HIV RNA monitoring after hospitalization for non-HIV-related illness in patients on combination antiretroviral therapy prior to admission

E. Paul O'Donnell, PharmD, BCCCP, BCPS[1,2]; Milena Murray, PharmD, MSc, BCPS AQ-ID, AAHIVP[1,3]; Sakhi Kaur, PharmD Candidate'21[1]; Reem Motan, PharmD Candidate'21[1]

[1]Midwestern University, Chicago College of Pharmacy; [2]Rush University Medical Center; [3]Northwestern Memorial Hospital

Background

- Hospitalizations for patients living with HIV are often related to comorbid illnesses such as non-AIDS-defining infections, cardiovascular, or gastrointestinal/liver diseases.[1,2]
- When patients are hospitalized for a non-HIV-related illness, it may have an impact on virologic control of their HIV.
- Incomplete medication adherence, missed clinic appointments, interruption of combination antiretroviral therapy (cART), altered pharmacokinetics, dietary changes, drug interactions, and medication errors could increase the risk of virologic failure.[3]
- Antiretroviral-related medication errors in hospitalized patients in particular have been observed frequently in previous studies.[4]
- Vigilant and timely viral load (VL) monitoring is essential to ensure viremia and virologic failure are detected early and attended to as soon as possible.
- This is especially true during periods when other risks for virologic failure, including decreased adherence, may be more prevalent, including post-hospitalization.
- Treatment guidelines for HIV recommend VL monitoring every 3-6 months.[3]

Rationale

- Hospitalization is potentially a high-risk period for patients with HIV. The transition from ambulatory to acute care and back to ambulatory care can be disruptive and present a barrier to timely follow-up for VL monitoring, especially when the hospitalization is not related to HIV. Hospitalization may increase the likelihood of treatment interruptions and present other factors for sub-optimal cART.[4,5]
- No study to date has focused on VL monitoring after patients are hospitalized and whether or not VL is measured within the recommended 3-6 months.
- Incidence of viremia and virologic failure after hospitalization is not well known.
- If a significant incidence of viremia and/or virologic failure after hospitalization exists, increased focus on this critical transition of care is warranted.
- Adherence to VL monitoring should also be optimized.

Study Objectives & Specific Aims

Research objective: Describe virologic monitoring and control following hospitalization in patients living with HIV on cART prior to admission.

Specific aim 1: Determine the length of time after hospital discharge to follow up for measurement of HIV VL

- **Sub-aim 1:** Characterize the frequency at which VL monitoring occurs as recommended within 6 months after hospital discharge

Specific aim 2: Quantify the incidence of viremia and virologic failure after hospital discharge in patients on established cART prior to admission

Methods

Study design

- Retrospective cohort study of patients hospitalized between January 1st 2010 and December 31st of 2015

Patients

Inclusion criteria

- Age ≥ 18 years
- Stable on cART regimen for 6 months prior to admission
- Hospitalized at least 24 hours for a non-HIV-related illness
  - Non-HIV-related illness: diagnosis excluding an AIDS-defining illness, acute HIV infection, opportunistic infection, or illness directly related to HIV infection
- Survived to hospital discharge

Exclusion criteria

- HIV VL or CD4 count not documented in the 6 months prior to hospital admission
- CD4 count < 200 cells/mm^3
- Documented non-adherence or changes to cART in the six months prior to hospitalization
- Pregnant at time of admission
- Incarcerated at the time of admission

Methods (continued)

Outcomes

Primary outcome

- Length of time in months from hospital discharge to first measurement and documentation of HIV VL (HIV RNA)

Secondary outcomes

- VL monitoring as recommended within 6 months
- Viremia: single detectable VL ≥ 50 copies/mL
- Virologic failure: 2 consecutive VLs ≥ 200 copies/mL

Data Collection

- Demographic, hospitalization-related, and clinical variables were collected

Statistical Analyses

- Descriptive statistics were used to characterize the median length of time to VL measurement and interquartile range
- "As recommended" VL monitoring, viremia, and virologic failure was calculated as a proportion of patients with any VL monitoring after hospitalization
- Associations between independent demographic, hospitalization, and clinical variables and dependent variables of "as recommended" VL monitoring, viremia, and virologic failure were analyzed with Chi-square or Fisher's Exact tests for categorical variables and Student's T-test or Mann-Whitney U for continuous variables

Results

Patients

- 3300 patients have been screened for inclusion
- 329 patients have met inclusion criteria and had data collection completed

Figure 1. Flow Diagram of Patient Inclusion & Exclusion

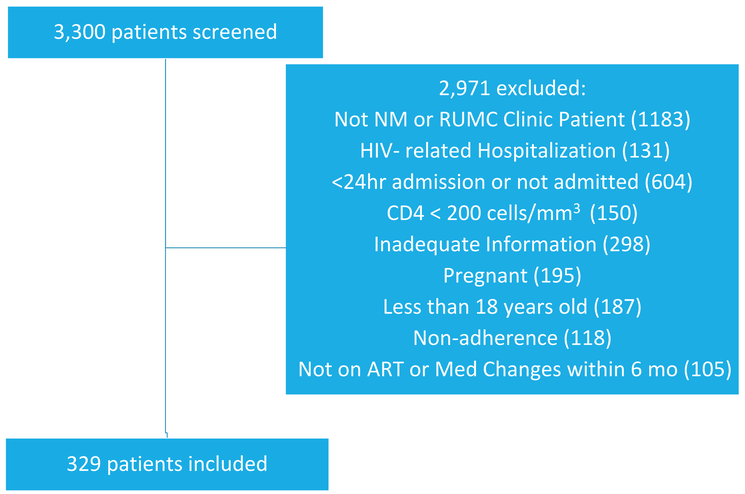

Table 1. Virologic Outcomes

	N=329
Primary Outcome	
Time to first HIV VL post hospital discharge (months), median (IQR)	2.5 (1.3-4.1)
Secondary Outcomes	
VL monitored as recommended, n (%)	284 (86.3)
Viremia post hospital discharge, n (%)	41 (12.5)
Virologic failure post hospital discharge, n (%)	15 (4.6)

Table 2. Demographic & Hospitalization Variables

	N=329
Age (years), median (IQR)	51 (44-58)
Male, n (%)	252 (76.6)
Race, n (%)	
African American	159 (48.3)
Caucasian	131 (39.8)
Hispanic	8 (2.4)
HIV transmission risk category, n (%)	
Men who have sex with men (MSM)	139 (42.3)
Heterosexual	63 (19.2)
IV drug use	37 (11.3)
Other/unknown	89 (27.1)
Baseline CD4 count (cells/mm^3), median (IQR)	484 (357-629)
Baseline HIV RNA (copies/mL), median (IQR)	120 (56-365)
Post-discharge non-adherence, n (%)	14 (4.3)
cART regimen type, n (%)	
Protease-inhibitor (PI)	145 (44.1)
Non-Nucleoside Reverse Transcriptase Inhibitor (NNRTI)	110 (33.4)
Integrase strand transferase inhibitor (INSTI)	48 (14.6)
Nucleoside Reverse Transcriptase Inhibitor (NRTI)	21 (6.4)
Other	5 (1.5)
Admission diagnosis, n (%)	
Infectious (non-HIV/AIDS related)	66 (20.1)
Neurological	14 (4.3)
Cardiovascular	60 (18.2)
Pulmonary	20 (6.1)
Oncological	5 (1.5)
Endocrine	3 (0.91)
Other	89 (27.1)
Medical hospital service, n (%)	251 (76.3)
ICU admission, n (%)	41 (12.5)
Hospital length-of-stay (days), median (IQR)	2 (2-4)
cART regimen error, n (%)	7 (2.1)
cART drug-drug interactions, n (%)	10 (3)
cART treatment interruption, n (%)	24 (7.3)
cART dosing error, n (%)	7 (2.1)

Conclusion

- HIV VL monitoring appears to occur according to guidelines, within 6 months, in the majority of patients even after hospitalization for a non-HIV related illness
- 41 patients experienced viremia and 15 had documented virologic failure

Future Directions

- Elucidate possible associations between post-hospitalization viremia or virologic failure and factors related to hospitalization and acute illness

References

1. Crowell TA, Ganesan A, Berry SA, et al. Hospitalizations among HIV controllers and persons with medically controlled HIV in the U.S. Military HIV Natural History Study. Journal of the International AIDS Society 2016;19(1):20524.
2. Crowell TA, Gebo KA, Blankson JN, et al. Hospitalization Rates and Reasons Among HIV Elite Controllers and Persons With Medically Controlled HIV Infection. The Journal of Infectious Diseases 2015;211(11):1692-1702.
3. Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the Use of Antiretroviral Agents in HIV-1-Infected Adults and Adolescents. 2016; http://aidsinfo.nih.gov/contentfiles/lvguidelines/AdultandAdolescentGL.pdf. Accessed Sept 27, 2016.
4. Li EH, Foisy MM. Antiretroviral and Medication Errors in Hospitalized HIV-Positive Patients. The Annals of Pharmacotherapy 2014;48(8):998-1010.
5. Yehia BR, Mehta JM, Ciuffetelli D, et al. Antiretroviral medication errors remain high but are quickly corrected among hospitalized HIV-infected adults. Clinical Infectious Diseases 2012;55(4):593–99.