

Antiretroviral Medication Errors in Hospitalized Patients with HIV Infection

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Abstract

Background: HIV patients prescribed highly active antiretroviral therapy (HAART) are at high risk for medication errors. We sought to determine the rate at our institution.

Methods: Retrospective chart review of patients admitted between 1/1/2011 and 10/31/2011 prescribed antiretroviral therapy. Patients treated with monotherapy lamivudine or tenofovir for hepatitis B were excluded. Rates and types of errors with HAART or opportunistic infection treatment/prophylaxis were determined by the infectious diseases clinical pharmacist. Drug interaction classifications were defined per Micromedex®.

Results: During the 10 month study period, 162 admissions with a median stay of 4 days (range 1-35). Median CD4 count was 272 cells/uL (3-2234) and median viral load log₁₀ copies/ml 2.07. Rate of medication errors was 50%, 81 of 162 admissions had at least 1 error. Total of 126 errors, average 1.6 errors/admission. 35% of errors were resolved during admission, average time to resolution 67.4 hrs. 65% of errors were not resolved, average time from error to discharge 78.7 hrs. Most common errors were major drug interaction 26%, dosing 20%, contraindicated drug interaction 12%, frequency 11%, and incomplete regimen 11%. Baseline characteristics that occurred more frequently in the patients with errors were female gender (44% in error group vs. 28% in no-error group, p=0.049) and hemodialysis (17% in error group vs. 5% in no error group, P=0.022). Infectious Diseases (ID) was consulted in 53% of admissions. Errors occurred in 58% of admissions in which ID was consulted and 41% without (p=0.04). Significantly more errors were resolved when ID was consulted 47% compared to when ID was not involved only 15% were resolved (p=0.002).

Conclusions: Medication errors were common (50%) in HIV patients admitted to the hospital. A significant number of errors (65%) were neither recognized nor resolved during admission. Quality improvement measures have focused on education, modification of electronic drug files, and targeted stewardship efforts between ID and pharmacy.

Background & Objectives

The increasing complexity of medication regimens puts HIV patients receiving antiretrovirals (ART) and medications for opportunistic infections (OI) at high risk for medication errors.

Objectives

- To determine the incidence of medication errors with ART and OI medications in patients admitted to the hospital
- To evaluate the resolution rate and time to resolution of medication errors with ART and OI medications
- To describe the most common types of medication errors with ART and OI medications

Methods

Study Site

- Cleveland Clinic, a 1,239 bed, tertiary care, academic medical center
- 11 Infectious Diseases consult services, no dedicated HIV/AIDS ward

Study Design and Population

- Retrospective chart review
- Inclusion Criteria
 - Adult inpatients who received antiretroviral therapy
 - January 1, 2011 to October 31, 2011
- Exclusion Criteria
 - Patients treated with lamivudine or tenofovir monotherapy for HBV
- Approved by the Institutional Review Board

Data Collection

- Data were obtained from electronic medical records by an Infectious Diseases trained pharmacist

Definitions

- Medication Error = any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in control of the health care professional, patient or consumer (National Coordinating Council for Medication Error Reporting and Prevention)
- Drug interaction classifications defined per Micromedex®
 - Contraindicated = The drugs are contraindicated for concurrent use.
 - Major = The interaction may be life-threatening and/or require medical intervention to minimize or prevent serious adverse effects.
- Incomplete regimen = fewer than 3 antiretroviral agents and/or missing antiretroviral medications from outpatient regimen
- Renal dose adjustment = Failure to adjust for renal insufficiency
- PCP prophylaxis = No prophylaxis for PCP and CD4 count < 200 cells/μL or 14%, or unnecessary prophylaxis for PCP and CD4 count > 200 cells/μL or >14% for 3 months
- Toxoplasmosis prophylaxis = Toxoplasmosis IgG positive and CD4 count < 100 cells/μL and no prophylaxis
- MAC prophylaxis = No prophylaxis for MAC and CD4 count < 50 cells/μL or unnecessary prophylaxis for MAC and CD4 count > 50 cells/μL for 3 months
- Formulation = incorrect formulation of medication prescribed

Analytical Techniques

- Categorical variables were compared using χ^2 test and continuous variables using Student *t* test for normally distributed variables and the Mann-Whitney *U* test for non-normally distributed variables

Results

Demographics	N=162 Admissions
Age, yrs, mean ±SD	49 ± 11
Gender, male	103 (65%)
Hospital LOS, days, median (range)	4 (1-35)
ID Consult	86 (53%)
Primary service	
General Internal Medicine	68 (42%)
Surgery (includes general and subspecialties)	24 (15%)
Hepatology/Gastroenterology	17 (10%)
Oncology	16 (10%)
Cardiology	12 (7%)
Nephrology	10 (6%)
Neurology/Neurosurgery	9 (6%)
Pulmonary	7 (4%)

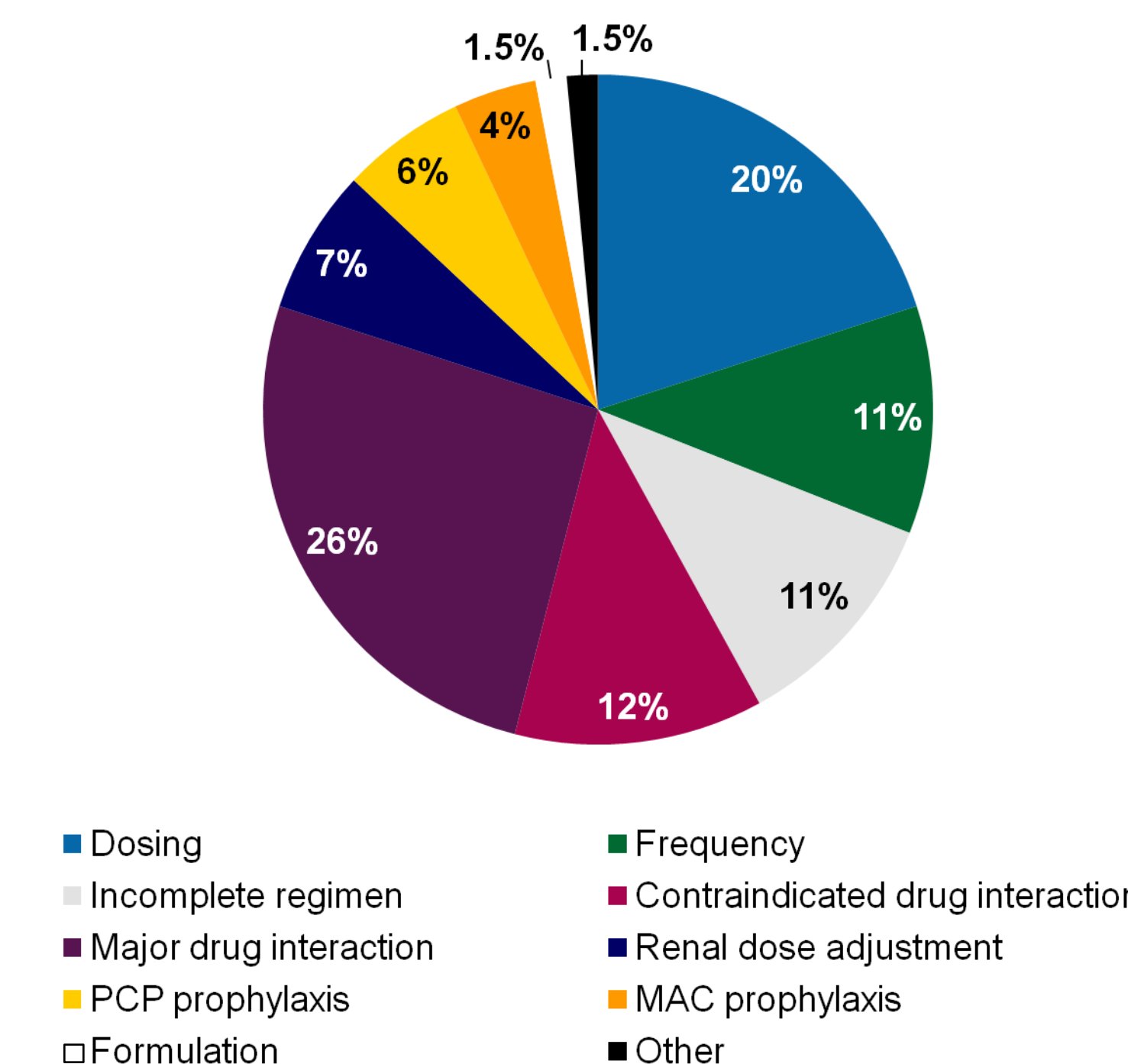
Laboratory Values	N= 162 Admissions
CD4 count, cells/μL, median (range)*	272 (3-2234)
CD4 count < 200 cells/μL*	59 (37%)
Viral load, log ₁₀ copies/ml, median**	2.07
Viral load < 40 copies/ml	51 (34%)
Creatinine Clearance (at time of admission), n(%)	
> 50 ml/min	134 (83%)
10-50 ml/min	10 (6%)
Hemodialysis	18 (11%)

*158 admissions had CD4 count available at time of admission or within 3 mo prior
**150 admissions had CD4 count available at time of admission or within 3 mo prior

Medication Errors	N=162 Admissions
Admissions with at least 1 error	81 (50%)
Total number of errors	126
Number of errors/admission	1.6
Errors resolved	44/126 (35%)
Time to resolution, mean	67 hours
Errors not resolved	82/126 (65%)
Time to discharge, mean	79 hours

Characteristics	Med Error N=81	No Med Error N=81	P value
Gender, male	45 (56%)	58 (72%)	0.049
Hospital LOS, days, median(range)	4 (1-35)	4 (1-28)	0.447
ID Consult	50 (62%)	36 (44%)	0.040
CD4 count < 200 cells/μL	23 (28%)	27 (33%)	0.610
Viral load < 40 copies/ml	32 (39%)	19 (23%)	0.042
Hemodialysis	14 (17%)	4 (5%)	0.022
PI based regimen	41 (50%)	21 (26%)	0.002
NNRTI based regimen	17 (21%)	37 (45%)	0.002
Both PI & NNRTI regimen	23 (28%)	15 (18%)	0.195
Neither PI nor NNRTI regimen	0	8 (10%)	0.007

Type of Medication Error



Other = (1) Delay in initiation >72 hrs, (2) Continuation of antiretroviral that was no longer part of regimen



Conclusions

- Medication errors with antiretrovirals and opportunistic infection medications occurred during 50% of admissions to the hospital during the study period
- A majority of errors (65%) were neither recognized nor resolved during the admission
- Errors were more likely to be resolved when patients received an Infectious Diseases consult
- Opportunities exist for improving medication use in HIV patients receiving antiretrovirals and opportunistic infection medications

Quality Improvement Measures

- Multifaceted, multidisciplinary stewardship efforts
 - Education
 - Competency for all pharmacists on antiretroviral dosing and drug interactions
 - Updates and modification of medication files in computerized physician order entry system
 - Addition of common dosage and frequency defaults
 - Prospective audit and review of all antiretroviral regimens by an infectious diseases trained pharmacist
 - Infectious Diseases follows continuity during transitions of care
- Future initiatives
 - Ongoing evaluation of current initiatives to reduce rate of errors and improve resolution rate and time to resolution
 - Implementation of computerized decision software to improve efficiency and detection of medication errors