

## BACKGROUND

- HIV is an independent risk factor for the development of ASCVD.
- Many factors may contribute:
  - Systemic inflammation secondary to HIV infection.
  - Exposure to ART may increase cardiac risk, specifically with abacavir and certain protease inhibitors.
  - Increased likelihood for modifiable risk factors (e.g. smoking and obesity).
- Gaps in therapy have been previously described:
  - 23-77% prescribing rates for HIV-infected individuals indicated for statin medications.
  - HIV-infected individuals are more likely to be on lower-intensity statins compared to uninfected patients.
- Previous data did not consider implications of certain patient-related factors and DDIs on appropriateness of statin dosing.
- Based on the 2013 ACC/AHA guidelines, we aim to evaluate appropriate statin prescribing rates in HIV-infected compared to uninfected individuals while accounting for patient-related characteristics (i.e., comorbidities, concomitant medications, and laboratory abnormalities).

## METHODS

- Study Design:** Retrospective, cohort study of statin eligible adult patients with a clinic encounter between 2/1/2017 – 9/30/2017 at two outpatient clinics within the University of Maryland Medical System (UMMS)
- Primary outcome:** percentage of HIV infected individuals prescribed an appropriately dosed statin compared to uninfected patient
- Secondary outcomes:**
  - Patient characteristics associated with inappropriate statin and doses.
  - Statin appropriateness for each statin benefit group

### Inclusion criteria

- Qualify for one of the four ACC/AHA statin benefit groups:
- History of clinical ASCVD
  - LDL-C  $\geq$  190 mg/dL
  - History of diabetes
    - Age 40-75 years old
    - LDL-C 70-189 mg/dL
  - 10-year ASCVD risk score  $\geq$  7.5%
    - Age 40-75 years old
    - LDL-C 70-189 mg/dL

### Exclusion criteria

- < 21 years old
- > 85 years old
- Most recent lipid panel > 3 years from start of study period

- Statistical Analysis:**
  - Propensity score matching analysis using t-test or Fisher's exact test were used for between group comparisons.
  - Multivariate analysis was conducted to evaluate the association between statin appropriateness and patient-related factors.
  - Analysis conducted with SAS V 9.4 (SAS Instituted, Cary, NC).

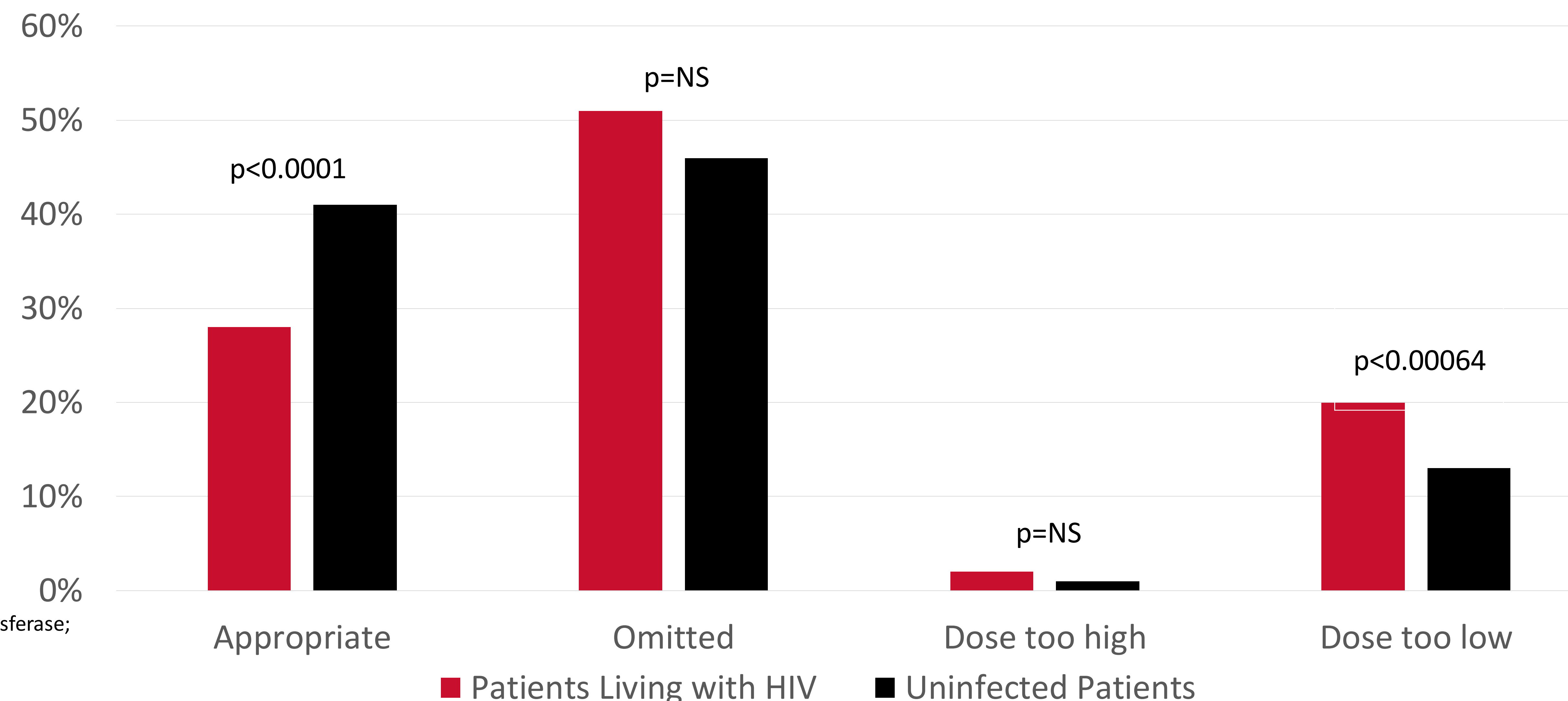
Propensity-Matched Patient Demographics			
Characteristic	All Patients (n=1758)	HIV Positive (n=879)	HIV Negative (n=879)
Age (years), mean (SD)	57.2 (9.0)	57.2 (8.0)	57.2 (9.0)
Sex (male), n (%)	1122 (63.8)	556 (63.3)	566 (64.6)
Race, n (%)			
White/Caucasian	139 (7.9)	66 (7.7)	73 (8.3)
Black/African American	1577 (89.7)	794 (90.3)	783 (89.1)
Other	42 (2.4)	19 (2.2)	23 (2.6)
Smoking, n (%)			
Yes	829 (47.2)	405 (46.1)	424 (48.2)
No/Never	544 (30.9)	279 (31.7)	265 (30.2)
Other	383 (21.8)	194 (22.1)	189 (21.5)
Unknown	2 (0.1)	1 (0.1)	1 (0.1)
Statin Allergy/Intolerance, n (%)	74 (4.2)	37 (4.2)	37 (4.2)
Elevated transaminases, n (%)			
Yes	33 (1.9)	16 (1.8)	17 (1.9)
Unknown	111 (6.3)	52 (5.9)	59 (6.7)
Hypertension	541 (30.8)	271 (30.8)	270 (30.7)
Diabetes	748 (42.6)	375 (42.7)	373 (42.4)
Primary Inclusion Criteria, n (%)			
Clinical ASCVD	532 (30.3)	239 (27.2)	293 (33.3)
LDL-C $\geq$ 190 mg/dL	129 (7.3)	69 (7.9)	60 (6.8)
Diabetes	339 (19.3)	184 (20.9)	155 (17.6)
10-year ASCVD Risk $\geq$ 7.5%	758 (43.1)	387 (44.0)	371 (42.2)

\*Primary inclusion criteria were not included in propensity matching

## RESULTS

Statin Appropriateness by Primary Inclusion Criteria				
Statin Intensity	All Patients (n=1689)	HIV Positive (n=403)	HIV Negative (n=1286)	P-value
<b>All Patients</b>				<0.0001*
Appropriate	600 (34.1)	244 (27.8)	356 (40.5)	<0.0001*
Omitted	853 (48.5)	450 (51.2)	403 (45.9)	0.11
Dose too high	22 (1.3)	14 (1.6)	8 (0.9)	1.0
Dose too low	283 (16.1)	171 (19.5)	112 (12.7)	0.00064
<b>Clinical ASCVD</b>				0.00013*
Appropriate	251 (47.2)	89 (37.2)	162 (55.3)	0.00016*
Omitted	149 (28.0)	77 (32.2)	72 (24.6)	0.21
Dose too high	6 (1.1)	5 (2.1)	1 (0.3)	0.38
Dose too low	126 (23.7)	68 (28.5)	58 (19.8)	0.096
<b>LDL <math>\geq</math> 190 mg/dL</b>				0.076
Appropriate	41 (31.8)	21 (30.4)	20 (33.3)	
Omitted	54 (41.9)	24 (34.8)	30 (50)	
Dose too high	1 (0.8)	1 (1.5)	0	
Dose too low	33 (25.6)	23 (33.3)	10 (16.7)	
<b>Diabetes</b>				0.10
Appropriate	96 (28.3)	48 (26.1)	48 (31.0)	
Omitted	135 (39.8)	70 (38.0)	65 (41.9)	
Dose too high	9 (2.7)	3 (1.6)	6 (3.9)	
Dose too low	99 (29.2)	63 (34.2)	36 (23.2)	
<b>10-year ASCVD Risk <math>\geq</math> 7.5%</b>				0.00055*
Appropriate	212 (28.0)	86 (22.2)	126 (34.0)	0.0014*
Omitted	515 (67.9)	279 (72.1)	236 (63.6)	0.051
Dose too high	6 (0.8)	5 (1.3)	1 (0.3)	0.87
Dose too low	25 (3.3)	17 (4.4)	8 (2.2)	0.42

## Appropriateness of Statin Prescribing in All Benefit Groups



## Frequency of Appropriate Prescribing by Patient-Related Factor

	Yes N (%)	No N (%)	P-value
HIV	232 (27.4)	335 (39.5)	<0.0001
Statin Allergy/Intolerance	72 (100)	495 (30.5)	<0.0001
Autoimmune Hepatitis	3 (100)	564 (33.3)	0.12
AST (>177)	32 (76.2)	424 (31.2)	<0.0001
ALT (>216)	16 (94.1)	446 (31.9)	<0.0001
Hemodialysis	32 (64)	24 (50)	0.072
CrCl (<30)	11 (33.3)	0	1
DDI	241 (67.7)	11 (9.7)	<0.0001

## CONCLUSIONS

- Statins were as likely to be omitted in patients with HIV compared to uninfected individuals.
- HIV infected patients are more likely to be prescribed inappropriately-dosed statin therapy.
  - Given the known risks of ASCVD in patients with HIV, the clinical significance of this may be higher than in uninfected individuals.
- HIV positive status, DDIs, and presence of statin allergies or elevated liver enzymes were all factors that affected appropriateness of statin prescribing.
- Additional analysis is warranted to investigate potential reasons for gaps in appropriate statin dosing to identify clinical interventions that may be

## DISCLOSURES

The authors have no actual or potential conflicts of interest in relation to the content of this presentation

## REFERENCES

- Clement ME, et al. Statin utilization and recommendation among HIV- and HCV-infected veterans: a cohort study. *Clin Infect Dis*. 20016;63(3):407-13.
- Althoff KN, et al. The large gap between statin eligibility and prescription among HIV+ in North America. Conference on Retroviruses and Opportunistic Infections (CROI). February 13-16, 2017. Seattle, WA. Abstract 619.
- De Socio GV, et al. Statins and aspirin use in HIV-infected people: gap between European AIDS clinical society guidelines and clinical practice: the results from HIV-HY study. *Infection*. 2016;44(5):589-97.
- Okeke NL, et al. Coronary artery disease risk reduction in HIV-infected persons: a comparative analysis. *AIDS Care*. 2016;28(4):475-82.
- Kelly SG, et al. Statin prescribing practices in the comprehensive care for HIV-infected patients. *J Acquir Defic Syndro*. 2017;76(1):e26-9.
- Ali N, et al. Statin utilization among human-immunodeficiency virus (HIV)-infected individuals based on the 2013 American College of Cardiology and American Heart Association (ACC/AHA) blood cholesterol guideline. *ID Week*. October 5, 2017. San Diego, CA.
- Levy E, et al. Evaluation of statin eligibility, prescribing practices, and therapeutic responses using ATP III, ACC/AHA, and NLA dyslipidemia treatment guidelines in a large urban cohort of HIV-infected outpatients. *AIDS Patient Care STDS*. 2018;32(2):58-69.
- Blackman AL, Pandit NS, Pincus KJ. Comparing the rates of statin therapy in eligible patients living with HIV versus uninfected patients. *HIV medicine*. 2020;135-141.