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A National Web Conference on the Use of Health IT to Reduce Medication Errors and Improve Patient Safety

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Moderator and Presenters Disclosures

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*Have no financial, personal, or professional conflicts of interest to disclose.

The Medication Metronome Trial: A Health IT System to Improve Medication Management and Laboratory Monitoring for Chronic Diseases

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Background

- Despite the availability of effective therapies, many U.S. patients with common chronic conditions such as diabetes, hyperlipidemia, and hypertension do not reach treatment goals.
- Medications are added for patients who are not succeeding with lifestyle interventions, but many still do not achieve recommended goals.
- Novel health IT tools have the potential to support chronic condition management in primary care settings.

Background

- Lack of timely medication intensification and inadequate safety monitoring are two prevalent and potentially modifiable barriers to effective and safe management of chronic conditions.
- Major challenges of visit-based care include competing demands for time and missed follow-up visits.
- Current visit-based delivery models do not include systematic efforts to engage in active risk factor management between visits.

"Come Back in 3 Months"

- Scheduled office visits are an unreliable method for planning future medication changes.

Table 1: Scheduled Visits, MGH Internal Medicine Associates, 2008

	Patients > 50 years		Patients with DM	
Visits	N	%	N	%
Patient Seen	110,003	63.8	70,361	63.7
Patient Cancelled	43,018	25.0	7,823	24.5
Provider Cancelled	10,989	6.4	1,831	5.7
Patient "No Show"	8,175	4.8	1,937	6.1

Fewer than two-thirds of planned visits actually occurred.

Medication Metronome

- Goal: Create an IT infrastructure to support **planned medication adjustment**
  - Writing prescription triggers future laboratory testing
  - Supports nonvisit-based management
- Objective: To test a model of chronic disease management for between-visit laboratory monitoring
- Study focused on A1c, LDL, and BP-related medicines
- Hypotheses:
  - H1: Metronome system will reduce delays in efficacy and safety monitoring
  - H2: Reduced delays between monitoring and prescribing will result in better risk factor control

Methods—Study Details

- **Study setting**: Two primary care practices within the Massachusetts General Primary Care Practice-Based Research Network
- **Study design**: Primary care physicians (PCPs) within these two practices randomly assigned to intervention (n=22) or control (n=22)
- **Procedures**: Intervention PCPs trained to use Medication metronome prior to start of trial
- **Clinical trial:** Metronome tool active in intervention arm for 1 year

Methods—Intervention

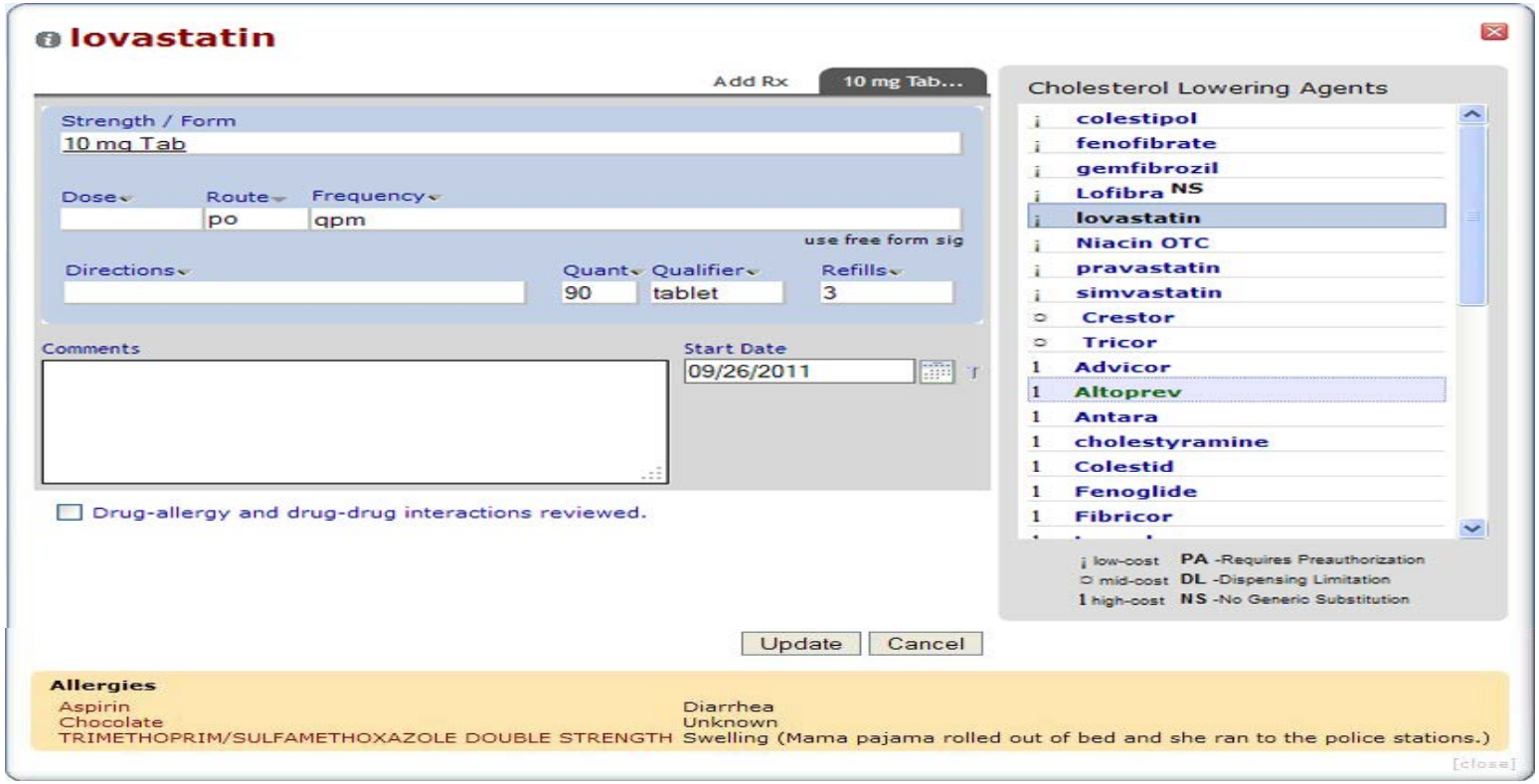
Control PCPs

- Usual care = electronic health record (EHR) with medication prescription interface

Intervention PCPs

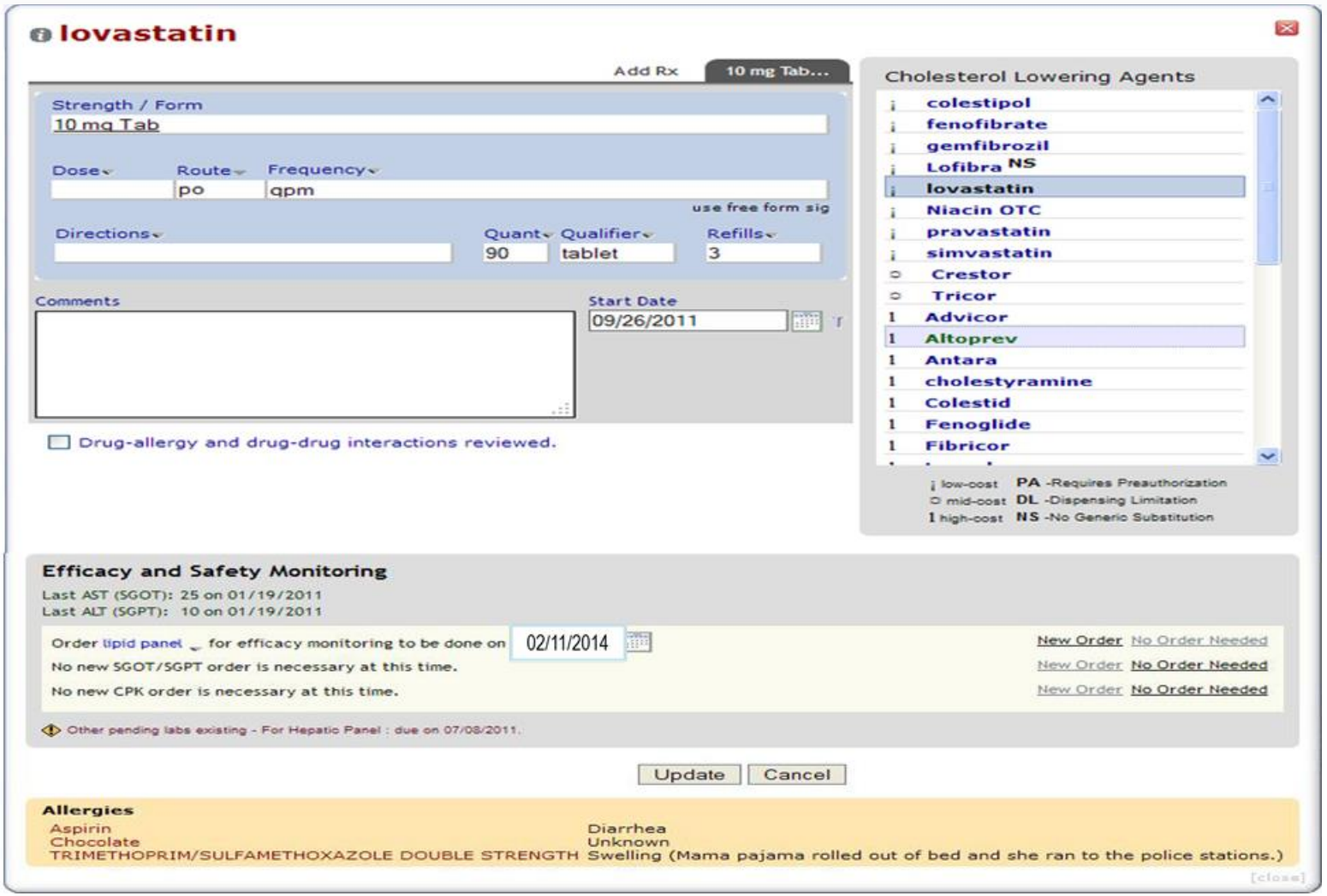
- Additional features in medication prescription interface:
  - Future laboratory test scheduling
  - Reminder letters sent to patients when labs due
  - Test tracking, results (or lack) sent to PCP
- Active when ordering new prescriptions or changing doses to treat:
  - Type 2 diabetes (oral hypoglycemic medications)
  - Hypertension (diuretics, ACEI/ARBs)
  - Hyperlipidemia (statins)

Electronic Prescription Interface with Medication Metronome Module



Control/Usual Care EHR Medication Ordering Interface

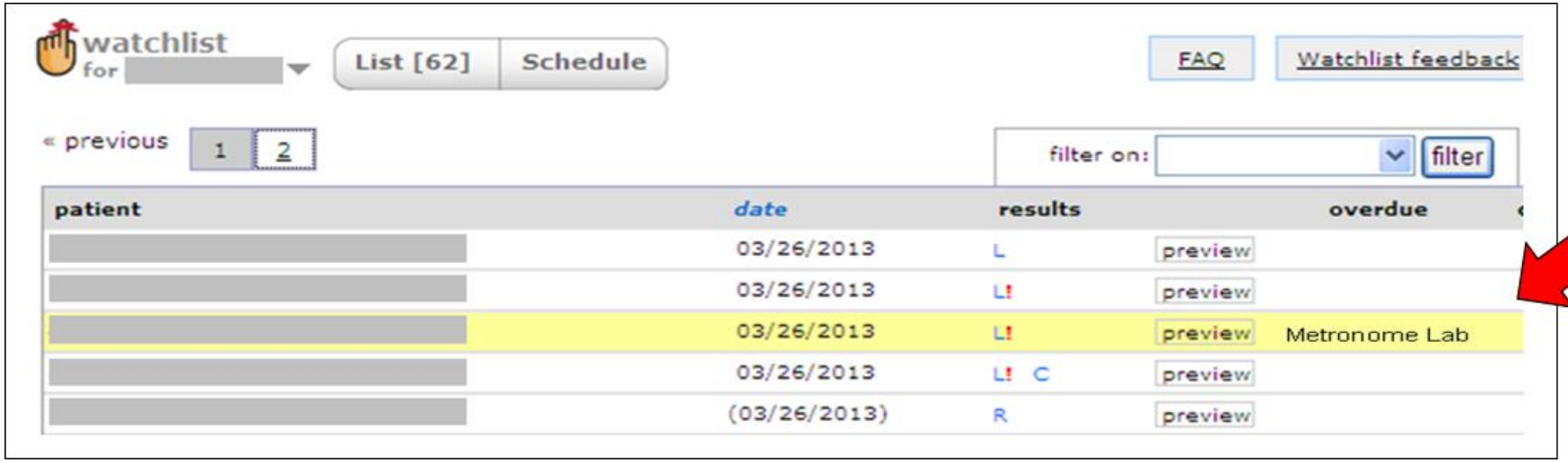
Electronic Prescription Interface with Medication Metronome Module



Electronic Prescription Interface with Medication Metronome Module

Methods—Intervention Outreach

- Medication metronome: Initiates automated patient outreach
  - Mailed letter and lab slip 1 week before the test is due
  - Mailed second letter and lab slip 1 week after test due date if no result is found
  - Notification of persistently overdue lab results (> 3-weeks after due date) is added to physician “Watchlist” of test results in EHR



Methods—Efficacy Outcomes

- Time to event outcomes for A1c and LDL tests:
  - Time from drug order to next lab assessment
  - Time from drug order to lab result being at or below goal
  - Analysis: Cox proportional hazards regression
- Proportion of time at goal: % follow-up time over 6 months that a patient was at or below risk factor goal
  - HbA1c ≤ 7% or ≤ 9% among patients prescribed hypoglycemic agents
  - LDL cholesterol ≤ 130 mg/dl (≤ 100 mg/dl for patients with cardiovascular risk)
  - Analysis: Linear regression

Methods—Safety Outcomes

- Safety outcome: % safety monitoring laboratory tests completed within 12 weeks of the medication order
  - Creatinine (diuretics, ACE-inhibitors, or metformin)
  - Liver function testing after initiating statins
  - Analysis: Logistic regression

- Multivariable models: Adjusted for patient age, gender, race/ethnicity, primary language, baseline lab value, with clustering by PCP

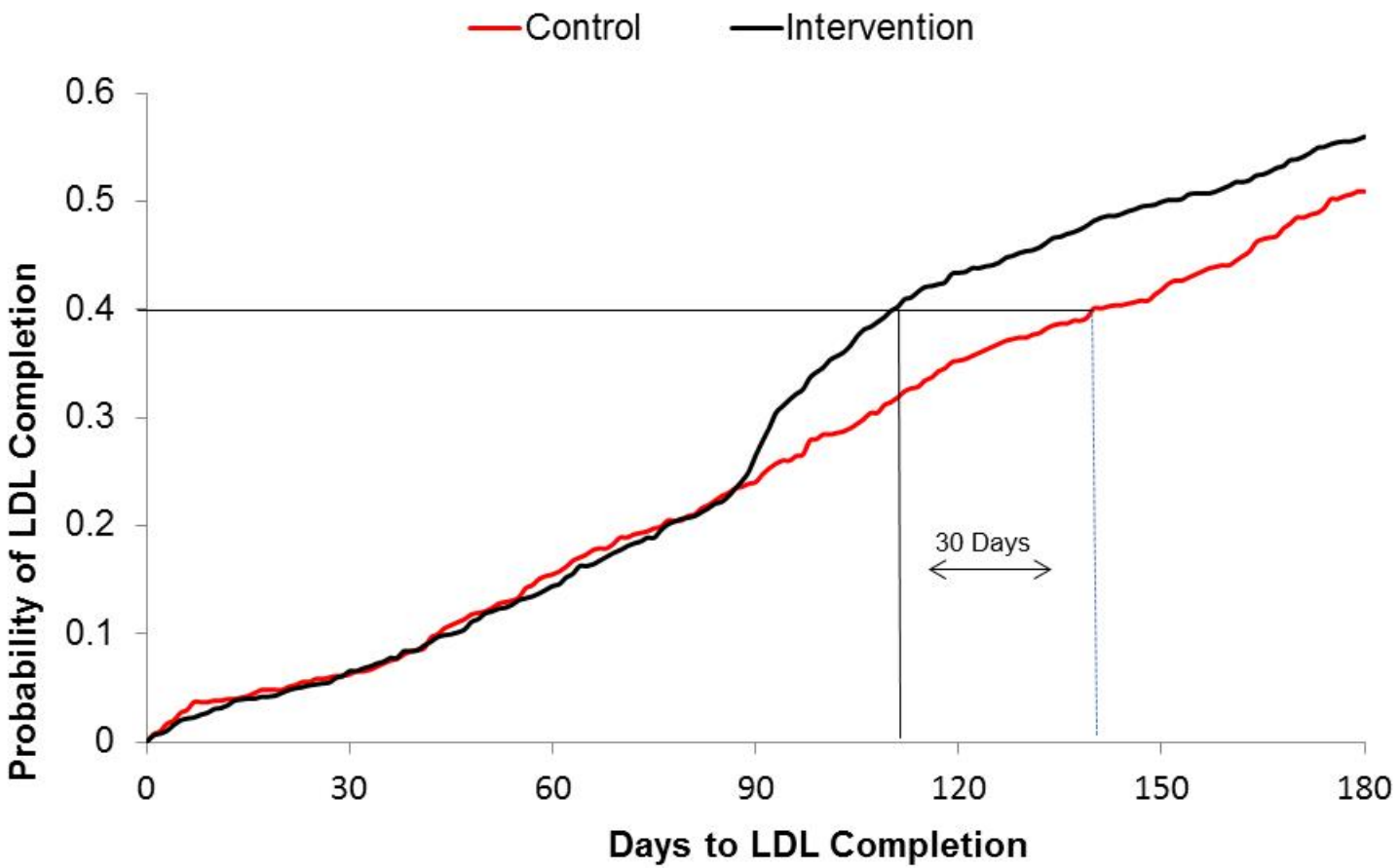
Patient Characteristics

* 3,655 unique patients representing 5,454 unique medication orders

	Intervention (n=2049)*	Control (n=1606)*	P-Value
Age, mean (SD)	65.9 (13.1)	65.7 (12.8)	0.64
Gender, female (%)	48%	53%	0.002
Race, non-white (%)	15.7%	19.6%	0.01
Insurance, commercial (%)	49.4%	49.3%	0.69
English primary language (%)	95.3%	92.4%	<0.001
Clinic visits 3 years, (SD)	9.2 (5.8)	9.2 (5.9)	0.90
Baseline HbA1c , mean (SD)	7.9 (1.6) (n=439)	8.1 (1.9) (n=424)	0.05
Baseline LDL, mean (SD)	117.7 (39.8) (n=1,069)	121.6 (43.8) (n=633)	0.07
Diabetes (%)	29.6%	32.3%	0.08
Hypertension (%)	76.6%	76.7%	0.96
Coronary Artery Disease	18.5%	18.1%	0.73

Time from Prescription to Next LDL

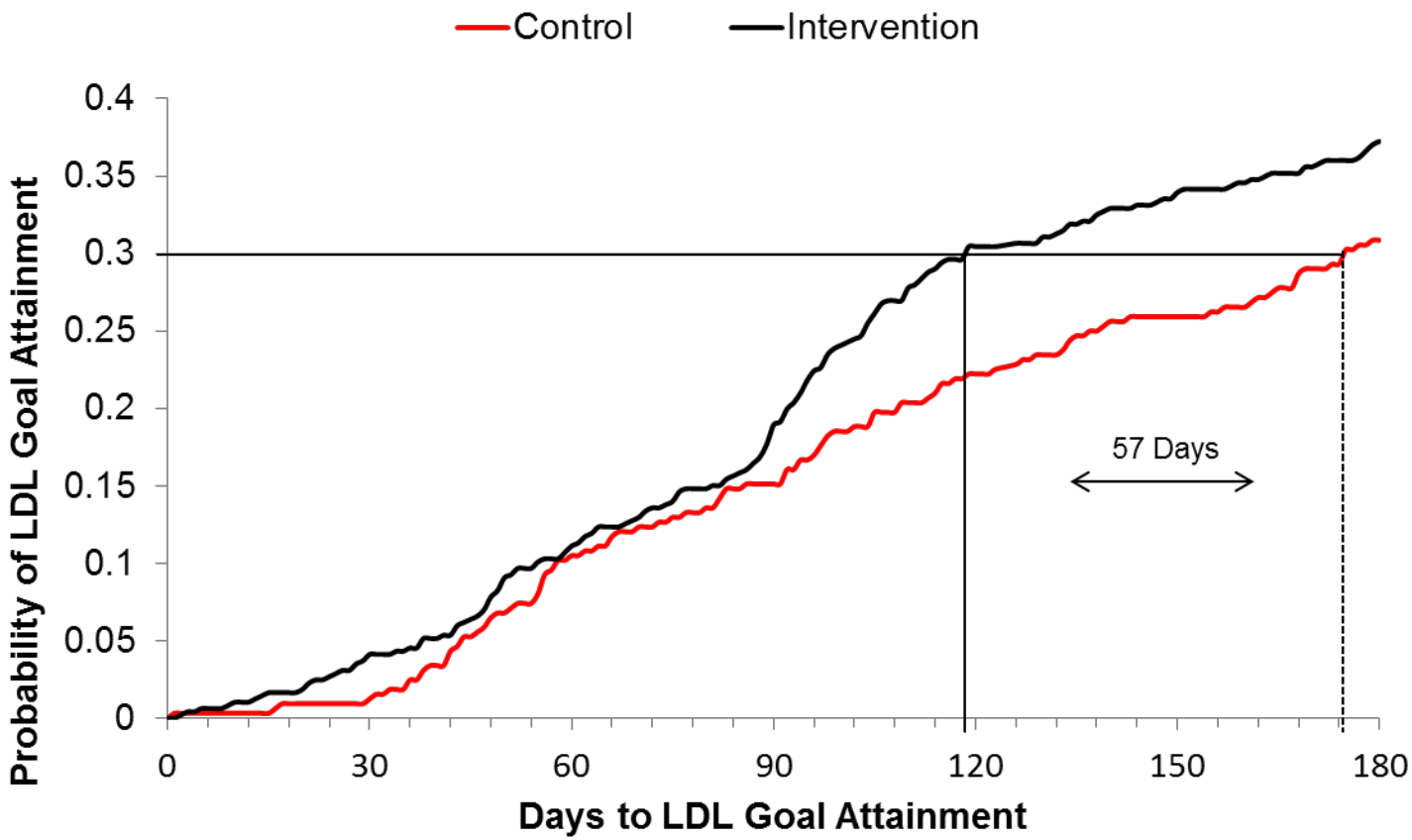
- Cholesterol-lowering medications, LDL (n=1,846)



- Hazard ratio (95% CI): 1.15 (1.01-1.32)

Time from Prescription to LDL Goal

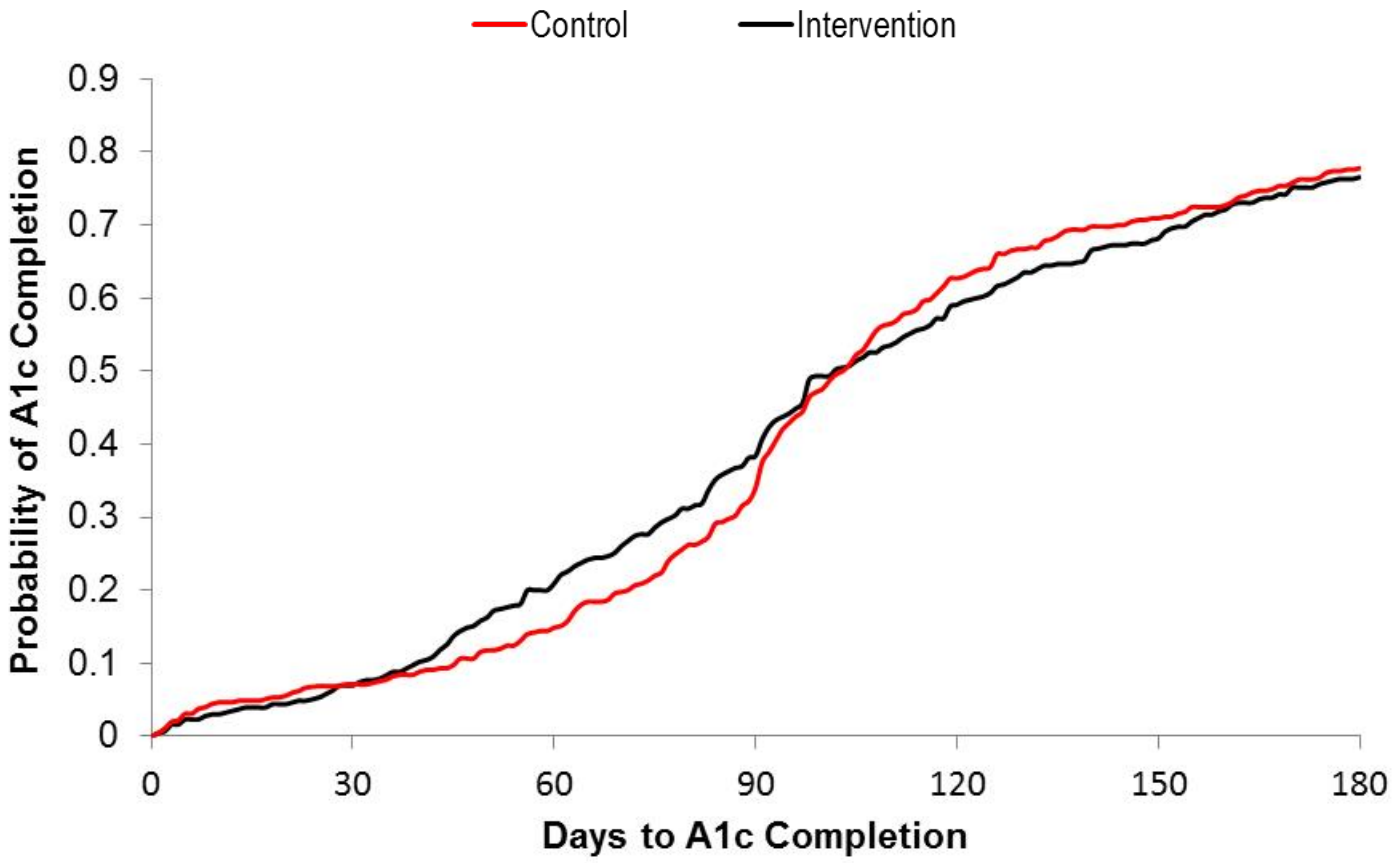
- Goal = LDL ≤ 100/130 (n=810 above goal at baseline)



- Hazard ratio (95% CI): 1.26 (0.99-1.62)

Time from Prescription to Next A1c

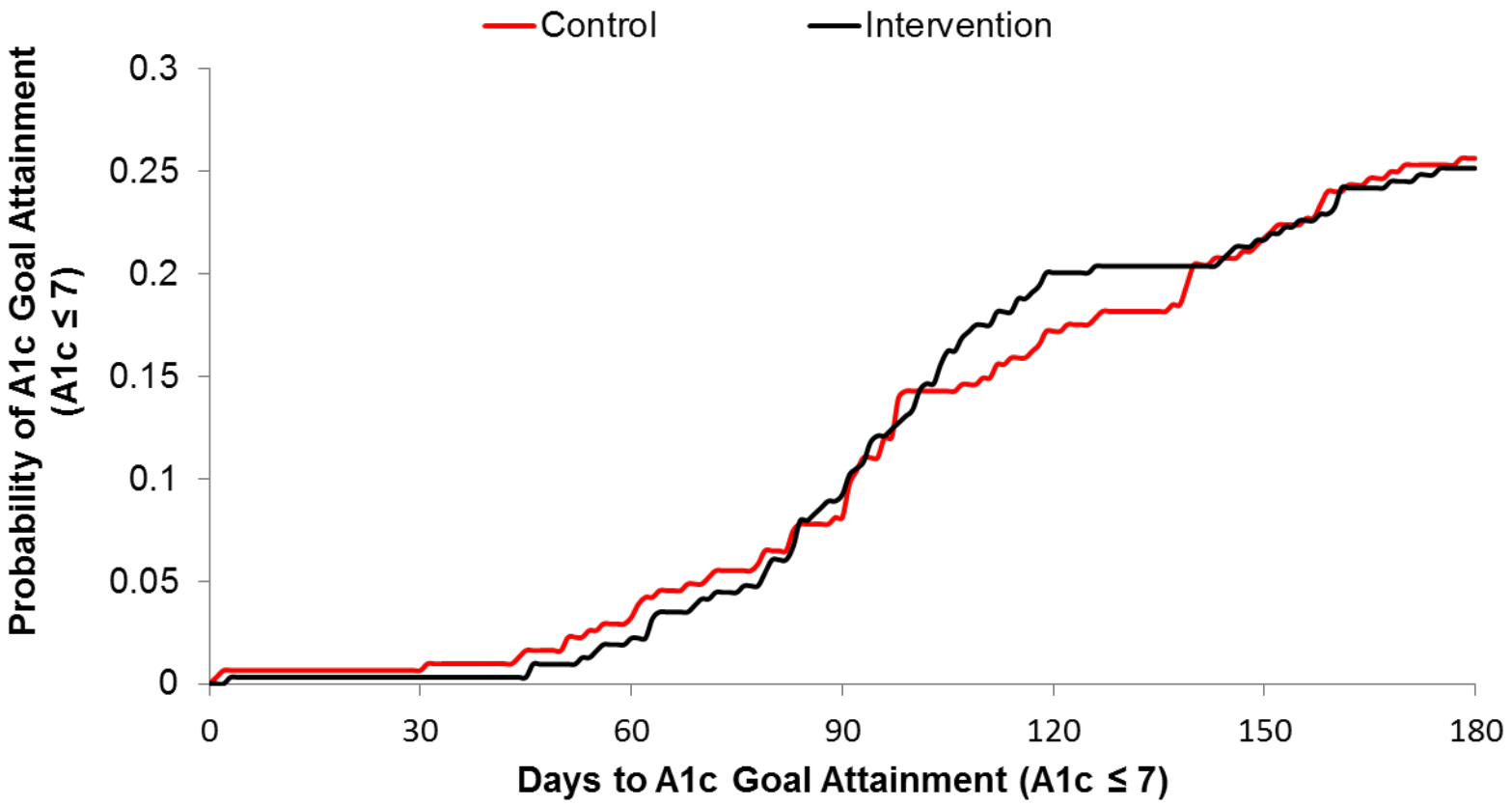
- Diabetes medications, HbA1c (n=880)



- Hazard ratio (95% CI): 1.05 (0.88-1.25)

Time from Prescription to A1c Goal

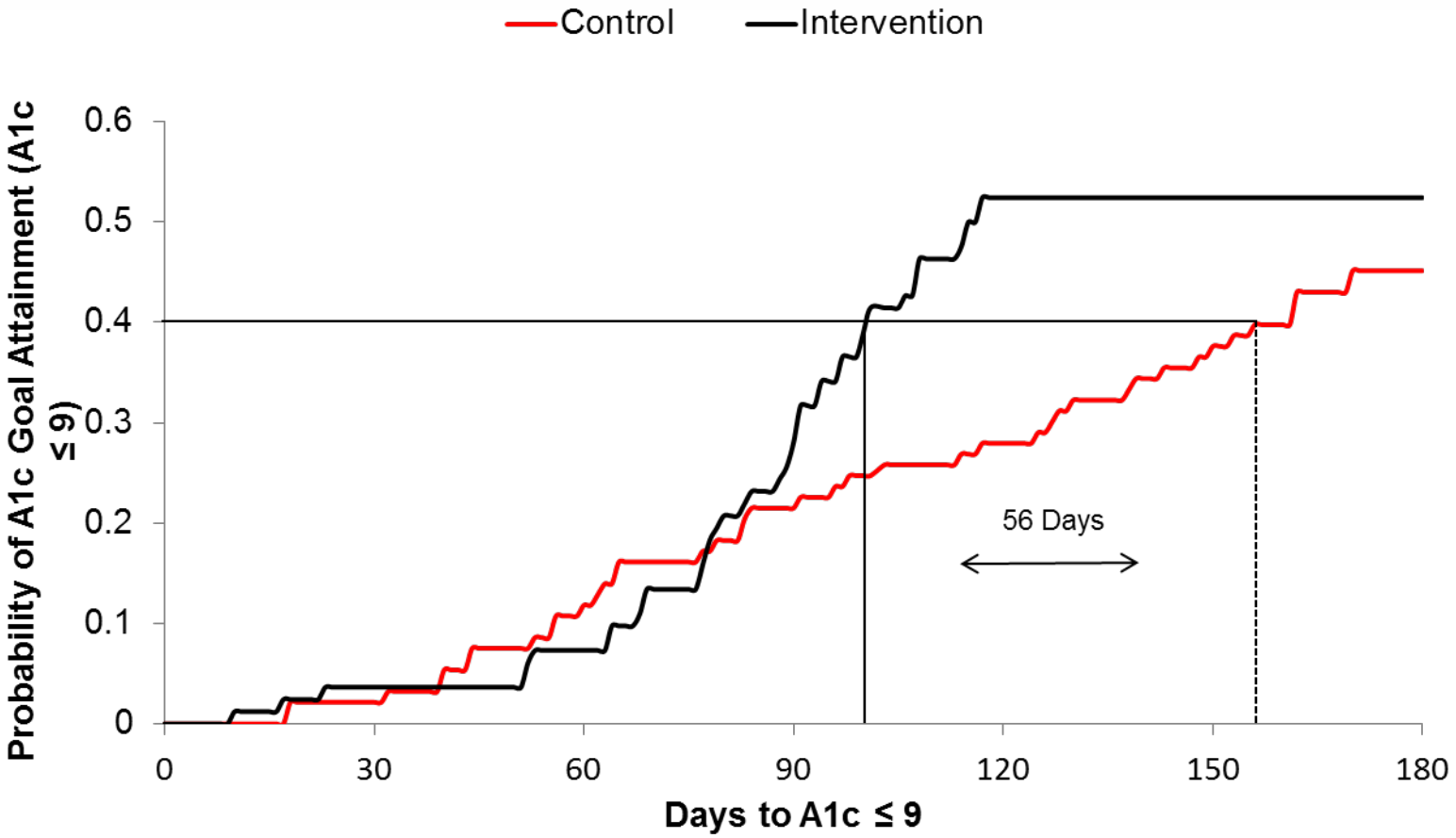
- Goal = HbA1c ≤ 7 (n=622 above goal at baseline)



- Hazard ratio (95% CI): 0.93 (0.64-1.36)

Time from Prescription to A1c Goal

- Goal = HbA1c ≤ 9 (n=175 above goal at baseline)



- Hazard ratio (95% CI): 1.18 (0.60-2.32)

Primary Effectiveness Outcome*

- % time that a patient is at or below risk factor goal

	Intervention		Control		P-Value
	N	Adjusted Mean %	N	Adjusted Mean %	
Hyperlipidemia: LDL ≤ 100 or ≤130	1053	57.9%	621	54.8%	0.30
DM: HbA1c ≤ 7	441	32.5%	418	34.3%	0.58
DM: HbA1c ≤ 9	441	83.0%	418	81.6%	0.55

* Intention-to-treat population

Primary Effectiveness Outcome†

- % time that a patient is at or below risk factor goal

	Intervention		Control		P-Value
	N	Adjusted Mean %	N	Adjusted Mean %	
Hyperlipidemia: LDL ≤ 100 or ≤130	329	59.7%	621	54.8%	0.19
DM: HbA1c ≤ 7	160	33.3%	418	34.3%	0.76
DM: HbA1c ≤ 9	160	83.3%	418	81.6%	0.54

† "On-Treatment" = e.g., Metronome order used

Primary Safety Outcome

- % laboratory tests measured within 12 weeks

	Intervention	Control	P-Value
	Adjusted %	Adjusted %	
BP Medication: Creatinine, K	50.1%	49.6%	0.89
Metformin: Creatinine	35.4%	40.5%	0.22
Statin: AST/ALT	23.9%	27.6%	0.28

PCP Survey: Barriers to Use

Barrier	n (%)
Did not want to schedule lab testing using this system	6 (30%)
Not clear how to use the interface to order and schedule lab tests	6 (30%)
Using the module required extra time	5 (25%)
Other barriers	7 (35%)
No barriers to use of the module	3 (15%)

Please note: Survey respondents could check multiple barriers. PCPs who checked "other barriers" were asked to specify.

Study Limitations

- Despite initial enthusiasm from stakeholders and PCP advisors, PCPs did not embrace this method of nonvisit-based care.
  - Only 660 medication orders used the IT system (21% of possible orders).
  - PCP surveys:
    - Lack of incentive to increase nonvisit-based management in fee-for-service environment
    - Lack of established workflows
    - Time required to explain to patients what to expect
    - Outside labs not captured by system frustrated PCPs and patients

Conclusions

- A health IT tool to support between-visit laboratory monitoring following the initiation or change of chronic disease medications in office visits:
  - Did not increase risk factor control or safety monitoring compared to usual care
  - Decreased the time to laboratory testing and goal attainment following initiation or change of cholesterol-lowering medications (but not glycemia)

Implications

- Persistent gaps in goal attainment for managing chronic disease support the role of nonvisit-based care to supplement and extend face-to-face interactions.
- Health IT innovations that support between-visit work represent a new model of care delivery that will require more patient and provider input to support standard workflow and educational outreach.
- New payment models that reimburse for nonvisit-based medication management may be needed before visit-independent medication management systems will be more widely adopted.

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Assessment of Pediatric Look-alike, Sound-alike (LASA) Substitution Errors

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Funding: Agency for Healthcare Research and Quality, R03 HS018841

Definition: LASA Errors

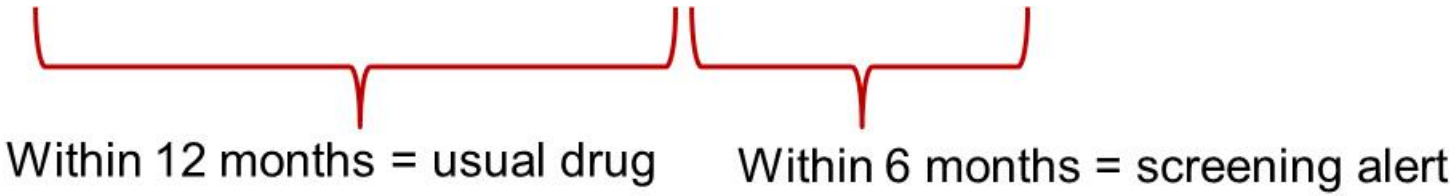
- LASA errors can occur when the names of two drugs
  - Look alike = orthographic similarity (e.g., Tegretol/Tequin)
  - Sound alike = phonetic similarity (e.g., Adderall/Inderal)
- LASA errors occur less commonly than dosing errors in children. (Basco et al. *Acad Pediatr* 2010;10(4):233-237)
- 2008 report identified over 1,500 drug pairs that have LASA potential. (*US Pharmacopeia,* January 2008)

Previous Studies in Children

- Phatek and co-authors completed two related studies that evaluated potential LASA errors in pediatric data.
  - *J Am Pharm Assoc* 2001;41:324
  - *J Am Pharm Assoc* 2005;45(5):616-621.
- Tested drug pairs based on orthographic similarity of drug names (shared letters and structures)
  - Found 1,138 potential errors; the error probability increased with increasing orthographic similarity
  - Neither study reported actual LASA frequency
- Refill error
  - Drug A, Drug A, Drug A, then Drug B
  - Constitute about 80% of LASA errors
- Initial dispensing error
  - Drug B, Drug A, Drug A, Drug A
  - Constitute about 20% of LASA errors

Framework for Identifying Potential LASA Errors—Screening Alert Rate

- Our approach has been from the pharmacy viewpoint
- Dispensing patterns could be used to trigger a screening alert at the point of dispensing…
  - Drug A, Drug A, Drug A, then Drug B



  - Either drug in a pair could serve as usual drug

- One can then calculate frequency of screening alerts (proxy for frequency of potential LASA error)

2010 Project—Data and LASA Pairs Sources

- Pilot study to test this approach
  - Basco et al. *Acad Pediatr* 2010;10(4):233-237
  - Utilized a selected set of 11 LASA drug pairs
  - Found a screening alert frequency of
    0.28 screening alerts per 1,000 prescriptions
- Much lower than dosing error frequency in pediatric outpatient prescriptions of 7-15%
  - McPhillips et al. *J Pediatr*. 2005;147:761–767
  - Kaushal et al. *JAMA*. 2001;285:2114–2120

Conclusions and Implications

- The frequency of pediatric LASA errors appears to be much lower than other types of pediatric medication errors.
- Evaluating these screening alerts does not appear to impose an unbearable burden on pharmacies.
- Lesson learned: Pay attention to tradeoff between “signal and noise.”

The AHRQ-Sponsored HIT Portfolio Project (R03)

Evaluating the Severity of Look-Alike, Sound-Alike Drug Substitutions in Children

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Funding: Agency for Healthcare Research and Quality, R03 HS018841

HIT Portfolio Grant Approach and Aims

- We kept the pharmacy screening perspective:
  - Dispensing patterns could be used to identify potential LASA errors by triggering a screening alert.
  - Pharmacists could query patients or providers about indications for prescriptions to verify whether it was appropriate to receive the second drug.

- The aims of this study were to:
  - Utilize a modified Delphi panel approach to evaluate the potential severity of specific LASA drug substitution errors.
  - Estimate frequencies of screening alerts (potential LASA substitution errors) in these drug pairs.

Method: Two Published Sources of LASA Pairs

- Institute for Safe Medication Practices (ISMP) list of Confused Drug Names
  - http://www.ismp.org/Tools/confuseddrugnames.pdf
- MedMarx – U.S. voluntary error reporting system
  - Hicks RW, Becker SC, Cousins DD, eds. (2008). MEDMARX data report. A report on the relationship of drug names and medication errors in response to the Institute of Medicine's call for action. Rockville, MD: Center for the Advancement of Patient Safety, US Pharmacopeia.
- Merged ISMP with MedMarx lists of LASA pairs
- Merged list = 1,784 unique pairs, but after reciprocating = 3,568 pairs

Method: Reducing the List

- Goal was always to focus on outpatient preparations
- Review process removed 867 pairs (of 1,784)
- Examples removed
  - Injectable preparations
  - Non-oral preparations
  - Vitamins
  - ALL of the above choices introduced limitations; can discuss if we have time!
- After exclusions—retained 917 pairs
- Reciprocated for Delphi surveys = 1,834 pairs

Method: Modified Delphi Plan

- Practicing pediatricians scored the LASA substitution errors based on the degree of POTENTIAL HARM
- Survey development:
  - Cognitive pretesting of concepts and terminology
  - Piloting of surveys for wording, online format, determine time to complete
  - 50-pair surveys took ~20 minutes
- Resulted in 37 versions of survey for Round 1
- Recruited a convenience sample of 37 participants from professional organization listservs
  - 59% female
  - 9 states were represented

Anatomy of a Pair Error

- Each pair consists of two drugs (Drug A/Drug B).
- No suggestion of direction, so a patient could receive Adderall instead of Inderal, or Inderal instead of Adderall.
- Nomenclature used:
  - Drug A = “intended” drug
  - Drug B = “delivered” drug
  - Reciprocating means that each pair also appeared as Drug B, Drug A, with Drug B as the “intended” drug, etc.

- With one LASA error, two drug errors occur, leading to two problems for patient:
  - Estimate potential harm of NOT receiving intended drug
  - Estimate potential harm of receiving delivered drug instead

Modified Delphi Process

- Utilized RedCAP online survey tool
- Round 1
  - Emailed unique survey link to each participant
  - Each participant scored 50 pairs
- Round 2
  - Emailed unique survey link to each participant
  - Each participant scored 50 DIFFERENT pairs
- Therefore, between Rounds 1 and 2, each pair scored by two participants

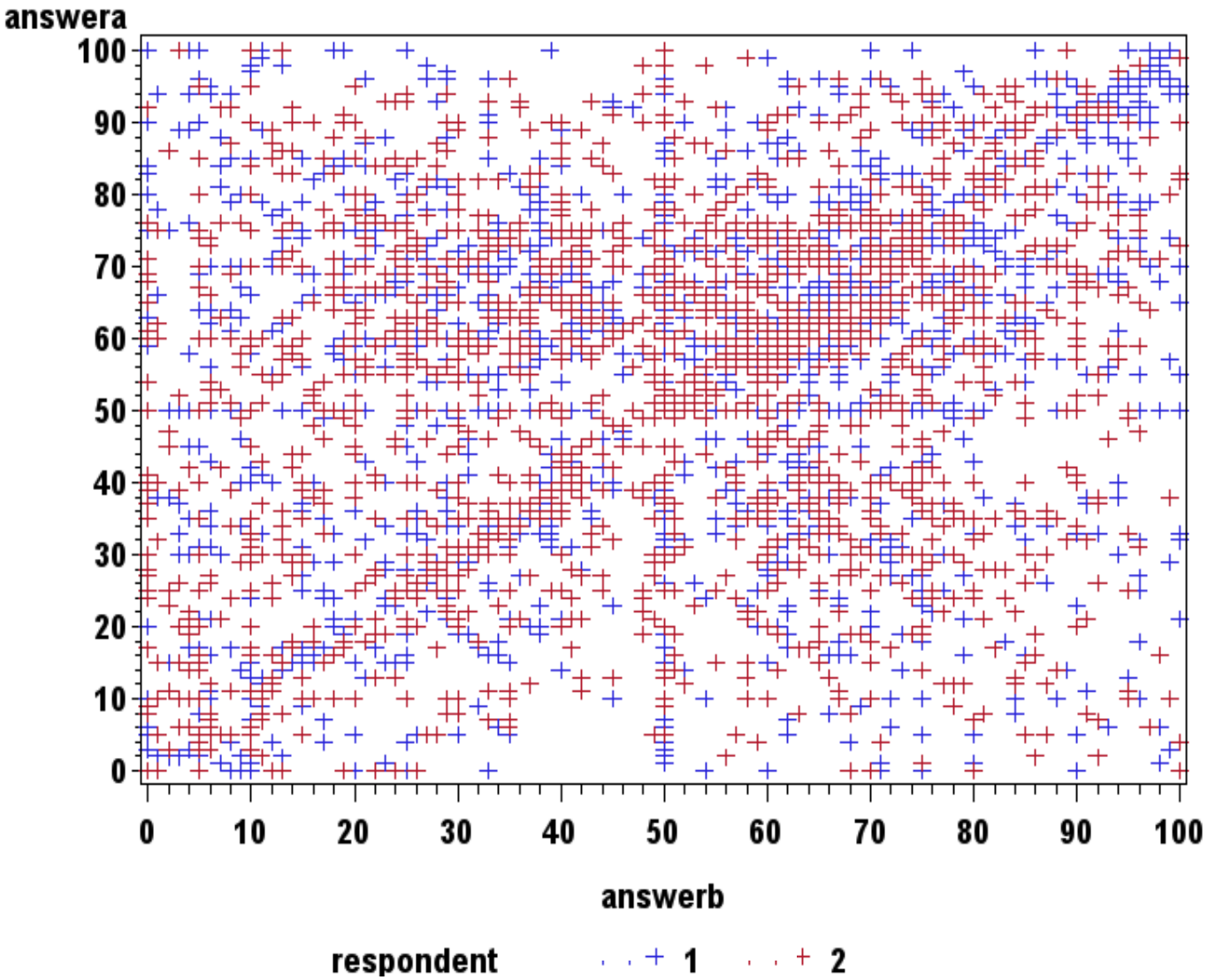
Example from RedCAP Survey

- Participants scored pairs on **potential harm** assessed on a continuous scale from **“no harm, little harm, moderate harm, severe harm,” to “death.”**

Assumptions for Participants (Developed Through Pretesting)

- Imagine that…
  - No medical conditions other than the one for which he or she was to receive the intended drug
  - No drug allergies
  - No dose change issues
  - 1-month error period for drugs meant to be taken daily, meaning that the error would NOT recur at next dispensing
- **Do not estimate the CHANCE that harm will occur**. Evaluate the ***degree of potential harm*** that might occur should the patient experience adverse effects from not receiving the intended drug or receiving the delivered drug by mistake

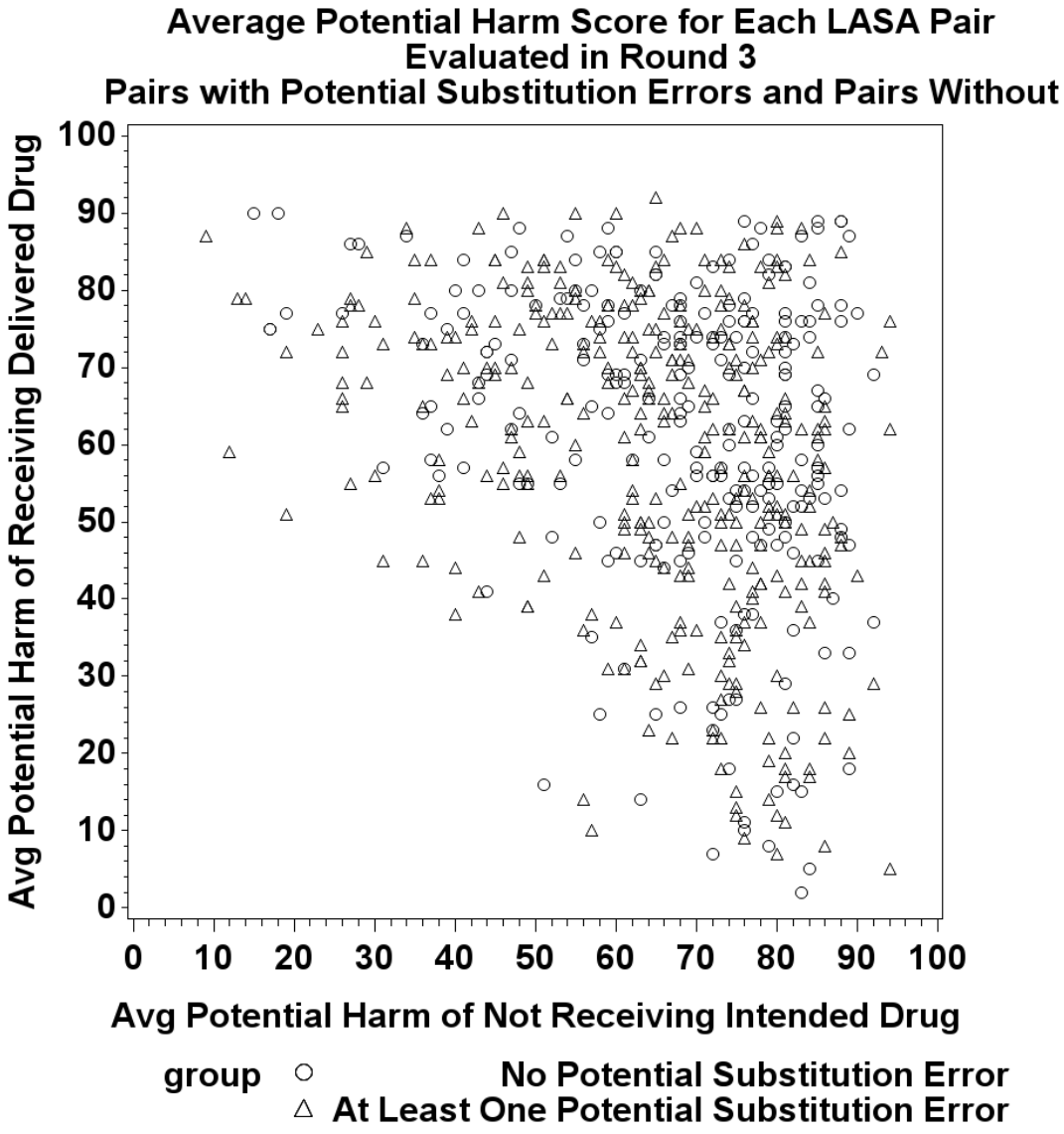
Distribution of Scoring for Rounds 1 (Blue) and 2 (Red)



Method: Cluster Analysis and Selection of Round 3 Pairs

- Kept any pair where EITHER of the two participants scored one of the two errors “potential harm” above the cutoff
  - Cutoff value was 82
- This process identified 608 pairs for Round 3
  - Each pair scored x 3 participants
  - Averaged those 3 results to get final scatterplot

Scatterplot of Average Round 3 Scores



List of Top 10 LASA Errors, Ranked by Potential Harm of Receiving the Delivered Drug in Error

Delivered Drug	Intended Drug	Average Harm Score
K Dur	Kayexalate	93
Cyclosporine	Cyclophosphamide	92
Lanoxin	Levothyroxine	92
Coumadin	Cardura	91
Jantoven	Januvia	90
Warfarin	Levaquin	90
Coumadin	Mephyton	89
Coumadin	Avandia	88
Jantoven	Janumet	88
Azathioprine	Azithromycin	87
Temodar	Tambocor	86

List of Top 10 LASA Errors, Ranked by Potential Harm of NOT Receiving the Intended Drug

Intended Drug	Delivered Drug	Average Harm Score
Warfarin	Levaquin	95
Ethmozine	Ethambutol	93
Cyclophosphamide	Cyclosporine	92
Prograf	Prozac	92
Dantrium	Danocrine	91
Cordarone	Cardene	89
Coumadin	Avandia	89
Folex	Foltx	89
Norvir	Norvasc	88
Oxcarbazepine	Oxaprozin	88

Aim 2

Estimate frequencies of screening alerts (potential LASA substitution errors) in these drug pairs

Method: Estimating Frequency of LASA Substitution Errors

- Approach: The frequency of screening alerts is
  - An estimate of the LASA error frequency
  - An estimate of the pharmacy screening burden: how many alerts would this approach generate?
- Prescription data source
  - 2000-2009 South Carolina Medicaid paid ambulatory claims data for patients < 20 years old
- Inclusion: 608 Round 3 LASA pairs
- Used the most inclusive definition of LASA error
  - ANY subject who received BOTH drugs in a LASA pair within 6 months of each other
    - LASA error = Drug A, then Drug B, within 6 months of each other
  - This gives the MAXIMUM error estimate

Results: The Good News

- 34% of the LASA pairs
  - No patient received both drugs within a 6-month period.
- 49% of the LASA pairs
  - The cumulative total of subjects who received both drugs in a pair amounted to < 1 screening alert per day in South Carolina over the 10-year data span.
- Therefore, for 83% of LASA pairs in Round 3, the pharmacy screening burden can be considered low.

Results: The Bad News

- By contrast, among the remaining 17% (n=103) LASA pairs, there were 27 screening alerts per day in the state.
- There were 19 pairs (3.1%) where >1,000 subjects received both drugs within 6 months of one another.
- Examples:
  - Prevacid/Prednisone
  - Zoloft/Zyrtec
  - Ciprofloxacin/Cephalexin

Global Project Limitations

- Because of the sheer number of drugs involved, we had to limit the pairs that were scored in the Delphi process.
- Eliminated drugs that would be of interest to other parties (e.g., inpatient).
- List of LASA pairs is not pediatric specific, so pediatricians are unfamiliar with many drugs.
- Input only from pediatricians. Future work should include pharmacists.

Conclusions and Implications Regarding Harm Ratings

- Pediatricians have ranked 608 potential LASA error combinations by harm rating
- Gives researchers and clinicians idea of how to prioritize approach

Conclusions and Implications Regarding Frequency

- For 83% of the LASA pairs
  - A child receiving both drugs in a LASA pair within a 6-month period should trigger a screening alert for potential LASA substitution error.
  - Will not produce a significant burden on pharmacies.
- For 17% of the LASA pairs
  - More work is needed to refine dispensing patterns that trigger screening alert in order to maximize the tradeoff between degree of potential harm versus screening burden.
- For 3.1% of the LASA pairs
  - So many subjects receive both drugs within a 6-month period that screening for potential substitutions via this method may not be possible.

Next Steps for Us

- For the 17%
  - Evaluate the PPV of the potential errors found
  - What dispensing pattern maximizes the PPV?
- For the 3%
  - Combine the error frequency data with potential harm data to determine potential drug pairs to use in future efforts
- With the next grant…
  - Test real-time screening for pediatric LASA errors in clinical pharmacies
  - Perhaps through an R18 mechanism

Project Lessons and Challenges

- LASA pair lists are ALWAYS being updated—how often should one add new drug pairs?
- Finding good lists of generic preparations of the brand names that appear in LASA pair lists has been a challenge
  - You must cross-walk …
  - Brand or generic name, as listed in the LASA pair
  - WITH generic form of the drug
  - WITH all brand versions of the generic form
- A screening alert ≠ true LASA error
  - Limited clinical data available to answer this in administrative data

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Improving the Approach to Electronic Medication Reconciliation

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The views expressed herein are those of the author and do not necessarily represent the views of the Department of Veterans Affairs.

Goal for Today

- Identify at least three findings related to improving the approach to electronic medication reconciliation used in the process of electronic prescribing.

Abbreviations

- Med = medication
- Recon = reconciliation
- ADE = adverse drug event
- EHR = electronic health record
- PADE = potential ADE
- PAML = pre-admission medication list

A Real Transition in Care

Day	Event
0	• Discharge from hospital (heart failure) • Furosemide is discontinued in orders but not in discharge instructions
5	• Home nurse discovers furosemide in pill boxes
6	• Creatinine increases from 1.6 to 3.7 • Patient is referred for emergency care but declines
7	• Patient declines to be evaluated
12	• Patient is found confused at home: creatinine 5.2, potassium 7.6 • Admitted to intensive care

Med Discrepancies on Discharge

41%

Discharges with medication discrepancies

Adverse Events on Discharge

20%

Discharges to home with adverse events

Example of Computerized Med-list Output

PATIENT,TEST-A #123456 (F) Age 45 years

ASPIRIN (BAYER TAB 81MG),, TAKE 1 TABLET BY MOUTH DAILY
Ordered: 5-Dec-11 Dr: 9876-5 SEUSS,DR Loc: Whoville Clinic
Qty dispensed: 30 tabs
Script expires: 4-Dec-12 Current supply expires: 30-Feb-12
Refills: 2 remain of 4 prescribed
Transaction: REFILL 30-Jan-12 Qty: 30
Transaction: NEW 5-Dec-11 Qty:30

ASPIRIN (BAYER TAB 81MG),, TAKE 1 TABLET BY MOUTH DAILY
Ordered: 14-Aug-11 Dr: 9876-5 SEUSS,DR Loc: Whoville Clinic
Qty dispensed: 30 tabs
Script expires: 13-Aug-12 Current supply expires: 4-Dec-11
Refills: 0 remain of 4 prescribed
Transaction: REFILL 3-Nov-11 Qty: 30
Transaction: REFILL 28-Sep-11 Qty: 30
Transaction: NEW 14-Aug-11 Qty: 30

ASPIRIN (BAYER TAB 81MG),, TAKE 1 TABLET BY MOUTH DAILY
Ordered: 17-Mar-11 Dr: 9876-5 SEUSS,DR Loc: Whoville Clinic
Qty dispensed: 30 tabs
Script expires: 16-Mar-12 Current supply expires: 14-Aug-11
Refills: 0 remain of 4 prescribed
Transaction: REFILL 14-Jul-11 Qty: 30
Transaction: REFILL 10-Jun-11 Qty: 30
Transaction: REFILL 30-Apr-11 Qty: 30
Transaction: NEW 17-Mar-11 Qty: 30

Med Recon Assessment

The process of comparing

current medications

to

planned medications

(e.g., new orders)

at transition points in medical care

Med Recon Is More Than Just Assessment

1. Assess
2. Compare
3. Decide
4. Communicate
5. Document

The Joint Commission Safety Goal NPSG.03.06.01

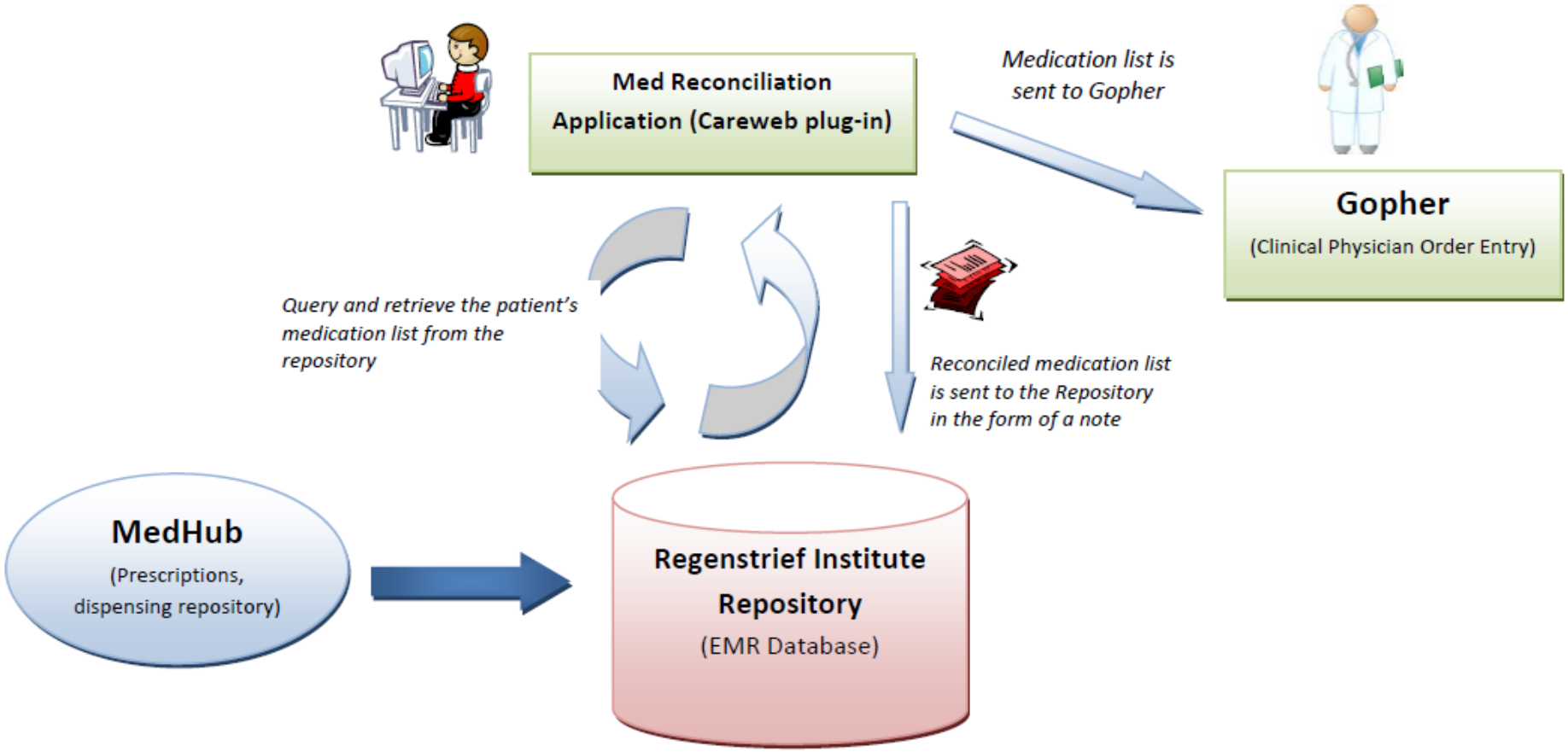
- Coordinate med information during transitions in care, inside and outside of the organization.
- Communicate with other providers.
- Educate patients about safe medication use.
- Provide the patient with written information about meds after inpatient and outpatient encounters.
  - Dosing information
  - Indication (purpose) for meds
- Carry medication information at all times.

Specific Aims

1. Integrate an electronic med recon system with an electronic prescribing system.
2. Conduct a randomized controlled trial of med recon.
3. Determine whether electronic facilitation of med recon alters med recon and the incidence of medication errors in ambulatory care.

- Hypothesis: Electronic facilitation of med recon will improve completion of med recon and will decrease the incidence of drug-related medical errors.

An EHR Adaptation for Med Recon



New EHR Module for Med Recon

Add Medication

	status	Name	Strength	Current dose, route, frequency
⊞	?	**Acetam/Hydrocodn**	50 mg	TAKE 1-2 TABLETS EVERY 4 HOURS AS NEEDED FOR PAIN NO MORE THAN 8 IN
⊞	Not taking	**Travoprost Ophth Sol 0.004%**	50 1null	1 DROP(S) IN EACH EYE EACH EVENING
⊞	Taking	**Bimatoprost Op Sol**	50 %	INSTILL 1 DROP(S) IN EACH EYE 2 TIMES A DAY
⊟	?	**Bimatoprost Op Sol**	50 1%	INSTILL 1 DROP INTO BOTH EYES EVERY DAY IN THE EVENING

Image:

Detail: 21-Jan-2009, mL 1%, bottles, Qty: 1.0, Days Supply: 30, Refill #1

Taking status: ?

Current dose, route, frequency: INSTILL 1 DROP INTO BOTH EYES EVERY DAY IN THE EVENING

Appropriateness: Taking as presc

Comments:

OK Cancel

Examples of Variables to Consider

- Patients' demographics and number of previous clinical encounters
- Providers' characteristics, such as level of training
- Med history was performed; accuracy and timing
- Patients' number of medications
- Med recon was performed; who did it; what sources were used
- Medications prescribed
- Reasons for not continuing a medication
- Med recon at outpatient follow-up visits

Examples of Reasons for not Continuing a Medication

- Drug contraindicated at this time
- Condition does not require treatment at this time
- Nondrug approach will be used
- Drug is nonformulary
- This drug will actually be used
- Different drug will be used

Main Ways that Drugs Can "Match"

- Exactly: drug, dose, route, and frequency
- Drug only (dose, route, or frequency differs)
- Class only (e.g., diuretic, or thiazide diuretic); drugs differ.
- Indication only (e.g., hypertension); classes differ.

Classifying Potential for Harm and Severity

- Confidence in potential for harm (any)
  - Little or no confidence
  - Slight to modest confidence
  - Less than 50% chance but close call
  - More than 50% chance but close call
  - Strong confidence
  - Virtually certain confidence
- Potential severity of harm
  - Significant (little or no threat to life)
  - Serious
  - Life-threatening

Pippins et al. *J Gen Intern Med 2008*; 23 (9):1414-22.

Signs of Potential ADEs (Must be Confirmed)

- Diagnostic codes associated with ADEs (e.g., urticaria, nephritis)
- Specific drugs often used to address ADEs (e.g., diphenhdyramine for allergy)
- Drug combinations (e.g., digoxin and azithromycin)
- Drugs and symptoms (e.g., angiotensin converting enzyme inhibitor and cough)
- Diagnoses and drugs (e.g., angiotensin converting enzyme inhibitor and angioedema)
- Drugs and miscellaneous conditions (e.g., amitriptyline and age more than 65 years)
- Laboratory triggers (e.g., diuretic and hypokalemia)
- Undesired encounters: urgent visits, emergency visits, and hospitalizations
- Incident reports

Morimoto et al. *Qual Saf Health Care 2004*; 13 (4):306-14.

Some Usability-Related Metrics

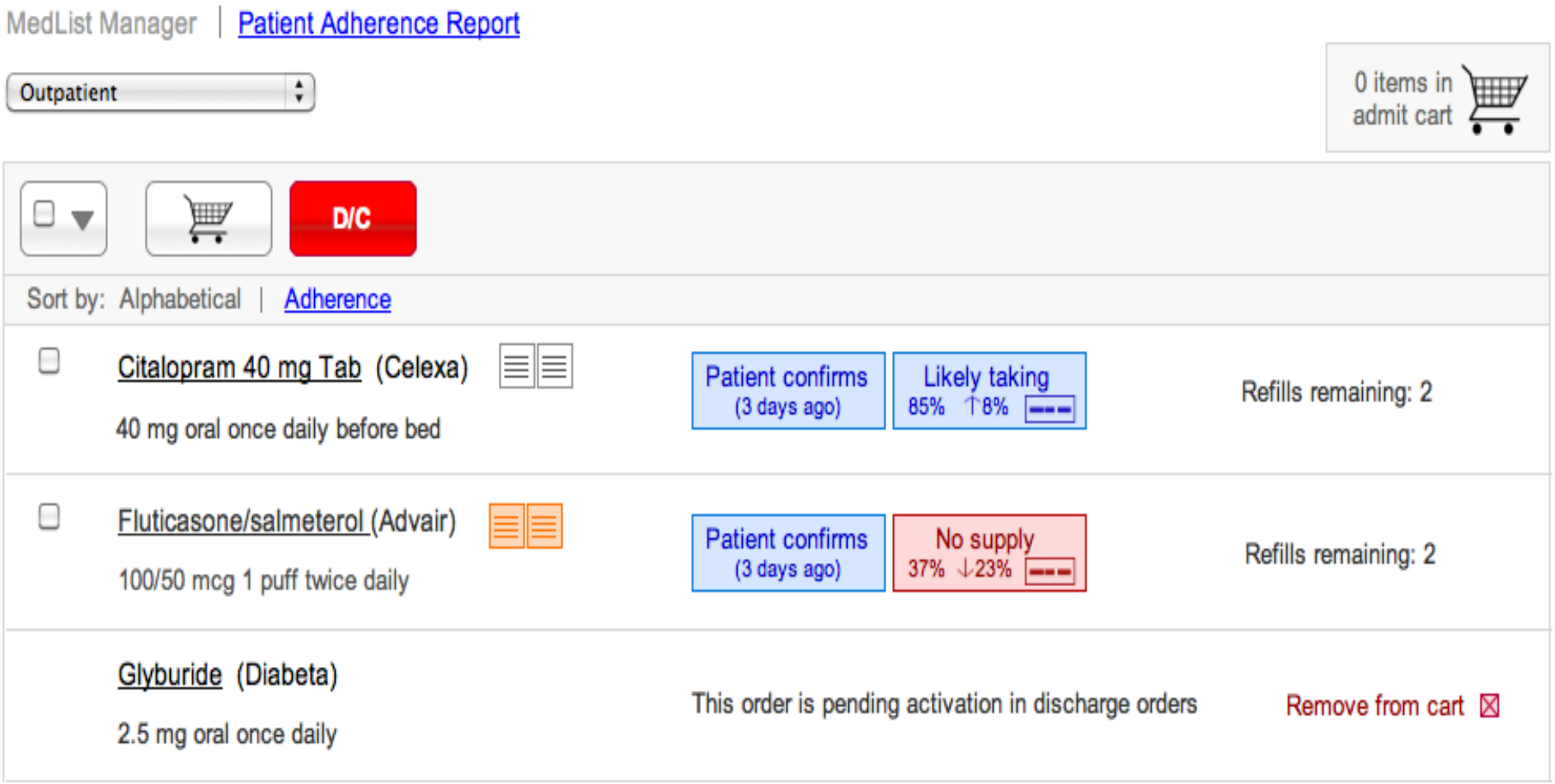
- Time spent
  - Total
  - Specific tasks
- Errors (medication errors)
- “Critical usability incidents“ affecting performance or satisfaction
- Satisfaction
- Workload (e.g., NASA Task Load Index)
  - Mental demand: how mentally demanding was the task?
  - Physical demand: how physically demanding was the task?
  - Temporal demand: how hurried or rushed was the pace of the task?
  - Performance: how successful were you in accomplishing task?
  - Effort: how hard did you have to work?
  - Frustration

Survey of Providers

- Accuracy of identifying meds
- Frequency of asking patients about meds
- Availability of tools and resources to help
- Ease of working with tools to identify, prescribe, and manage meds
- Potential clinical benefits
- Additional considerations
  - Quality of tools
  - Workflow compatibility
  - Climate for implementation

Lesselroth et al., *Inform Prim Care 2011*; 19 (2):105-18.

Example of a New Design



Cadwallader et al., *Appl Clin Inf 2013* (March); 4:110–125.

Planning Med Recon

- Interviews with 13 professionals with a role in planning med recon implementation; organizational roles in quality improvement, information technology, medication safety, and education
- Assessed perceptions of implementation process, facilitators, and barriers
- Involve a multidisciplinary planning team
- Understanding principles of performance improvement facilitates implementation
- Integrate med recon into diverse workflows
- Some changes to roles may be needed
- Train staff
- Monitor compliance and impact on prescribing

Sanchez et al., *BMC Health Serv Res 2014*; 14 (1):290.

Additional Activities to Consider

- Consider hospital readmissions, outpatient visits, and morbidity
- Include a control group and an adequate sample size; randomize?
- Understand activity of the control group
- Use multiple sources of information in med recon

Lehnbom et al., *Ann Pharmacother 2014*.

Additional Activities to Consider

- Integration with orders and decision support
- For which medications is a subspecialist responsible?
- Getting discharge summary to match discharge instructions

Patient-Reported Med Histories

- Self-service kiosk in primary care clinic
- EHR system showed patients' responses
- 91 primary care providers were surveyed regarding attitudes, perceptions, and organizational climate for implementation
- 43% indicated that they did not believe that they had the necessary resources to manage med discrepancies
- Climate for implementation was suboptimal
- Most indicated that new approach was better than usual care

Lesselroth et al., *Inform Prim Care 2011*; 19 (2):105-18.

EHR Versus No EHR

- 469 patients transferred between 7 nursing homes and 3 hospitals were followed retrospectively (1999 to 2005)
- Compared Veterans in EHR system to non-VA patients in non-EHR system
- Measured med discrepancies at transfer, and ADEs
- No significant differences between groups
- Are specialized computer tools needed?

Boockvar et al., *Qual Saf Health Care 2010*; 19 (5):e16.

Med Recon Can Improve Med Discrepancies

- Randomized 14 inpatient general medical teams at two academic hospitals
- 322 patients admitted to 14 medical teams, for whom a medication history could be obtained before discharge
- Computerized med recon tool and process redesign
- Involved physicians, nurses, and pharmacists
- Main outcome: unintentional discrepancies between preadmission medications and admission or discharge medications with potential for harm
- Potential ADEs per patient: 1.44 (control) versus 1.05 (intervention); adjusted relative risk 0.72
- Hospitals differed in integration with computerized provider order entry, and results

Schnipper et al., *Archives of Internal Medicine 2009*; 169 (8):771-80.

Does Med Recon Improve Clinical Outcomes?

- Systematic review, January 2000 to March 2014
- Randomized and nonrandomized studies rating the severity of med discrepancies and med-related problems during med recon
- 83 articles
- Process improved: med recon helped to identify problems with meds
  - Unintentional med discrepancies: 3.4% to 98.2% of patients
  - Potential ADEs: 17.2% to 94.0% of patients
- Outcomes
  - Limited evidence that discrepancies caused harm
  - Little evidence of improvement in length of stay, readmission, and mortality

Lehnbom et al., *Ann Pharmacother 2014*.

Key Lessons to Help You

- Review and develop policies carefully.
- Involve people from diverse, relevant services.
- Seek early feedback on current and new approaches.
- Be creative and adaptable.
- Do research without stalling the implementation.
- Identify a comparison group.
- Educate and train professionals and patients.
- Clarify roles: who will be involved, and how (including pharmacists, subspecialists, and nurses).
- Work closely with software developers and data managers.
- Improve the user interface.
- Integrate new approach into diverse workflows.
- Understand principles of performance improvement.
- Target and monitor process (compliance) and outcomes (impact), including communication with patients and providers.
- Get the patient involved in self-reporting medication history.
- Include the ambulatory setting.
- Provide value to both patients and clinicians!

Q & A

Please submit your questions by using the Q&A box to the right of the screen.

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