Using IT to Improve Quality: Past Results and Future Potential

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Goals

- Major gaps between evidence, practice
  - Costs high
  - Problems with errors
- Computerized decision support
  - Current Partners system
  - Errors
  - Costs
  - Guidelines
- Next 5 years at Partners IS
- Conclusions

Leadership and IT

Leadership is the capacity to hold a shared vision of that we wish to create.

– Peter Senge

The best way to predict the future is to invent it.

– Peter Drucker

Old Paradigm

- Authorities are infallible
- Heuristics work well
  - If in doubt, do it
- Clinical judgement and the "art of medicine" get you to the right answers
- Community standards are correct

David Eddy, Aetna Quality Forum 1999

New Paradigm

- Authorities vary substantially
- Heuristics don't work
- Clinical judgement is insufficient
- Huge variation by community

Therefore

- Need to begin to practice evidence-based medicine

David Eddy, Aetna Quality Forum 1999

The IOM Report

- Report targets hospital errors: Mistakes killing thousands every year 11/30/99
  - **Medical errors kill 44,000-98,000 people per year**
  - **"More people die from medical errors each year than from suicides, highway accidents, breast cancer, or AIDS"**
- "These stunningly high rates of medical errors - resulting in deaths, permanent disability, and unnecessary suffering - are simply unacceptable in a system that promises to first 'do no harm.'"

William Richardson

Reengineering Medicine: The Role of IS

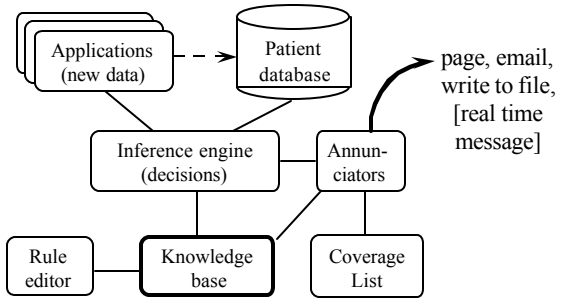
- Could be changed by providing external aids
  - Linking medical knowledge and patient-specific data
  - Identifying options
- Without such tools, experts
  - Make errors
  - Overlook available knowledge
  - Don't sufficiently account for uniqueness
- Patients could participate in decision-making

Weed LL, Weed L, *Federation Bulletin*, 1994

Development and Implementation of POE

- Physician involvement and leadership
- Decision to automate existing systems as is
- Constant focus on speed
- Strong support from hospital administration
- Willingness to be flexible, modify system

Event monitor architecture



Physician Coverage List

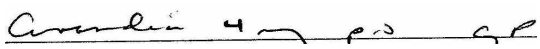
- Functions
  - Identifies first and second-call physicians
  - Manages physician rotation
  - Handles evening coverage and signing out
- Facilitates delivery of computer-generated messages
  - Computer-page interface allows automated paging

Pharmacy Computer System Field Test of Unsafe Orders

	Unsafe Order Not Detected
Cephradine oral suspension IV	61%
Vincristine 3 mg IV x 1 dose (2-year-old)	62%
Colchicine 10 mg IV for one dose (adult)	66%
Cisplatin 204 mg IV x 1 dose	63%

Source: ISMP Medication Safety Alert! Feb 10, 1999

Handwriting example



Medication Error Frequency and Potential for Harm

In 10,070 Orders
530 Medication Errors 1.4 per admission
35 Potential ADEs
5 Preventable ADEs

- 1 in 100 medication errors results in an ADE
- 7 in 100 represent potential ADEs

ADE Prevention Study: Key Results

- 6.5 ADEs/100 admissions
  - 28% preventable
  - 3 potential ADEs for every preventable ADE
  - 62% of errors at ordering and transcription stages
- Systems analysis
  - No individual responsible for repeated errors
  - Systems should be designed to:
    - Make errors less likely
    - Catch those that do occur

***JAMA* 1995;274:29-43**

Costs of ADEs

- ADEs are expensive
  - $2461 per ADE, $4555 per preventable ADE
  - Annual BWH costs:
    - $5.6 million for all ADEs
    - $2.8 million for preventable ADEs
- These figures exclude costs of:
  - Injuries to patients
  - Malpractice costs
  - Costs of admissions due to ADEs
- Justifies investment in prevention efforts

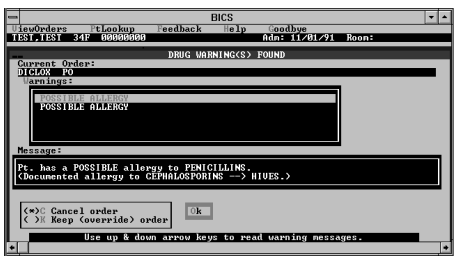
***JAMA* 1997;277:307-311**

Improving the Quality of Drug Ordering with Order Entry

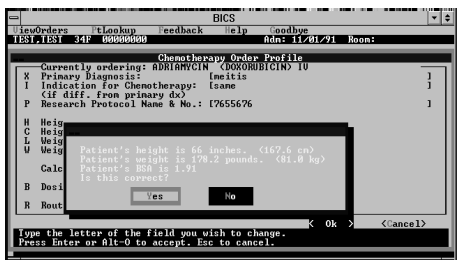
- Streamline, structure process
  - Doses from menus
  - Decreased transcription
  - Complete orders required
- Give information at the time needed
  - Show relevant laboratories
  - Guidelines
  - Guided dose algorithms
- Perform checks in background

  Drug-allergy Dose ceiling Drug-lab
  Drug-drug Drug-patient

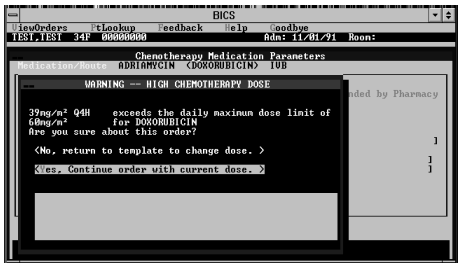
Allergy to Medication



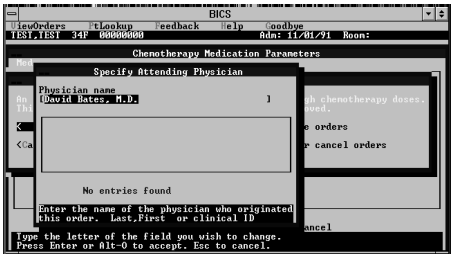
Chemotherapy Order: Patient Characteristics



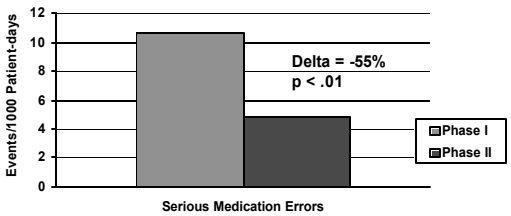
High Chemotherapy Dose Warning



High Chemotherapy Dose: Requires Attending Approval



Serious Medication Error Rates Before and After OE



Bates et. al. JAMA 1998

Impact of BWH Inpatient Provider Order Entry

- Nizatidine use, for all oral H2 blocker orders, increased from 12% to 81%
- The percent of doses over the suggested maximum decreased from 2% to .6%
- The percent of orders for ondansetron, with a frequency of 3 times daily, increased from 6% to 75%
- The percent of bed rest orders with a consequent order of heparin increased from 24% to 54%

Teich, Arch Int Med 2000

"Panic" Laboratory Study

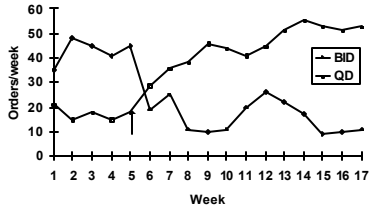
- For markedly abnormal results (K, Na, glucose, Hct)
  - Allows consideration of other factors
  - Direct interface with paging system
- "Before" data
  - Median time to rx 2.5 hours
  - For 25% > 5.3 hours
- RCT results
  - Mean time to rx 11% shorter (p<.0003)
  - Mean time to resolution 29% shorter (p=.11)
- 95% physicians pleased to be paged

Kuperman, *JAMIA* 1999

Reducing Drug Costs with Order Entry

- Types of useful suggestions
  - Drug interchange
  - Lower dose
  - Different route (IV-PO switches)
  - Guidelines for use

Effect of Changing Default Dosing Frequency for Ceftriaxone



Selected Laboratory Interventions

- Charge display RCT
  - No statistically significant effect
  - BUT $1.7 million lower lab charges in intervention group
- Redundant labs
  - 67% reminders followed
  - Annual charge savings $31,000, vs. estimate of $376,000
  - Only 44% tests performed had computer order
  - Substantial improvement possible if loop closed with laboratory "back end"

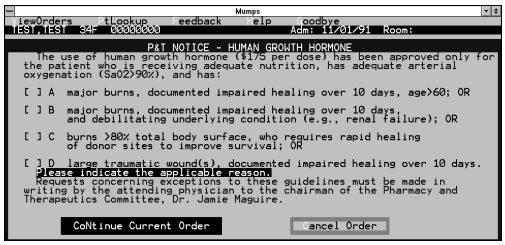
Other Laboratory Evaluations

- Antiepileptic drug levels
  - Only 28% of BWH inpatient levels appropriate
  - RCT of structured ordering showed improvement
- Digoxin levels
  - Only 16% of BWH inpatient levels appropriate
  - Potential charge savings $388,000
- PSA levels
  - 19% inappropriate (age, frequency issues)
- Thyroid studies
  - Initial testing TSH alone in only 73% of patients

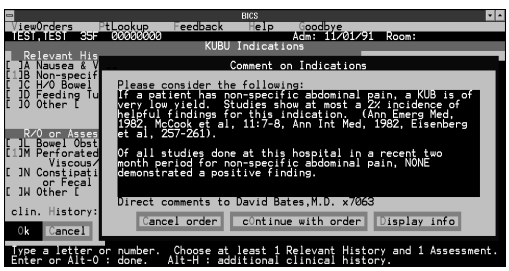
Guidelines: Vancomycin RCT

- Initiation, renewals both targeted
- Vancomycin use was reduced by intervention
  - Bigger effect on renewals than on initiation
- Magnitude of overall decreases
  - Vancomycin-days/prescriber 37% lower
  - Duration of therapy 17% lower
- Much of use likely still inappropriate
  - Further decreases possible by targeting specific indications

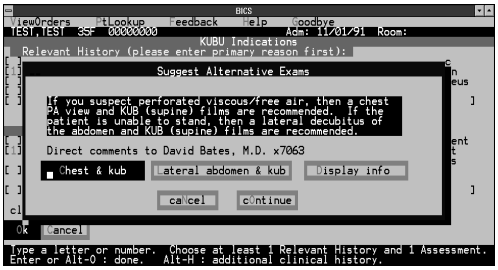
Guideline for Expensive Agent



Low Yield Critique



Alternate Exam



Chest Radiographs and Structured Ordering

	Percent Acceptable	
	History	Assess/R/O
Before	78%	35%
After	99%	99%

Impact of Computer OE on Physician Time

- Order writing took twice as long on computer
  - Medical HOs 44 min/day, recovered half
  - Surgical HOs 73 min/day, no recovery
- Daily and one-time orders accounted for most of change, increasing 3-fold
- Sets of orders took half the time they did before order entry
- Interventions
  - Introduction of "Write 1"
  - Reorganization of screens to facilitate access to OE

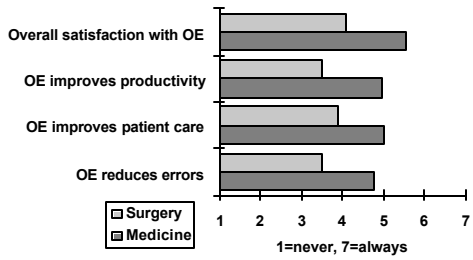
Order Entry and Critical Paths

- Critical paths specify what should happen for a specific day
  - Essentially sequences of order sets
  - In place for 25 diagnoses
- Have decreased LOS, costs, improved satisfaction
- Require physicians to select dx at admission
  - Allows prompting about path
  - Increases likelihood path will be selected

Results of Critical Path Evaluation

- 82% of admission diagnoses coded
- Half the diagnoses have an order set
  - Physicians select 40% of time when offered
- Substantial variation by diagnosis
  - Total knee 77%
  - Pregnancy 54%
  - Deep venous thrombosis 14%

HO Satisfaction with OE



Rough Cost-Benefit for POE

- Costs:
  - Development $1,000,000
  - Hardware $400,000
  - Maintenance $500,000/year
- Benefits:
  - Overall $5-10 million/year charges
  - Main savings relate to efficiencies re drugs, ADE prevention, and tests
  - Many other interventions coming on line all the time

Current BWH Quality Measurement Strategy

- Measure as much as possible using IS
- Collect limited number of measures across institution
- Have each department specify additional measures covering following domains:
  - Efficiency
  - Critical variances
  - Sentinel events

Trajectories that Will Shape the Next Five Years

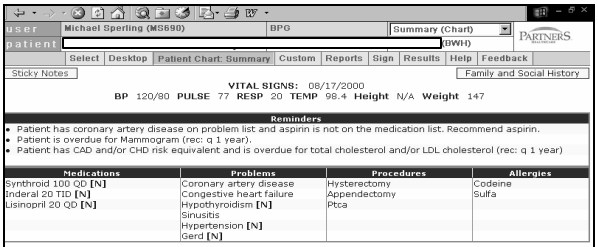
- Healthcare context
  - Movement of care to outpatient/non-acute settings
  - Managing inpatient capacity
  - Growing dominance of the treatment of the chronically ill in the healthcare cost discussion
  - Gradual movement to provider payment based on quality
  - Increased patient service and participation expectations
- Technology context
  - Growing presence of mobile technologies
  - Improved (but not great) interoperability between systems
  - Progressive improvement in the Internet infrastructure

Trajectories that Will Shape the Next Five Years

- Management context
  - Increased information systems sophistication on the part of organizational leadership
  - Heightened emphasis on defining and managing information systems "value"
- "Agenda" context
  - Leapfrog
  - Jackson Hole
  - eHealth Initiative
  - Series of IOM reports
  - HIPAA
  - NHII

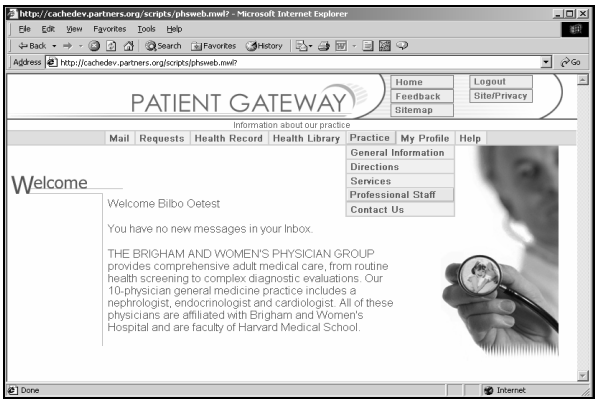
Key Clinical IS Over the Next Five Years

- Provider order entry
- Computerized medical record
- Knowledge repositories and management
- Physician-to-physician consultation
- Patient-provider communication/monitoring
- Care analysis
- Integration of clinical systems

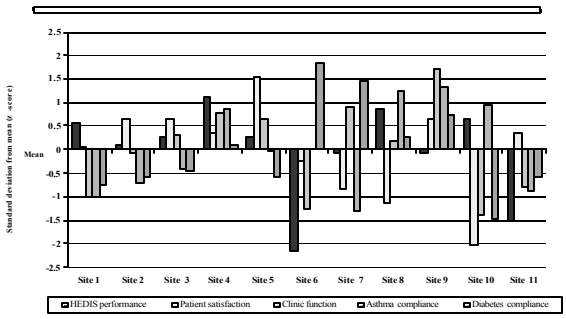


The Kaiser Experience

- KP-Online supports:
  - Ask a question
  - Review guidelines and consumer information
  - Review benefits
- Piloted with 100,000 members
- Resulting in:
  - 11% fewer office visits
  - 14% treated their illness at home
  - 46% fewer calls to nurses
  - 42% improved perception of Kaiser
  - 59% reported understanding their disease better



Comparison of Site Scores on Five Quality Domains



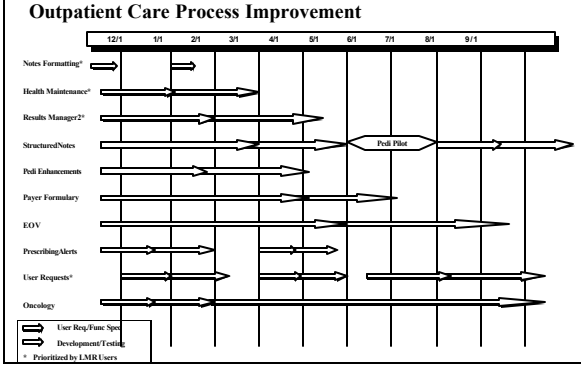
Percent of Patients Seen at Another Partners Hospital

MGH	29%
BWH	34%
NWH	46%
FH	79%
SRH	87%

Scale of the Partners Clinical Information Systems

- 56,000 user accounts
- 2,300,000 patients in the Partners MPI
- 350,000,000 results in the Clinical Data Repository and growing at a rate of 100,000 transactions per day
- 80,000,000 images archived
- 26,000 inpatient orders are written on an average day, across Partners, using CPOE
- 1,800 physician users (58 practices) of the Computerized Medical Record

•The Computerized Medical Record as a Foundation for Outpatient Care Process Improvement



What Do Providers Want From IS?

- Speed
- Ability to access information from multiple sites
- Different views of same information
- Ability to aggregate across patients
- Better information about performance
- Decision support that anticipates needs and doesn't waste time

What Can IS Do To Help?

- Can improve communication between:
  - Providers
  - Payors/providers
  - Patients/providers
- Can decrease costs, improve quality, by
  - Pointing out redundancies
  - Suggesting alternatives
  - Identifying errors of omission
  - Emphasizing important abnormalities
  - Making guidelines accessible
- Make routine quality measurement possible

What Is Future of Systems?

- Can give providers "better cockpit"
- Will help narrow gaps
  - Between evidence and practice
  - Between revenues and expenses
- Ordering is the key process
  - Communication can also be vastly improved
    - Especially at transition points
  - Even simple decision support has enormous leverage
- Quality measurement will be increasingly important