Effective Healthcare Information Technology to Improve Medication Safety

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HMO Research Network CERT

HIT for Medication Safety

- Clinician-targeted interventions
  - Electronic health records (EHRs)
  - Computerized provider order entry (CPOE)
  - Computerized clinical decision support (CDSS)
- Patient-targeted interventions
  - Web-based outreach
  - Email
  - Automated telephony (e.g., speech recognition)

The Effects of Medication Safety Alerts on Medication Error Rates

Conducted at the Center for Health Research, Kaiser Permanente Northwest, for the HMO CERT's Medication Safety Grant

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with essential support from many people in KPNW operations

Target Areas

- Medications (generally) to avoid in the elderly ("Beers drugs")

- Drug-drug interactions

- Dose adjustment for renal insufficiency

The Impact of Prescribing Safety Alerts for Elderly Persons in an Electronic Medical Record

An Interrupted Time Series Evaluation

David H. Smith, RPh, PhD; Nancy Perrin, PhD; Adrianne Feldstein, MS, MD; Xiuhai Yang, MS; Daniel Kuang, MS; Steven R. Simon, MD, MPH; Dean F. Sittig, PhD; Richard Platt, MS, MD; Stephen B. Soumerai, ScD

Background: Considerable effort and attention have focused on medication safety in elderly persons; one approach that has been understudied in the outpatient environment is the use of computerized provider order entry with clinical decision support. The objective of this study was to examine the effects of computerized provider order entry with clinical decision support in reducing the use of potentially contraindicated agents in elderly persons.

Methods: With data from a 39-month period of a natural experiment, we evaluated changes in medication dispensing using interrupted time series analysis to estimate changes, controlling for prealert prescribing trends. The setting was a large health maintenance organization in the Pacific Northwest. All adult enrollees of the health plan participated. The intervention was computerized alerts cautioning against using certain medications in elderly persons. The main outcome measure was dispensing per 10 000 members per month.

Results: Following the implementation of the drug-specific alerts, a large and persistent reduction (5.1 prescriptions per 10 000, P=.004), a 22% relative decrease from the month before alert implementation, in the exposure of elderly patients to nonpreferred medications was observed. We found no evidence of a decrease in use of nonpreferred agents for nonelderly patients. The reduction seen in use of nonpreferred agents for elderly persons was driven primarily by decreases in dispensing for tertiary tricyclic agents.

Conclusions: We found that alerts in an outpatient electronic medical record aimed at decreasing prescribing of medication use in elderly persons may be an effective method of reducing prescribing of contraindicated medications. The effect of the alerts on patient outcomes is less certain and deserves further investigation.

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| Patient | Schedule | Exam | Review | Charting | Other Enc | Options | In Basket | Desk | Message | Pathways | Secure | Help | Exit | **Messages** |

Health Record #	Patient Name (Last,First MI)	Birthdate	Age	Sex	Primary Care Clinician	PHLink		**Health Mnt**
1193-78-57	KPNW,THIRTY-FOUR	1/14/1963	39	F				

Medication Alternatives

Alternatives for DIAZEPAM 5MG TABLET

🔍

Web Links:
No additional information.

* Formulary drug.
* Caution in elderly: Has a long half-life (often several days) in
  the elderly and active metabolites, producing prolonged sedation
  and increasing the risk of falls and fractures. Short- and
 intermediate-acting benzodiazepines are preferred if a

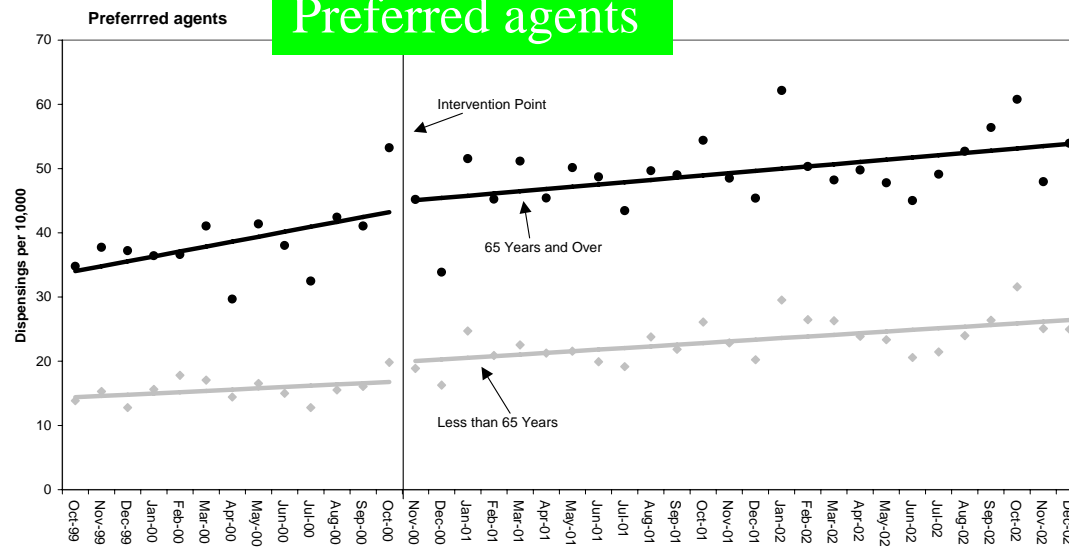| Medication	Sig	Quantity	Refill	End Date	Class	Cost
OXAZEPAM 15MG CAPSULE [8317]	1C PO TID PRN FOR 'ANXIETY'	30	1			1
BUSPAR 10MG TABLET [5257]	1T PO BID FOR 'ANXIETY'	100	1			26
PAXIL 40MG TAB [14141]	0.5T PO QD	15	1			12

Cancel Filing Process   Continue with Original Rx   Accept Alternative

Pending   Cancel   Accept

Non-preferred agents

Preferred agents

Smith et al. Arch Intern Med 2006
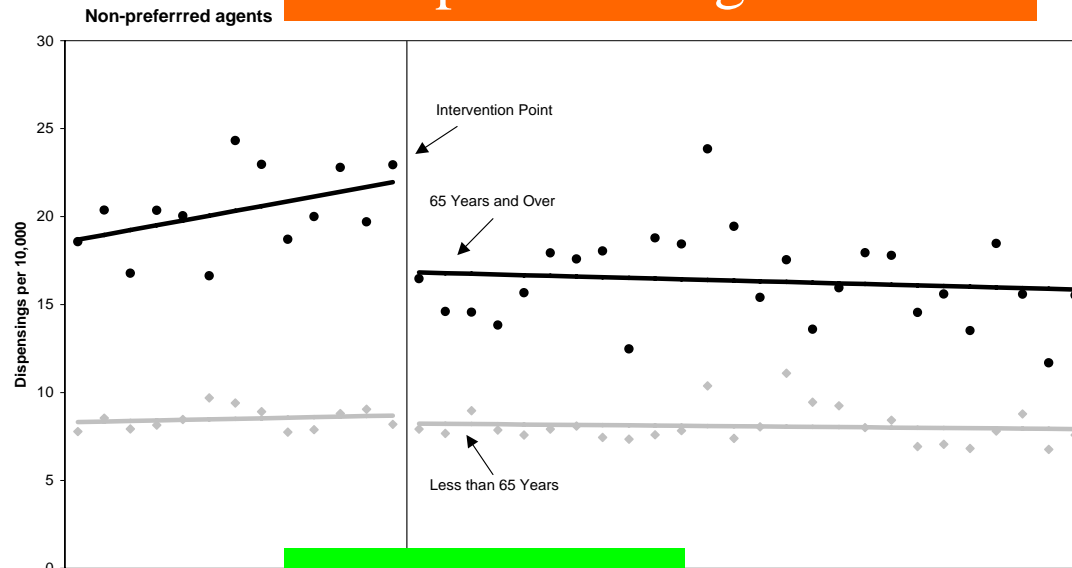
Reducing Warfarin Medication Interactions

An Interrupted Time Series Evaluation

Adrianne C. Feldstein, MD, MS; David H. Smith, RPh, MHA, PhD; Nancy Perrin, PhD; Xiuhai Yang, MS; Steven R. Simon, MD, MPH; Michael Krall, MD, MS; Dean F. Sittig, PhD; Diane Ditmer, PharmD; Richard Platt, MD, MS; Stephen B. Soumerai, ScD

Background: Computerized decision support reduces medication errors in inpatients, but limited evidence supports its effectiveness in reducing the coprescribing of interacting medications, especially in the outpatient setting. The usefulness of academic detailing to enhance the effectiveness of medication interaction alerts also is uncertain.

Methods: This study used an interrupted time series design. In a health maintenance organization with an electronic medical record, we evaluated the effectiveness of electronic medical record alerts and group academic detailing to reduce the coprescribing of warfarin and interacting medications. Participants were 239 primary care providers at 15 primary care clinics and 9910 patients taking warfarin. All 15 clinics received electronic medical record alerts for the coprescription of warfarin and 5 interacting medications: acetaminophen, nonsteroidal anti-inflammatory medications, fluconazole, metronidazole, and sulfamethoxazole. Seven clinics were randomly assigned to receive group academic detailing. The primary outcome, the interacting prescription rate (ie,

the number of coprescriptions of warfarin-interacting medications per 10 000 warfarin users per month), was analyzed with segmented regression models, controlling for preintervention trends.

Results: At baseline, nearly a third of patients had an interacting prescription. Coinciding with the alerts, there was an immediate and continued reduction in the warfarin-interacting medication prescription rate (from 3294.0 to 2804.2), resulting in a 14.9% relative reduction (95% confidence interval, −19.5 to −10.2) at 12 months. Group academic detailing did not enhance alert effectiveness.

Conclusions: This study, using a strong and quasi-experimental design in ambulatory care, found that medication interaction alerts modestly reduced the frequency of coprescribing of interacting medications. Additional efforts will be required to further reduce rates of inappropriate prescribing of warfarin with interacting drugs.

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Drug-drug Interaction Alerts

- Warfarin
  - Acetaminophen
  - Metronidazole
  - Fluconazole
  - NSAIDS
  - Co-trimoxazole
- Alerts occurred when…
  - Co-prescription of warfarin and a target interaction, or
  - Both warfarin and an interacting medication were listed as "active" on the patient's EMR medication list

Visit Date: 10/03/2003

Patient Number: xx-xx-xxxx   **Sex:** Male   **DOB:** 12/15/1937   **Age:** 65

BestPractice Alerts Reminder

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* SAFETY ALERT: DRUG INTERACTION WARFARIN+APAP INCREASE RISK OF BLEEDING
- ACTION: Change to a single agent narcotic (Oxycodone, Codeine, or Morphine)
- Avoid prescribing APAP > 2gm/day
- Interactions have occurred at lower doses.
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Press OK to continue

[OK]

- Time series of overlapping warfarin interaction dispensings
- Sudden drop and change in slope (p<0.05)

Overlapping Prescriptions for Warfarin and Other Drugs

Feldstein AC, et al. Arch Intern Med 2006
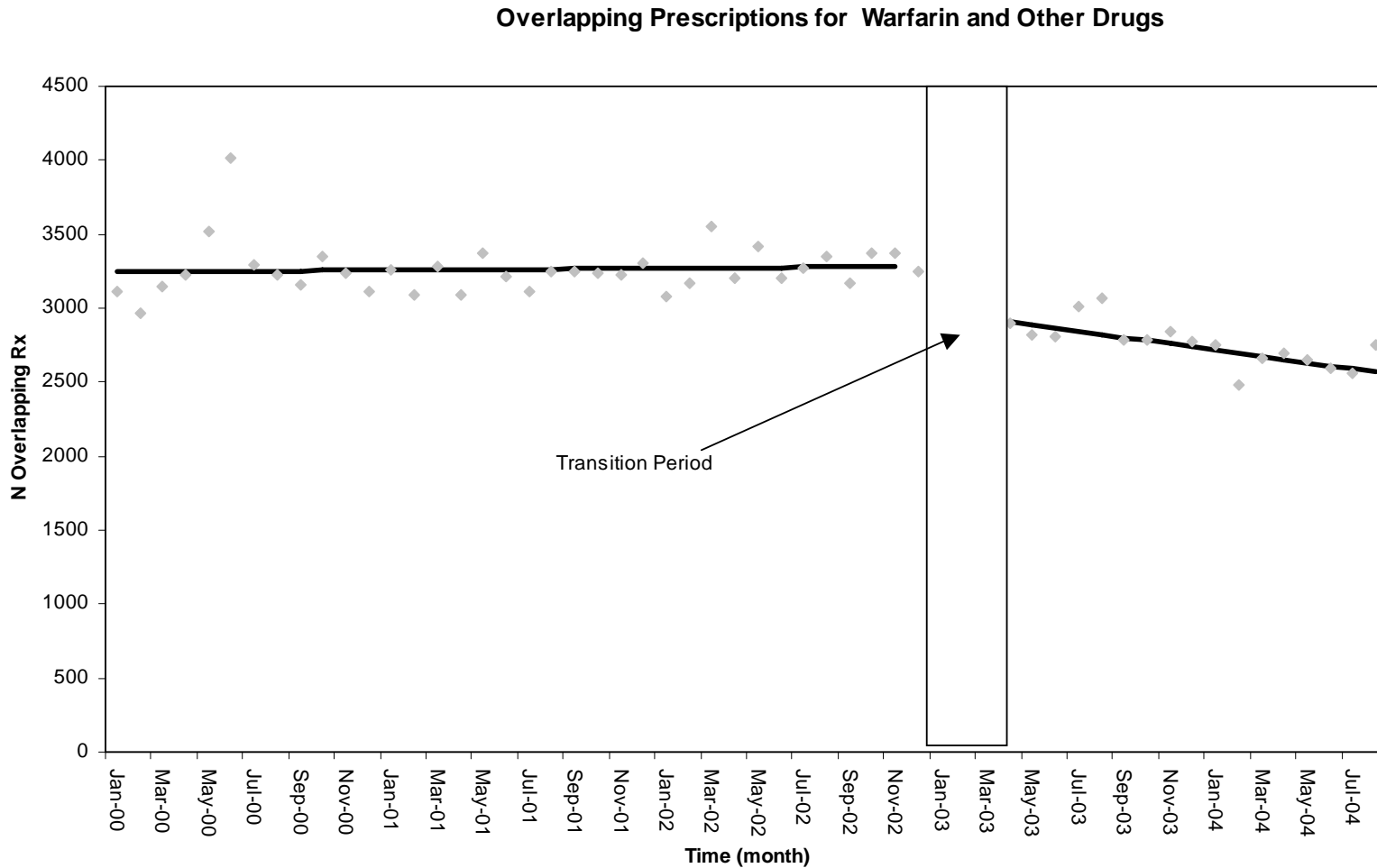
Questions

- Can computerized clinical decision support be used to prevent clinicians from prescribing, or to ensure that they prescribe with precautions?

- Will such systems be acceptable to clinicians?

Automated Telephone Outreach

- Interactive voice recognition *or* speech recognition
- Automated calls to thousands of patients
- Multiple call attempts
- Dial-in option

Automated telephone outreach

- Reminders for health maintenance
  - Influenza immunization
  - Cancer screening
- Case-finding for and prevention of chronic conditions
  - Hypertension
  - Lipids
  - Diabetes
- Enhance self-management of chronic illness
  - Diabetes
  - Congestive heart failure
  - Asthma

Potential uses of automated telephone outreach for RiskMAPs

- Confirmation of medication receipt
- Education about medication purpose and risks
  - Opportunity for two-way interaction
- Assessment for adverse drug events
- Ensuring adherence and follow-up

- Effective???