

**Effects of Computerized Treatment Guidelines
for Outpatient Management of Chronic Disease**

William Tierney, MD, Marc Overhage, MD, PhD
Michael Murray, PharmD, MPH, Lisa Harris, MD,
Andrew Zhou, PhD, George Eckert, MAS
and Fredric Wolinsky, PhD

*Regenstrief Institute
Indiana and Purdue Universities
Indianapolis, Indiana*

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Problem/Questions

- Healthcare providers need timely access to valid information to deliver optimal health care.
- This includes improvements to the medication use process.
- How can this be accomplished?
- And, how will it improve patient outcomes?

Solutions

- Technology should improve access to information.
- Science should assess the validity of information provided and determine whether access to valid information makes a difference in the outcomes of patients.

Steps in the Medication Use Process Affected by Information Technology

- Prescribing
- Dispensing
- Monitoring
- Education
- Research

Prescribing

- Computer-stored medical records
- Computer-based prescription entry
- On-line access to internal documents
- On-line access to external documents
- Treatment guideline availability
- Displayed probabilities from models that are predictive of benefit and risk from drugs

Computer-stored medical records

- Improve the logistics and organization of the medical record to speed care and improve caregiver efficiency
- Limit errors and control costs by automating review of medical records
- Guide future practices and policies by systematic analysis of past clinical experience

From: McDonald, C.J Tierney WM. Computer-stored medical records: Their future role in medical practice. JAMA 1988; 259:3433-3440.

Computer-based prescription entry

- In the integrated environment, improvements include:
 - drug selection
 - making risk-benefit decisions
 - identifying [clinically-relevant] drug interactions
 - forming links between Rx and laboratory data

Schiff GD, Rucker D. Computerized prescribing: Building the electronic infrastructure for better medication usage. JAMA 1998; 279:1024-1029.

Computer-based prescription entry

- In the integrated environment, improvements include:
 - calculating appropriate doses and dose scheduling
 - patient education
 - monitoring and documenting adverse events
 - post-marketing surveillance

Schiff GD, Rucker D. Computerized prescribing: Building the electronic infrastructure for better medication usage. JAMA 1998; 279:1024-1029.

On-line access to internal documents

- Formularies and product information
- Insurance/payer information
- Treatment guidelines
- Drug information

On-line access to external documents

- Medline
- Internet
- Patient information pamphlets

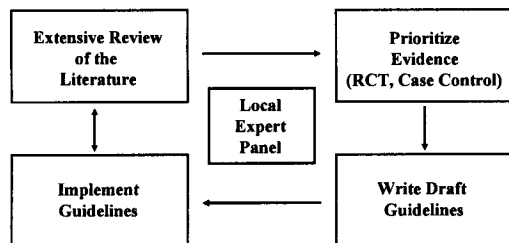
Treatment guidelines

- Physicians use what they know and heuristics to deliver care.
- Treatment guidelines can be complex
- Some aspects of expert guidelines are not amenable to electronic delivery
- Triggered by data contained in the computer

Successful computer-based DSS

- Offer *just-in-time* decision support
- Encourage providers to perform the tasks that they *intend* to perform
- Focus on *common* tasks or conditions that are clinically important
- Are not *intrusive*

Creation of Reminders



Implementation of Guidelines

Re-Write Guidelines in Machine Language

Target Condition: {ALBUTEROL.OUTPAT.COUNT/N (NUMERIC VALUE OF) >2 AND NOT ((STERIODS.OUTPAT))}

Reminder: Patient received ALBUTEROL.OUPAT.COUNT/N (numeric value of) prescriptions for albuterol MDIs in the last month. They may be misusing the drug or may need a steroid to reduce inflammation/symptoms

Suggested Order: !!Add a inhaled steroid because of frequent albuterol use; BECLOMETHASONE INHLA2 PUFFS PO Q6H

References: R:10852, R10865, R11998

Successful interventions in Indiana

- Paper medium
 - flowsheets of ER patients' data
 - reminders for outpatient preventive care
 - feedback reports of patients not receiving indicated preventive care

Successful interventions in Indiana

- Paper medium
- Computer workstation medium
 - outpatient display of information
 - > prior diagnostic test results
 - > charges for tests
 - > predicted likelihood that a test would be abnormal

Successful interventions in Indiana

- Paper medium
- Computer workstation medium
 - outpatient display of information
 - inpatient
 - > order-writing workstations
 - > suggested orders for inpatient drug monitoring

Failed intervention in Indiana

- Reminders to perform indicated preventive care for inpatients
 - residents felt that the hospital was an inappropriate place for preventive care
 - they did not intend to comply

Next step for quality improvement

- Improve care for chronic medical conditions by computerizing decision support for treating conditions that are:
 - common
 - morbid
 - guidelines for care exist
 - current care is suboptimal

Hypothesis

- Suggested orders, delivered to physicians (via their outpatient workstations) and to pharmacists (via the pharmacy computer) will improve:
 - providers' compliance with practice guidelines
 - patients' health-related quality of life, clinical outcomes, and satisfaction with care

Study site

- Academic primary care GIM practice affiliated with an inner-city public hospital
 - IM residents and faculty
 - 4 firms (32 half-day sessions)
 - on-site pharmacy that fills 95% of primary care patients' prescriptions
 - all information management provided by the Regenstrief Medical Record System

Patient enrollment

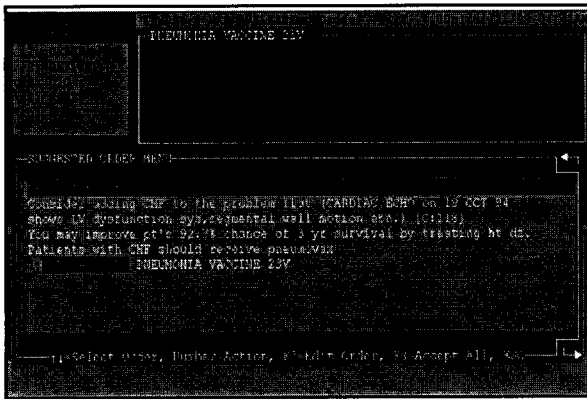
- Patients with:
 - CAD or heart failure
 - Uncomplicated hypertension
 - Reactive airway disease
- Eligibility based on data stored within their electronic medical records
 - diagnoses: inpatient, outpatient, ER
 - test results: xrays, scans, EKGs, caths

Patient enrollment

- Patients with CAD or heart failure
- Eligibility based on data stored within their electronic medical records
 - diagnoses: inpatient, outpatient, ER
 - test results: xrays, scans, EKGs, caths
- Approached in the waiting room before or after scheduled appointments
- Each patient followed for 1 year

Intervention

- Suggested orders based on AHCPR, ACC, local guidelines developed by a consensus panel of general internists and cardiologists
- Delivered when writing orders (physicians) or processing prescriptions (pharmacists)
- Response (physicians)
 - do not order (cleared intervention message)
 - order (begin routine ordering dialogue)



Intervention

- Suggested orders based on AHCPR, ACC, local guidelines developed by a consensus panel of general internists and cardiologists
- Delivered when writing orders (physicians) or processing prescriptions (pharmacists)
- Response (pharmacists)
 - nothing (message could be ignored)
 - discuss with patient, phone / e-mail MD

Study design		
		Pharmacist Gets Reminder
		YES NO
MD Gets Reminder	YES	Both MD Only
	NO	Pharmacist Only Neither

Study design
<ul style="list-style-type: none"> • Randomized, controlled trial <ul style="list-style-type: none"> — 2 X 2 factorial design • Suggested orders were generated, if indicated, for <ul style="list-style-type: none"> — each scheduled or walk-in visit — each medication refill

Study design
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Data collected

- Patients
 - by phone interview (baseline, 6, 12 months)
 - > health-related QOL (McMaster CHQ)
 - > satisfaction with physician (ABIM)
 - > satisfaction with pharmacy (local instrument)
 - > medication compliance (Inui, Morisky)

Data collected

- Patients
 - by phone interview (baseline, 6, 12 months)
 - from electronic medical record
 - > demographics
 - > problem-specific ER visits, hospitalizations
 - > direct health care charges

Data collected

- Patients
 - by phone interview (baseline, 6, 12 months)
 - from electronic medical record
 - from physician during workstation ordering, describing patient *that day*
 - > blood pressure
 - > weight
 - > NYHA functional class

Data collected	
<ul style="list-style-type: none"> ● Physicians and pharmacists <ul style="list-style-type: none"> — demographics — knowledge, attitudes, and beliefs about practice guidelines 	

Results: Study patients enrolled	
Eligible patients with scheduled visits	1248
Missed by RA	128
Eligible patients contacted	1120 (90%)
Refused to participate	275
Contacted and agreed to participate	845 (68%)
<hr/>	
Complete baseline phone interview	706 (57%)

Results: Study patients enrolled	
Control	181
MD intervention	197
Pharmacist intervention	158
Both	170
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Results: Study patients enrolled

Eligible patients with scheduled visits	1248
Missed by RA	128
Eligible patients contacted	1120 (90%)
Refused to participate	275
Contacted and agreed to participate	845 (68%)
<hr/>	
Complete baseline phone interview	706 (57%)
Interviewed at 12 months	511

Study patients enrolled

Age (years)	59 yrs.
Sex (% women)	64%
Race (% African-American)	56%
Ischemic heart disease	81%
Heart failure	54%
Both conditions	35%

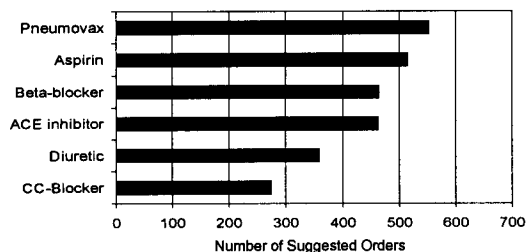
Providers caring for study patients

Physicians	154
Residents (%)	77%
Sex (% male)	70%
Pharmacists	28
Sex (% male)	57%
Full-time (%)	46%

Study activity

Patients making outpatient visits	654 (93%)
No. of study visits during year in study	3897
No. of visits / patient	6.0 ± 4.0
Patients with ≥ 1 suggested order	651 (99.5%)
No. of suggested orders	4,554
Mean no. suggested orders / patient	7.0 ± 7.3
Range of suggested orders / patient	0 - 18

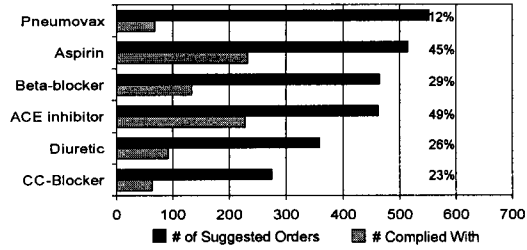
Most common suggested orders



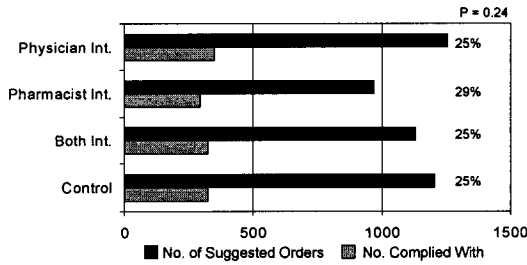
Definition of compliance

- Unit of analysis was the patient
- Multiple suggestions for the same order were considered one treatment suggestion
- Treatment was considered compliant if the suggestion was ever ordered

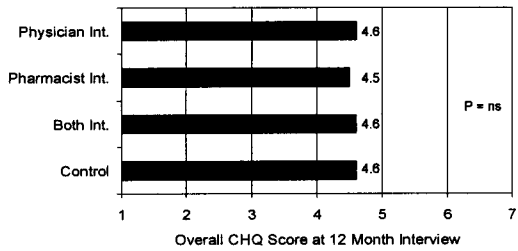
**Most common suggested orders:
CAD/CHF**



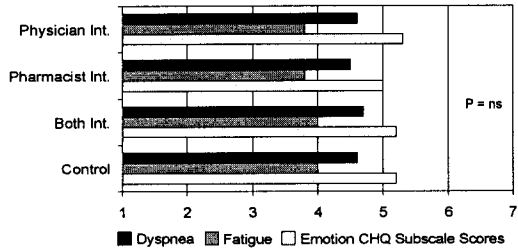
**Compliance with suggested orders:
CAD/CHF**



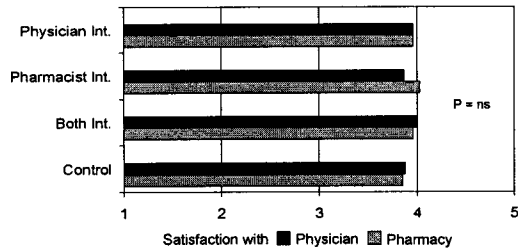
Quality of life (CHQ) at 12 months



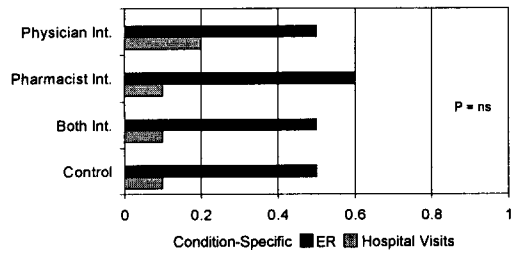
Quality of life (CHQ) at 12 months



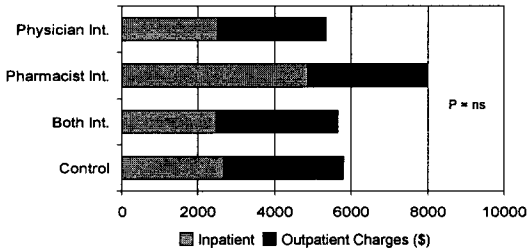
Patient satisfaction at 12 months



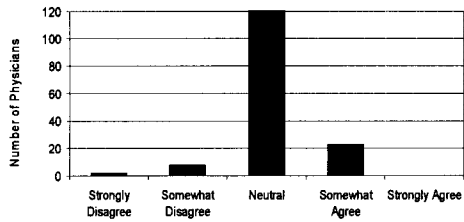
Acute exacerbations of heart disease



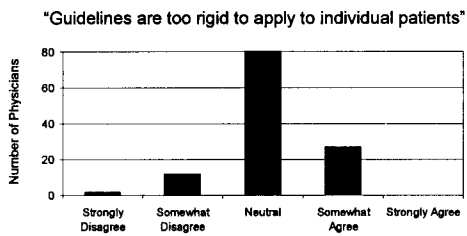
Health care charges



MD attitudes towards guidelines

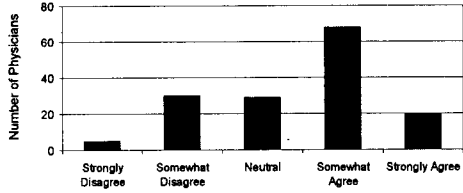


MD attitudes towards guidelines



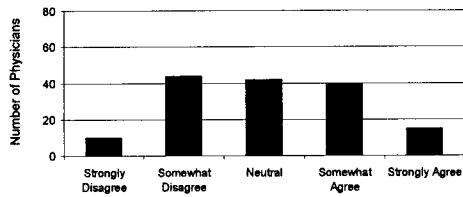
MD attitudes towards guidelines

"Guidelines are likely to decrease practitioner autonomy"



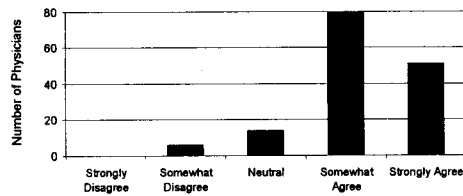
MD attitudes towards guidelines

"... just another hoop for the practitioner to jump through"



MD attitudes towards guidelines

"Guidelines are likely to improve the quality of care"



Conclusions

- There is a long history of effective computer-supported decision-making in this practice.
- Yet a powerful intervention that was patient- and condition-specific had no effect on the processes or outcomes of primary care of patients with chronic disease.

Conclusions

- Possible causes of this negative outcome:
 - inaccurate data (“false-positive” suggestions)
 - disagreements with these practice guidelines
 - negative attitudes towards practice guidelines
 - negative attitudes towards computers suggesting treatment (as opposed to preventive care)
 - overwhelmed providers (care, studies)
 - kinder, gentler intervention

Limitations

- Single academic practice site
- Limited penetration of managed care
- Part-time clinicians

The future

- For computer-based decision support to be embraced by practicing physicians, it must
 - be seen as time saving (or at least neutral)
 - be easy to use (navigation, data input)
 - help providers perform tasks they want to perform
 - be cost-effective (physician time, dollars)
 - have teeth
