Evaluation of Oral Fluoroquinolone Administration Before and After Implementation of Electronic Prepared Medication Administration Record

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ABSTRACT

- **OBJECTIVES:** Determine the incidence of scheduled co-administration times in handwritten (paper) and electronic prepared medication administration records of oral ciprofloxacin and oral moxifloxacin with interacting substances that can affect fluoroquinolone gastrointestinal absorption. Also, determine the incidence of actual co-administration of oral ciprofloxacin and moxifloxacin with interacting substances that can affect fluoroquinolone gastrointestinal absorption with electronic and handwritten prepared medication administration records
- **METHODS:** Retrospective data was obtained by a chart review of patients from an academic medical center for a one month period before (May 2010) and after (August 2010) implementation of an electronic prepared medical administration record system. The scheduled time and actual time given for all fluoroquinolone antibiotics, as well as all possible interacting substances, were recorded.
- **RESULTS:** A total of 99 subjects were included in this study (36 paper and 63 electronic). There was no statistical difference (p=0.47) between the percentage of scheduling errors for the electronic prepared medication administration records, 25.3%, compared to the paper medication administration records, 22.1%. However, there was a decrease in the percentage of actual co-administrations of fluoroquinolones with interacting substances for the electronic prepared MARs compared to paper prepared medication administration records; 22.3% and 32.1% respectfully (p=0.03).
- **CONCLUSION:** After implementing electronic prepared medication administration records at an academic institution, co-administration errors went down even though the amount of scheduling errors did not decrease.

INTRODUCTION

- Fluoroquinolone antibiotics are widely used to treat various infections.[1] However, concomitant oral administration fluoroquinolones such as ciprofloxacin and moxifloxacin with metal cations can decrease the absorption of the antibiotic and can lead to decreased blood concentrations and pharmacological effect.
  - Avoiding these supplements during a course of fluoroquinolone therapy is one way to evade this interaction, but this is not always possible
  - If both drugs must be given orally, then sufficient time between the two drugs needs to be exercised in order to minimize the interaction
  - If this is not properly done, it may lead to treatment failures as well as possible antibiotic resistance of the pathogen[2]
  - Some studies have suggested spacing the metals out at least 3.5 hours before or one and 0.5 hours after the dose of the fluoroquinolone antibiotic[1] but the conventional rule of thumb at most institutions currently state that the metals should not be given within 2 hours either before or after the dose of the oral antibiotic.
- While patient safety is the most critical issue in healthcare, medication errors will never be fully eliminated.[3] As technology further evolves, it should be easier and easier to limit medication errors that may potentially harm a patient.
  - Human errors are almost always preventable and this should be the main focus for eliminating errors.[4]
- The purpose of this study was to perform an evaluation of inappropriate co-administrations, as well as scheduling, of interacting medications with oral fluoroquinolone antibiotics before and after the implementation of an electronic prepared medication administration records (MAR) at an academic medical center.
  - The study focused on cationic metals (antacids, multivitamins, etc.) within 2 hours, before or after, a dose of either oral ciprofloxacin or oral moxifloxacin

SPECIFIC AIMS

- **Specific Aim #1** – Determine the incidence of scheduled co-administration times in handwritten and electronic prepared MARs of oral ciprofloxacin and oral moxifloxacin with interacting substances that can affect fluoroquinolone gastrointestinal absorption
- **Specific Aim #2** – Determine the incidence of actual co-administration of oral ciprofloxacin and moxifloxacin with interacting substances that can affect fluoroquinolone gastrointestinal absorption with electronic prepared and handwritten MARs.

HYPOTHESIS

- We hypothesized that there would be a significantly lower incidence of ciprofloxacin or moxifloxacin original scheduled co-administration with metal cations with electronic prepared MARs compared to hand-written prepared MARs
- We hypothesized that there was a significantly lower incidence of ciprofloxacin or moxifloxacin actual co-administration with metal cations with electronic prepared MARs compared to hand-written prepared MARs

METHODS

STUDY DESIGN

- IRB approved, retrospective medical record review
- Inclusion criteria: Patients (>6 month of age) admitted to University Medical Center (Tucson, AZ) prescribed either oral ciprofloxacin or moxifloxacin in May 2010 (pre-electronic prepared MAR) or August 2010 (post-electronic prepared MAR)
- Exclusion criteria: Patients who did not receive any interacting substance such as antacid therapy, tube feeds, or vitamin supplements that are known to affect oral fluoroquinolone absorption within 24 hours of an administered oral fluoroquinolone dose
- Data were collected using electronic medical records
  - The data extraction form gathered baseline patient characteristics including:
    - Baseline patient characteristics such as age, sex, admission height and weight, serum creatinine, allergies to fluoroquinolone, comorbid conditions, renal function, risk of QT prolongation, risk of seizures, gastrointestinal issues, location in the hospital on Day 0, and the type of MAR.
    - Some of the charts reviewed in May had electronic prepared MARs (depending on the location in the hospital) and these subjects were included in the electronic group. Also, a few of the charts reviewed from the August list were still using paper prepared MARs, these subjects were included in the paper group.
    - Oral fluoroquinolone prescribed as well as the dose and schedule
    - Any possible interacting substances were also recorded with its original start and end date relative to Day 0 along with its schedule.
      - Enteral feeds were recorded separately but still noting its start date, end date, and schedule.
    - The scheduled time and actual time given for all oral fluoroquinolone antibiotics, as well as all possible interacting substances.

DATA ANALYSIS

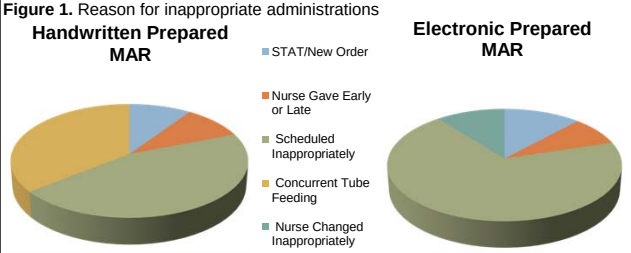
- Relative rates of change were calculated for electronic prepared MARs from the original handwritten (paper) MARs. Rates for inappropriate scheduling and inappropriate administration were the main outcomes determined.
- Frequencies and percentages were used for count data were compared using a Chi square test
- The *a priori* alpha level of significance was 0.05.

RESULTS

	Handwritten Prepared MAR Group (N = 36)	Electronic Prepared MAR Group (N = 63)
Oral Ciprofloxacin Prescribed	31 (86.1%)	49 (77.8%)
Mean (SD) Number of Doses Administered	3.6 (3.2)	6.0 (8.7)

- **The electronic prepared group had a slightly higher rate of scheduling errors (25.3%) compared to the paper group (22.1%); however, this difference was not statistically significant (p=0.47).**
  - Of the 95 inappropriate scheduling errors for the electronic prepared group, 22 (23.2%) of the inappropriate schedules were new orders that were handwritten on the printed electronic prepared MARs
- **The rate of actual administration errors for the electronic prepared group was statistically lower than the paper group, 22.3% and 32.1%, respectfully (p=0.03)**
- The most common interacting substance: Generic adult multivitamin

Figure 1. Reason for inappropriate administrations



CONCLUSION

- While there was no statistical difference the rate of scheduled oral fluoroquinolone agents with potential interacting substances before and after implementation of electronic- prepared MARs, there was a statistically significant decrease in the actual co-administration of oral fluoroquinolone agents with potential interacting substances

DISCLOSURE STATEMENT

Authors of this presentation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation:

- Kevin Malina: nothing to disclose
- Kathryn R. Matthias: nothing to disclose
- Kurt Weibel: nothing to disclose

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