

Avoiding Inpatient Delays in Antiretroviral Therapy via Low Cost Formulary Management

Hannah Sundquist PharmD^{1,2}; Zahra Kassamali PharmD, BCPS^{1,2}

¹UW Medicine, Valley Medical Center, Renton, WA; ²University of Washington School of Pharmacy, Seattle, WA

ABSTRACT

Background: Of 8 formulary HIV medications at our institution, 3 are no longer first line treatments. Agents unavailable on formulary are administered from a patient's own supply. We examined the impact of availability of antiretroviral therapy (ART) on time to appropriate therapy among HIV positive inpatients.

Methods: Adult inpatients who received ART from 11/2015 – 10/2016 were included in this single-center review. Data were evaluated by encounter; individuals with multiple admissions were counted per admit. Descriptive statistics were used to evaluate the time from admission to ART order and administration. We noted discrepancies between ordered and home ART regimen, and any administration of partial therapy. Patients not taking ART prior to admission or without documentation of a home ART regimen were excluded from the outcomes analysis. A cost analysis was conducted to describe the financial impact of any recommended formulary changes.

Results: 36 patients with 55 inpatient encounters were evaluated; 46 (84%) had a documented home ART regimen. Mean age was 47.8 years, 67% were male, 36% met criteria for AIDS by CD4 cell count. Creatinine clearance was < 60 ml/min in 33% of subjects, 25% were admitted for an infectious issue. Median length of stay was 5 days. Half (49%) were taking nucleoside reverse transcriptase inhibitors, 22% integrase inhibitors, 19% protease inhibitors, 3% non-nucleoside reverse transcriptase inhibitors. In the 7 encounters (15%) with all ART on formulary, 100% received their full ART regimens as inpatients vs 69% of those with partial or no ART on formulary. Median time to therapy doubled in patients who had partial or no home ART on formulary: 25 hours (median of 1 missed dose) vs. 12 hours (median of 0 missed doses). Anticipated annual cost of formulary revisions, including addition of 4 agents, was \$6016.37.

Conclusion: Having a complete ART regimen on formulary substantially increased likelihood of complete ART administration without delay. Adding an NRTI alternative to tenofovir was needed due to high rates of renal dysfunction; adding agents with higher barriers to resistance, dolutegravir and darunavir, were important as genotypes and viral loads are not always known at admit. Expanding the ART formulary provides a significant improvement in quality of care at a reasonable cost.

BACKGROUND & OBJECTIVE

- Changing HIV treatment guidelines led to an outdated antiretroviral formulary at our 321-bed urban, acute-care, community hospital.
- Of the 8 available formulary HIV medications at Valley Medical Center, 3 are no longer recommended as first line treatment agents by the NIH HIV/AIDS treatment guidelines.
- We assessed the impact of formulary antiretroviral therapy (ART) on patient care.

METHODS

Study Design: Single-center, retrospective medical chart review

Inclusion Criteria: Inpatient adults with an HIV or AIDS diagnosis code in the electronic medical record during a 1-year time period, November 1, 2015 – October 31, 2016

Exclusion Criteria: Patients not on ART prior to admission
Undetermined home ART

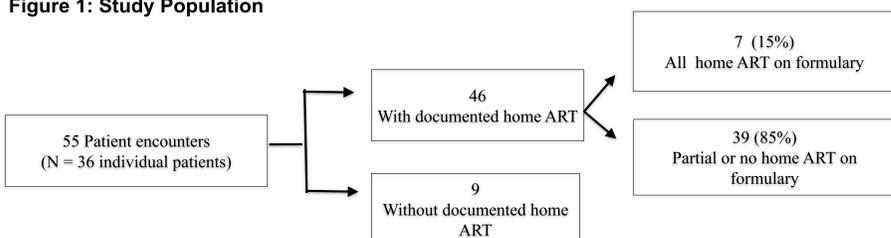
- Primary Endpoints:**
- Time from admit until ART ordered:** Time of admission as documented in the electronic medical record (EMR) to the time the first antiretroviral medication order was made by the prescriber.
 - Time from admit until first dose of ART:** Time of admission as documented in the EMR to the time the first antiretroviral medication order was documented as given.
 - Number of missed doses:** Time from admit until first dose of ART divided by that medication's dosing interval, rounded down to nearest integer.

Cost Analysis: Cost analysis was completed by taking the median time of admission multiplied by the amount of Medication used per day based on study data multiplied by the number of encounters per each medication

Data Analysis: Outcomes assessed in subjects with all ART on formulary vs. those with not, using descriptive statistics

RESULTS

Figure 1: Study Population



RESULTS

Table 1: Baseline Characteristics, N = 55¹

Age (years), mean (range)	47.8 (25 - 77)
Male, N (%)	37 (67)
Infectious admit diagnosis, N (%)	14 (25)
AIDS (Absolute CD4 < 200 or CD4% < 14), N (%)	20 (36)
New HIV diagnosis, N (%)	3 (5)
Duration of admission (days), median (range)	5.4 (0.3 - 43.7)
CrCl during admit ² , N (%)	
< 60mL/min	33 (62)
< 30mL/min	20 (38)
Hepatitis coinfection, N (%)	
HCV	8 (15)
HBV	1 (2)
Absolute CD4 count (cells/mcL), median (range)	217 (8 - 832)
% CD4 cells, median (range)	24.1 (2.8 - 48.2)
HIV Viral Load (copies/mL), median (range)	0 (0 - 804,503)
Undetectable, ³ N (%)	26 (47)
>100,000, N (%)	7 (13)
Unknown, N (%)	10 (18)

- Baseline characteristics reported by encounter. Some patients have multiple encounters.
- N = 53 encounters, 2 did not have measured SCr.
- "< 40" (N = 9) included as it represents the lowest limit of lab quantitation.

Figure 2: Impact of Formulary Status on Treatment Delays

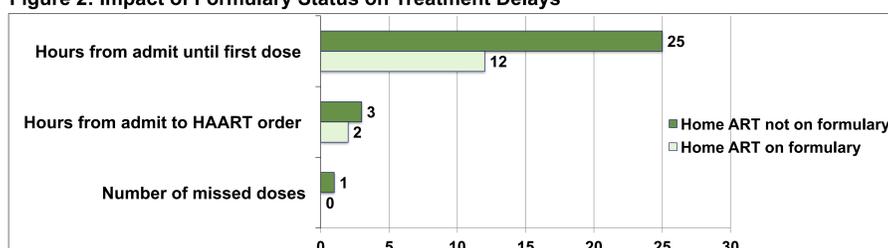


Figure 3: Home ART by Class

Boxed agents represent medications on formulary

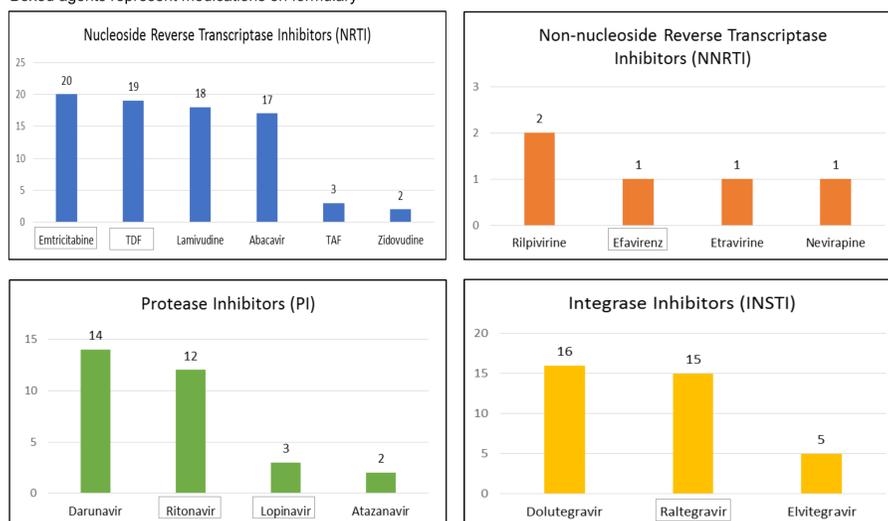


Table 2: Receipt of full ART Regimen While Inpatient

	All home ART on formulary	Partial or no home ART on formulary	Total
N (%)	7 (15)	39 (85)	46 (100)
Patients who received full ART regimen while inpatient, N (%)	7 (100)	27 (69)	34 (74)

RESULTS

Figure 4: New ART Agents Started for Inpatients

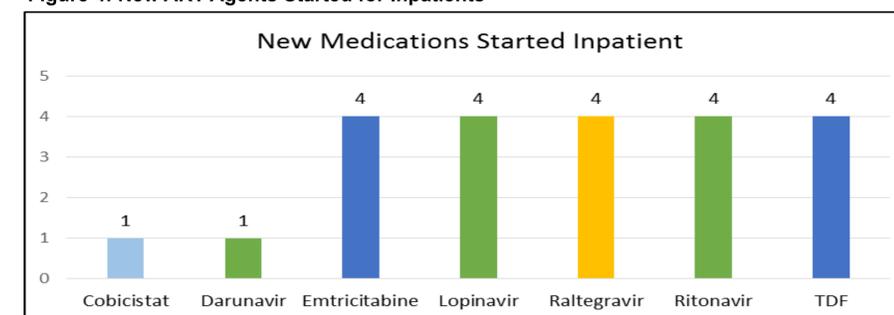


Table 3: Projected Annual Costs

Based upon 2015/2016 usage history

Previous ART Formulary	Cost	Proposed ART Formulary	Cost
Efavirenz 600mg tab		Abacavir 300mg tab	
Efavirenz-Emtricitabine-TDF 600-200-300mg tab		Darunavir 800mg tab	
Emtricitabine-TDF 200-300mg tab		Dolutegravir 50mg tab	
Lopinavir-Ritonavir 200-50mg tab		Emtricitabine-TDF 200-300mg tab	
Raltegravir 400mg tab		Lamivudine 10mg/mL oral solution	
Ritonavir 100mg tab		Lamivudine 150mg tab	
Zidovudine 10mg/mL IV solution		Raltegravir 400mg tab	
Zidovudine 10mg/mL syrup		Ritonavir 100mg tab	
		Zidovudine 10mg/mL IV solution	
		Zidovudine 10mg/mL syrup	
Total	\$9,268	Total	\$15,284

SUMMARY & CONCLUSIONS

- 30% of patients without their full ART regimen on formulary did not receive ART while admitted as inpatients.**
- Non-formulary home ART increased the time from admit to first dose by 13 hours and resulted in one missed dose compared to formulary home ART.**
- New start HIV diagnoses were often started on second or third-line regimens due to ART availability.**
- Adding 5 antiretrovirals to the formulary and removing 3 antiretrovirals from the formulary resulted in an estimated annual cost impact of an increase of \$6,016.37.**
- We project these therapeutic additions will increase the rate of patient encounters with all home ART on formulary from 15% to 48%.**

REFERENCES

- Bartlett, J. (2002, February 1). Addressing the challenges of adherence. *Journal of Acquired Immune Deficiency Syndromes*, 29, 2-10.
- Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the use of antiretroviral agents in HIV-1-infected adults and adolescents. Department of Health and Human Services. Available at <http://www.aidsinfo.nih.gov/ContentFiles/AdultandAdolescentGL.pdf>. Accessed 12/14/2016.
- Commers, T., Swindells, S., Sayles, H., Gross, A., Devetten, M., & Sandkovsky, U. (2014, January). Antiretroviral medication prescribing errors are common with hospitalization of HIV-infected patients [Electronic version]. *Journal of Antimicrobial Chemotherapy*, 69(1), 262-267.
- Panel on Treatment of HIV-Infected Pregnant Women and Prevention of Perinatal Transmission. Recommendations for Use of Antiretroviral Drugs in Pregnant HIV-1-Infected Women for Maternal Health and Interventions to Reduce Perinatal HIV Transmission in the United States. Available at <http://aidsinfo.nih.gov/contentfiles/lvguidelines/PerinatalGL.pdf>. Accessed 1/7/2017.