HIV AND CHRONIC COMORBIDITIES: MEDICATION ADHERENCE AND CLINICAL ENDPOINT COVARIATION

892

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BACKGROUND

- Evidence suggests negative monthly medication adherence trends during the COVID-19 era for patients with HIV (PWH) and multiple chronic conditions.
- It is unknown whether observed adherence trends are associated with changes in intermediate outcomes of HIV care before and during the COVID-19 era.

Study Objective:

- To evaluate the association between medication adherence and clinical endpoint covariation while accounting for the COVID-19 interruption.

METHODS

Design:

- 37-month longitudinal retrospective cohort study from 9/2018 – 9/2021

Sample:

- Adult PWH with type 2 diabetes, hypertension, and/or hypercholesterolemia were identified in a US mid-Atlantic integrated health system.

Exposure Measurements:

- Mean and dichotomous thresholds for monthly proportion of days covered (PDC)] for: antiretrovirals [ART] (90%), diabetes medications [DMs] (80%), renin-angiotensin antagonists [RASMs] (80%), and statins [SMs] (80%)
- Combination RASMs and SMs were not included

Outcome Measurements:

- Viral load (VL; copies/mL), HbA1c, systolic and diastolic blood pressure (SBP, DBP; mmHg), and total cholesterol (TC; mg/dl)]
- Last observation carried forward and next observation carried backward were used to impute missing values

Analysis:

- Descriptive statistics for demographic characteristics
- Time series models for medication adherence and clinical endpoints
- Multivariable population-averaged panel general estimating equations with Binomial Distribution, Logit Link, First-Order Autoregressive Correlation Structure, and Robust Standard Errors over the observation period
  - Covariates included demographics, number of medication groups, COVID-19 era (starting 3/1/2020), and a COVID-19/PDC interaction term.

↑ART adherence ***was associated*** with ↓VL over the 37-month observation period

No observed associations between DM, RASM, and SM adherence and their respective clinical endpoints

COVID-19 ***was not associated*** with VL, HbA1c, DBP, and TC variations

RESULTS

Demographics:

- The cohort [n=543] was predominantly:
  - 51-64y [59.30%]
  - Black [73.11%]
  - Male [69.24%]
  - Privately insured [65.38%].
- All patients were prescribed ART with 75.32% co-prescribed SMs; followed by RASMs [42.73%]; and DMs [25.60%]
- 63.2% with 2 medication groups, 28.9% with 3, and 7.4% with 4 medication groups

Time Series Models – VL and ART Adherence

Figure 1a. Viral Load

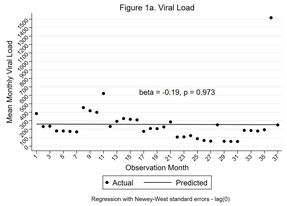
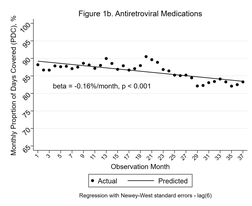


Figure 1b. Antiretroviral Medications



Time Series Models – SBP and RASMs Adherence

Figure 2a. Systolic Blood Pressure

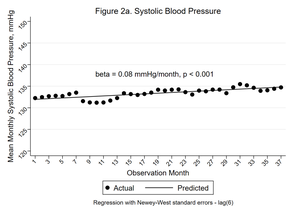
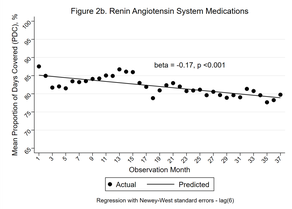


Figure 2b. Renin Angiotensin System Medications



Multivariable Models

Table 1. Factors Associated with Clinical Endpoints

Comorbidity / Medication	**HIV / Antiretrovirals** (n=543 Patients, 20,091 Monthly Observations)	**Type 2 Diabetes / Diabetes Medication** (n=139 Patients, 5,143 Monthly Observations)	**Hypertension / Renin-Angiotensin System Medications** (n= 232 Patients, 8,584 Monthly Observations)		**Hypercholesterolemia / Statin Medications** (n=404 Patients, 14,948 Monthly Observations
	Viral Load ≥200	**HbA1c ≥7**	**Systolic ≥130**	**Diastolic ≥80**	**Total Cholesterol ≥200**
Factor	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)
PDC Above Threshold*	**0.77 (0.63 – 0.94)**	0.99 (0.94 – 1.04)	1.03 (0.93 – 1.14)	1.05 (0.94 – 1.16)	1.00 (0.96 – 1.04)
COVID-19 Interruption (3/2020)	1.01 (0.67 – 1.52)	0.99 (0.88 – 1.11)	**1.22 (1.01 – 1.48)**	1.05 (0.85 – 1.28)	0.95 (0.86 – 1.04)
Age Group (Ref: 18-50 years)	-	-	-	-	-
51-64 Years	0.56 (0.27 – 1.17)	0.53 (0.26 – 1.05)	0.83 (0.53 – 1.31)	**0.58 (0.36 – 0.93)**	0.79 (0.48 – 1.30)
65+ Years	0.38 (0.11 – 1.26)	**0.31 (0.10 – 0.92)**	1.16 (0.65 – 2.08)	0.68 (0.37 – 1.25)	0.69 (0.34 (1.42)
Race Group (Ref: White)	-	-	-	-	-
Black	**4.37 (1.79 – 10.67)**	0.63 (0.21 – 1.87)	1.41 (0.83 – 2.41)	1.61 (0.95 – 2.73)	**1.78 (1.07 – 2.97)**
Hispanic/Asian/Other	1.20 (0.32 – 4.57)	1.15 (0.28 – 4.81)	1.08 (0.46 – 2.54)	0.71 (0.27 – 1.87)	0.99 (0.39 – 2.47)
Male Gender (Ref: Female)	0.96 (0.52 – 1.76)	0.87 (0.47 – 1.63)	0.82 (0.57 – 1.18)	1.00 (0.67 – 1.50)	**0.52 (0.34 – 0.78)**
Insurance Type (Ref: Commercial)	-	-	-	-	-
ACA/Other	0.34 (0.11 – 1.02)	1.13 (0.50 – 2.60)	1.06 (0.61 – 1.86)	1.19 (0.66 – 2.15)	1.63 (0.91 – 2.90)
Medicaid	0.24 (0.03 – 2.06)	1.03 (0.24 – 4.42)	1.27 (0.24 – 6.70)	1.33 (0.35 – 5.03)	0.89 (0.34 – 2.34)
Medicare	0.94 (0.39 – 2.28)	0.93 (0.40 – 2.15)	0.82 (0.52 – 1.30)	**0.61 (0.38 – 0.97)**	0.97 (0.53 – 1.78)
Medication Groups Total (Ref: 2)	-	-	-	-	-
3	0.98 (0.50 – 1.91)	1.43 (0.71 – 2.88)	0.77 (0.53 – 1.11)	**0.45 (0.30 – 0.68)**	**0.43 (0.27 – 0.68)**
4	**0.07 (0.02 – 0.32)**	1.29 (0.57 – 2.93)	0.83 (0.53 – 1.28)	**0.28 (0.17 – 0.47)**	**0.33 (0.15 – 0.72)**
Adherence/COVID-19 Interaction	0.89 (0.65 – 1.23)	1.00 (0.91 – 1.09)	0.96 (0.82 – 1.13)	1.04 (0.89 – 1.22)	0.97 (0.90 – 1.04)
Constant	**0.02 (0.01 – 0.05)**	**4.42 (1.15 – 17.05)**	1.63 (0.74 – 3.59)	0.91 (0.40 – 2.06)	**0.45 (0.23 (0.90)**

*Proportion of Days Covered (PDC) Threshold for Antiretrovirals ≥90%; PDC for other medication groups ≥80%.

CONCLUSIONS

Adherence and Clinical Endpoint Trends

- No significant trend in VL (Figure 1a.)
- Negative trend in ART adherence (Figure 1b.)
- Positive trend in SBP (Figure 2a.)
- Negative trend in RASMs adherence (Figure 2b.)

Adherence and Clinical Endpoints

- Increased ART adherence (PDC≥90%) was associated with decreased VL≥200 copies/mL (Table 1.)
- No observed associations between DM, RASM, and SM adherence and their clinical endpoints (Table 1)

COVID-19 and Clinical Endpoints

- Significant direct relationship between the COVID-19 start date and SBP (Table 1.)
- COVID-19 start date not associated with variations in VL, HbA1c, DBP, and TC clinical endpoints (Table 1.)

Demographics and Clinical Endpoints

- Age, Race, Gender, Insurance, and # of Concurrent Medication Groups were associated with various clinical endpoints (Table 1.)
- No Adherence + COVID-19 Interaction (Table 1.)

LIMITATIONS

- Observational design with evidence of active treatment
- Incomplete data ascertainment from undetected care external to the system and missing information from within system
- Undetected therapy switches for medications not included at study outset
- Missing monthly clinical endpoints requiring imputation
- References available on request

ADDITIONAL KEY INFORMATION

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