence was observed using a single item from the HATQoL questionnaire, indicating that valuable information can be obtained through PROs with minimal time burden for the patient

- Overall, these results suggest that screening for treatment dissatisfaction using PROs may provide value to adherence management in routine HIV care

ART, antiretroviral therapy; HATQoL, HIV/AIDS-targeted quality of life; PRO, patient-reported outcomes assessment; PWH, people with HIV.

17th International Conference on HIV Treatment and Prevention Adherence; November 7-9, 2022; Virtual and Washington, DC   Short et al. Adherence 2022; Virtual and Washington, DC. Slides ADH221043.

17

Acknowledgments

17th International Conference on HIV Treatment and Prevention Adherence; November 7-9, 2022; Virtual and Washington, DC

Short et al. Adherence 2022; Virtual and Washington, DC. Slides ADH221043.

18