

Reducing Antiretroviral Medication Errors Utilizing an Electronic Medical Record in Hospitalized HIV Positive Patients

Jean C Lee¹, Nnaemeka E Egwuatu^{1,3}, Andrea D Goodrich², Kymberlee A Moline², Terry K Kirkpatrick², David D Baumgartner^{1,3}, Minerva A Galang^{1,3}
¹Special Immunology Services, Saint Mary's Health Care, Grand Rapids, MI, ²Department of Pharmacy Services, Saint Mary's Health Care, Grand Rapids, MI, ³College of Human Medicine, Michigan State University, Grand Rapids, MI

Jean C. Lee, PharmD
 Saint Mary's Health Care
 310 Lafayette SE, Suite 410
 Grand Rapids, MI 49503
 616-685-8238
 LeeJC@trinity-health.org

ABSTRACT

Background: Antiretroviral (ARV) medication errors occur in all settings including during the admission process with medication reconciliation. These medication errors may lead to toxicity and decreased efficacy of ARVs, leading to potential development of viral mutations to current ARV therapy and thus, limiting future treatment options. Hospital electronic medical records (EMR) may be utilized to provide accurate ARV regimens to reduce medication errors and aid in medication reconciliation.

Methods: All ARVs were updated in the hospital EMR and maintained with any changes from the HIV clinic. ARV error rate, cost of errors and cost of pharmacist time to resolve errors were determined from a sample of 20 HIV positive hospitalized patients. Post-intervention metrics were compared to baseline and 6 months later for sustainability. Errors were categorized as: wrong dose, wrong time, drug interaction, ARV not ordered, wrong drug or wrong frequency. Cost of pharmacist time was based on an average pharmacist wages. Cost of error was based on activity definitions from a benchmarking system on cost of medication errors.

Results: Post-intervention, ARV error rate reduced from baseline by 93% (16.0% vs. 1.1%, p=0.002) and was sustained 6 months later (16.0% vs. 1.1%, p=0.004). Comparing baseline to post-intervention, the most common ARV error was wrong time (14 vs. 1), followed by wrong dose (4 vs. 1), drug interaction (4 vs. 1), missing ARV (4 vs. 1), wrong drug (3 vs. 0) and wrong frequency (2 vs. 0). The cost of these errors was reduced by 85% at approximately \$25000. Cost of pharmacist time to resolve these errors was reduced by 87% at \$338.

Conclusions: The use of hospital EMR to maintain outpatient HIV clinic antiretroviral regimens decreased error rate by 93% and cost of medication errors by 85%, approximately \$25,000. Continuous maintenance of ARV regimens within the hospital EMR allows for accurate medication reconciliation with hospitalized HIV positive patients.

BACKGROUND

- Due to repeated medication errors in HIV positive patients admitted to Saint Mary's Health Care, a process change was warranted. A root cause analysis determined that an intervention to provide the most accurate ARV medication order was needed.

OBJECTIVES

- To reduce the rate of antiretroviral medication errors for HIV positive patients admitted to Saint Mary's Health care who are prescribed HAART.
- To determine the reduction in cost of errors and pharmacist time to resolve the errors.
- To determine the sustainability of this process change.

METHODS

Study Design

- Single site Outpatient HIV clinic and its affiliated 344 bed acute care hospital
- Analysis of 20 patients during each phase
 - Phase 1: baseline (retrospective analysis-2009)
 - Phase 2: post intervention (April 2010)
 - Phase 3: sustainability (Nov 2010)

Inclusion:

- Admitted HIV + patients who receive medical care from Special Immunology Services
- Prescribed ARVs upon admission

Exclusion:

- Patients who had ARVs prescribed by ID physicians

For each phase, data collected included:

- Medication error rate: # Errors/Total # Rx
 - Cost of pharmacist time for error resolution
 - Time to resolve error: 15min
 - Cost of pharmacist time: \$50/h

Cost of errors

- Major vs. minor errors
- Amount per type of error from activity based definitions from a benchmarking system on cost of medication errors

Types of error classification:

- Wrong drug
- Wrong time
- Wrong frequency
- Wrong dose
- Drug interactions
- Drug not ordered

Intervention:

- Medications entered into Cerner PowerChart under the "Documented Medications by History" for each patient
 - Antiretrovirals
 - Medications to treat or prevent Opportunistic Infections
- Medications are maintained and updated in PowerChart by HIV Clinic staff
- Notification of this process
 - Nursing Staff
 - Hospital Physicians, Medical Residents
 - Pharmacy Staff
 - P & T Newsletter

RESULTS

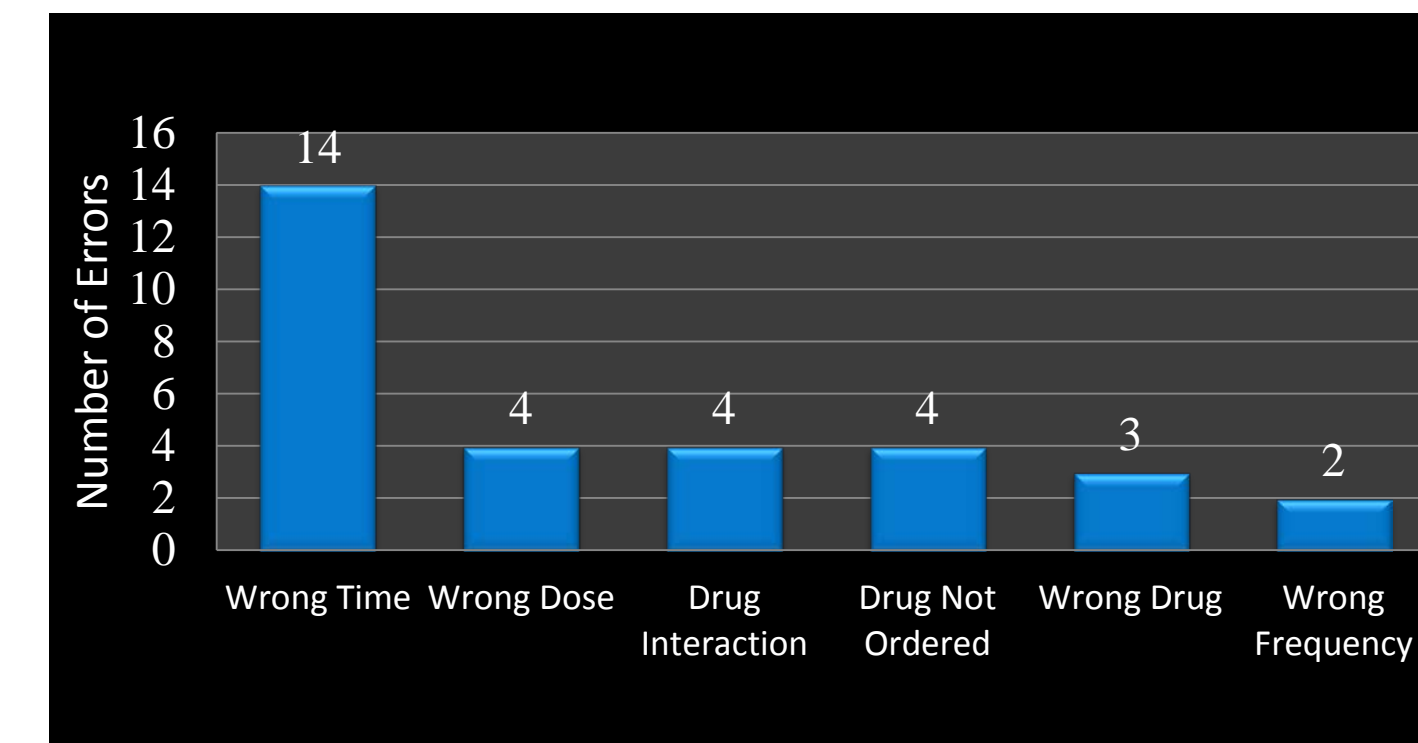


Figure 1: Types of medication errors at baseline

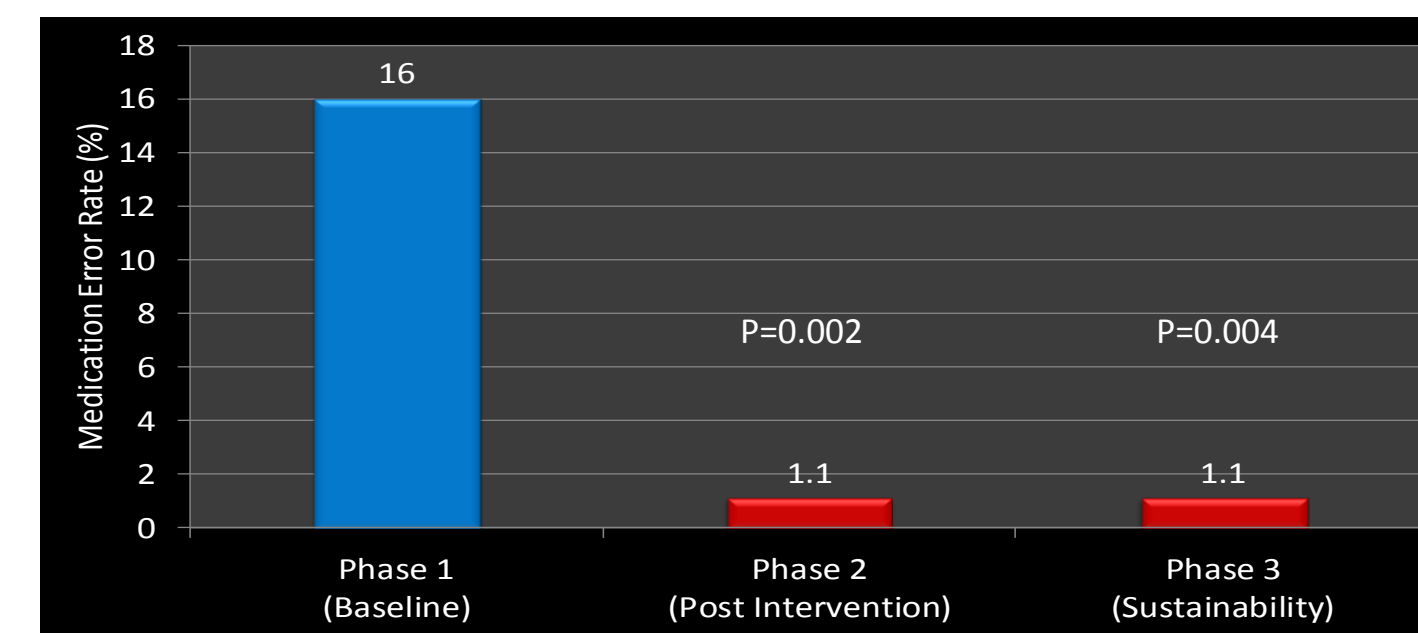


Figure 2: Medication error rate, p-values compared to baseline

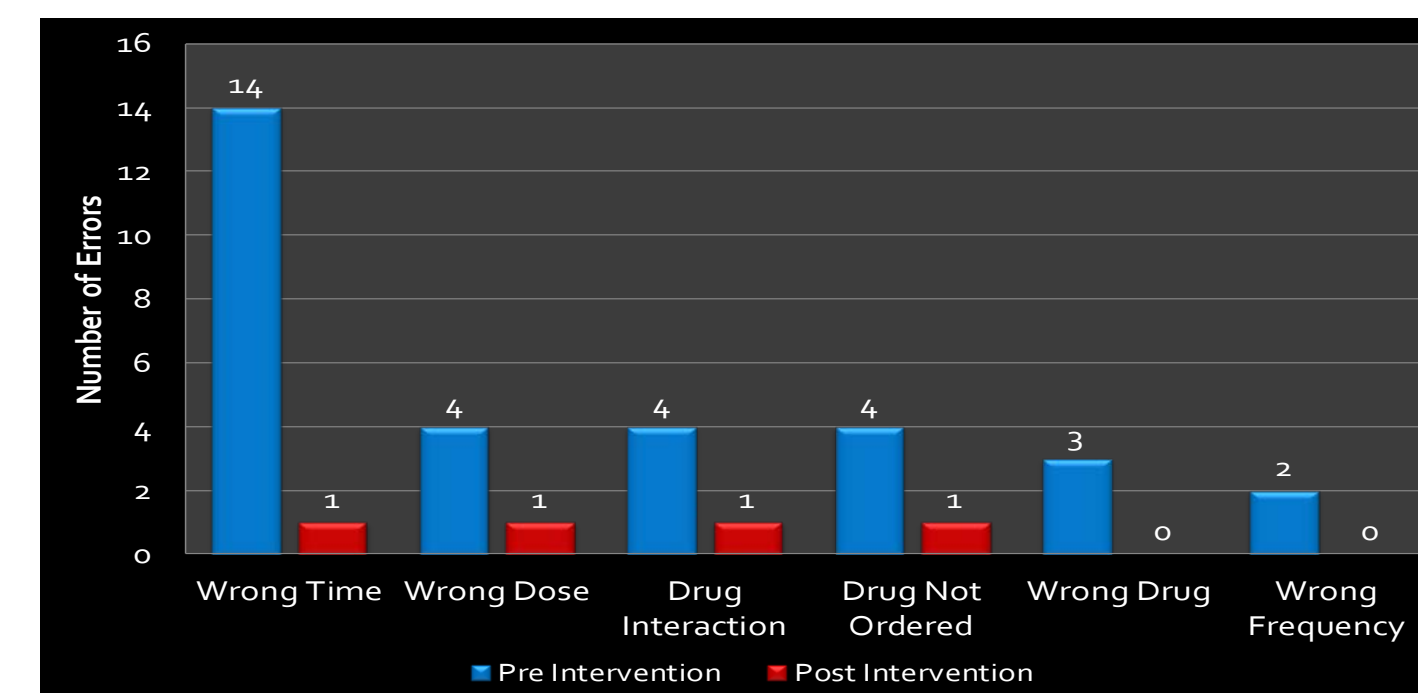


Figure 3: Comparison of types of errors pre and post intervention

Metric	Baseline	Phase I	Phase II	Change (BL vs Phase I)	Change (BL vs. Phase II)	% Reduction (BL vs Phase I)	P-value	% Reduction (BL vs Phase II)	P-value
Error Rate	16.0%	1.1%	1.1%	14.9	14.9	93.1	0.002	93.0	0.004
Cost of Pharmacist time	\$388	\$50	\$50	337.50	337.50	87.1	0.002	87.1	0.003
Cost of Errors	\$30,616	\$4,624	\$8,800	\$24,992	\$21,816	84.9	0.005	71.3	0.04
Total	\$ 31,004	\$4,674	\$8,850	\$26,330	\$22,154	84.9	-	71.5	-

Table 1: Comparison of error rates and costs

RESULTS

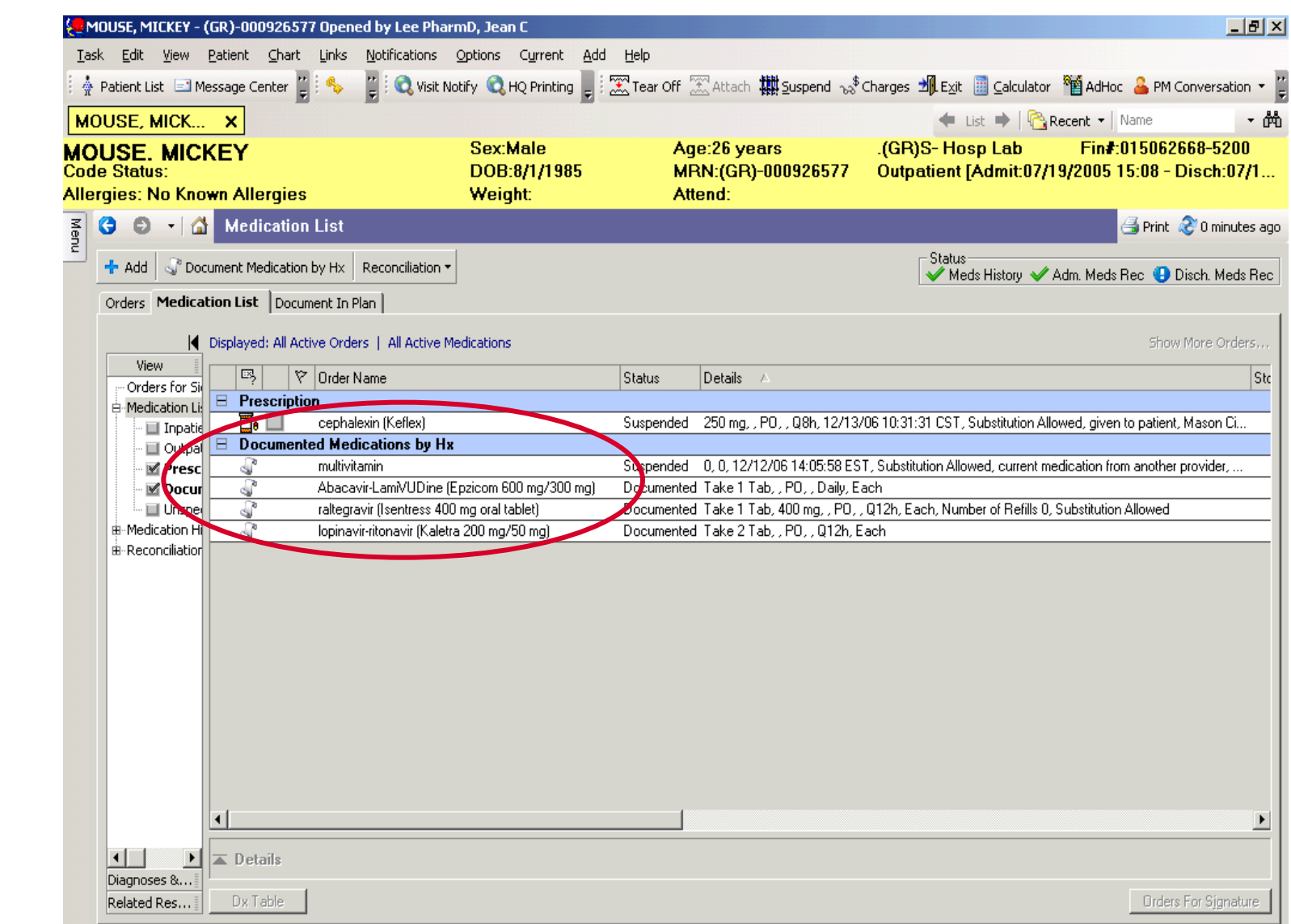


Figure 4: Snapshot of patient medication list outlining "Documented by History"

- The current process for HIV positive patients admitted to SMHC includes: patient identification by staff or clinical pharmacists, ID consult or a daily ARV report.
- The HIV pharmacist reviews the inpatient medical record for accuracy and communicates with staff or clinical pharmacist as needed.
- Communication of the admission to the HIV provider and medical case manager, who provide a courtesy visit.

CONCLUSIONS

- The use of hospital EMR to maintain antiretroviral regimens prescribed by the HIV clinic, decreased error rate by 93%, cost of pharmacist time by 87% and cost of medication errors by 85%, approximately \$25,000.
- Continuous maintenance of ARV regimens within the hospital EMR allows for accurate medication reconciliation to ensure continuity of care for hospitalized HIV positive patients.

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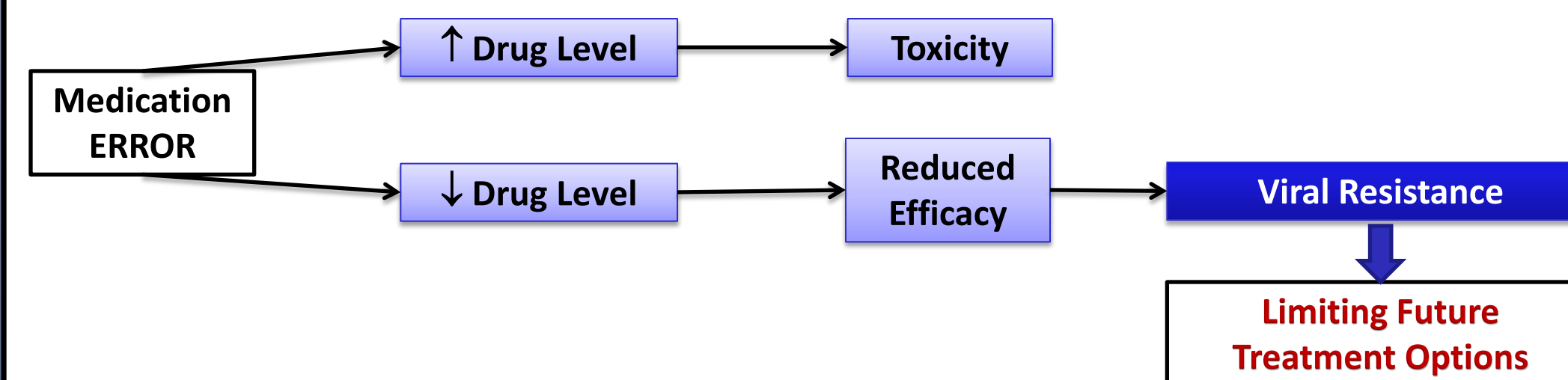
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BACKGROUND

- Medication errors are ubiquitous in medicine.
- There are processes in place within all forms of drug distribution to reduce these errors to maintain patient safety.
- Medication errors in the area of HIV medicine may have damaging consequences.



- MEDMARX, 2000-2003, an internet based voluntary antiretroviral (ARV) medication error system, showed the most common type of error to be wrong medication (32%), wrong dose (38%), and missed dose (21%). These were also the most common type of error reaching the patient.¹
- ARV medication errors reported in literature vary and depend on type: 5.8% - 100% of HIV positive patients have had medication errors when hospitalized²⁻⁶, and in 21%-23% of prescribed ARV prescriptions.^{7,8}
- At a US tertiary care center, 551 prescribing errors were found in 248 patients, with an error rate of 11.59 per 100 patient days. 70% were within 24h of admission with the most common errors of dosing (32%), administration (22%) and drug interactions (20%). Estimated cost savings per year, based on harm aversion for inpatients was \$24,273 and after discharge was \$124,000.⁹
- Seamless care between practice settings have prevented and resolved drug-related problems, without experiencing a gap in health management. This was achieved by shared patient profiles, patient data forms and enhanced communication between pharmacists.^{10,11}