Using IT to Improve Quality: Past Results and Future Potentia

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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

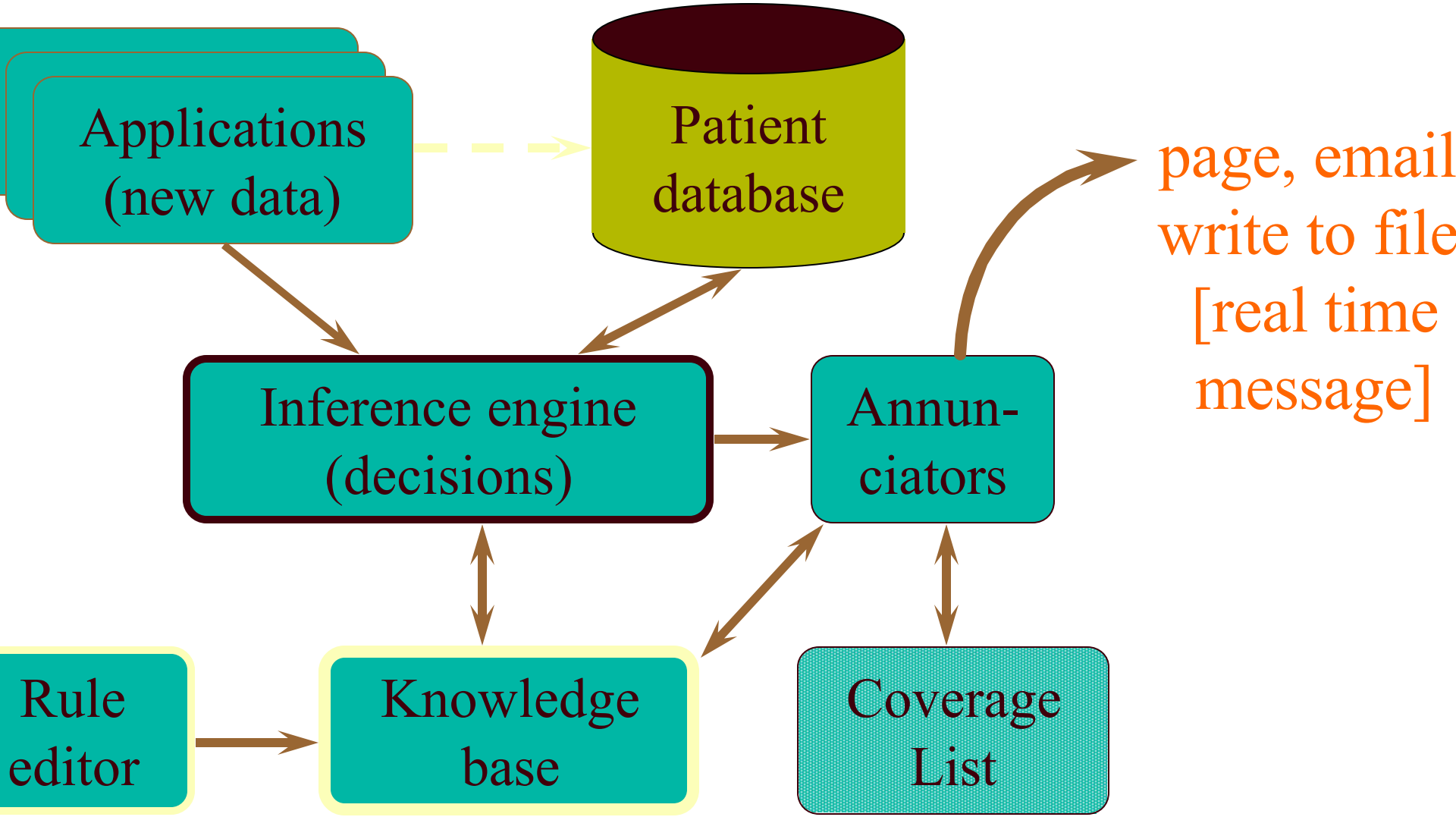
- Could be changed by providing external aids
  - Linking medical knowledge and patient-specific data
  - Identifying options
- Without such tools, experts
  - Make errors
  - Overlook available knowledge
  - Don’t sufficiently account for uniqueness
- Patients could participate in decision-making

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

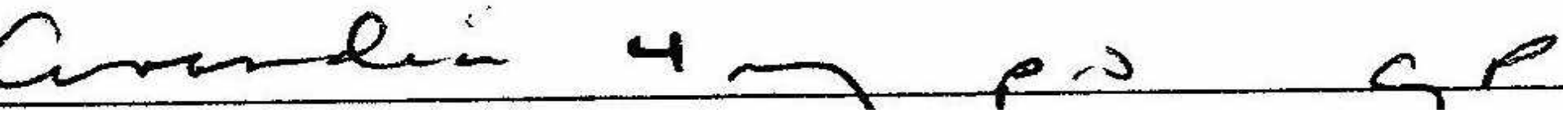
- Functions
  - Identifies first and second-call physicians
  - Manages physician rotation
  - Handles evening coverage and signing out
- Facilitates delivery of computer-generated messages
  - Computer-page interface allows automated paging

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

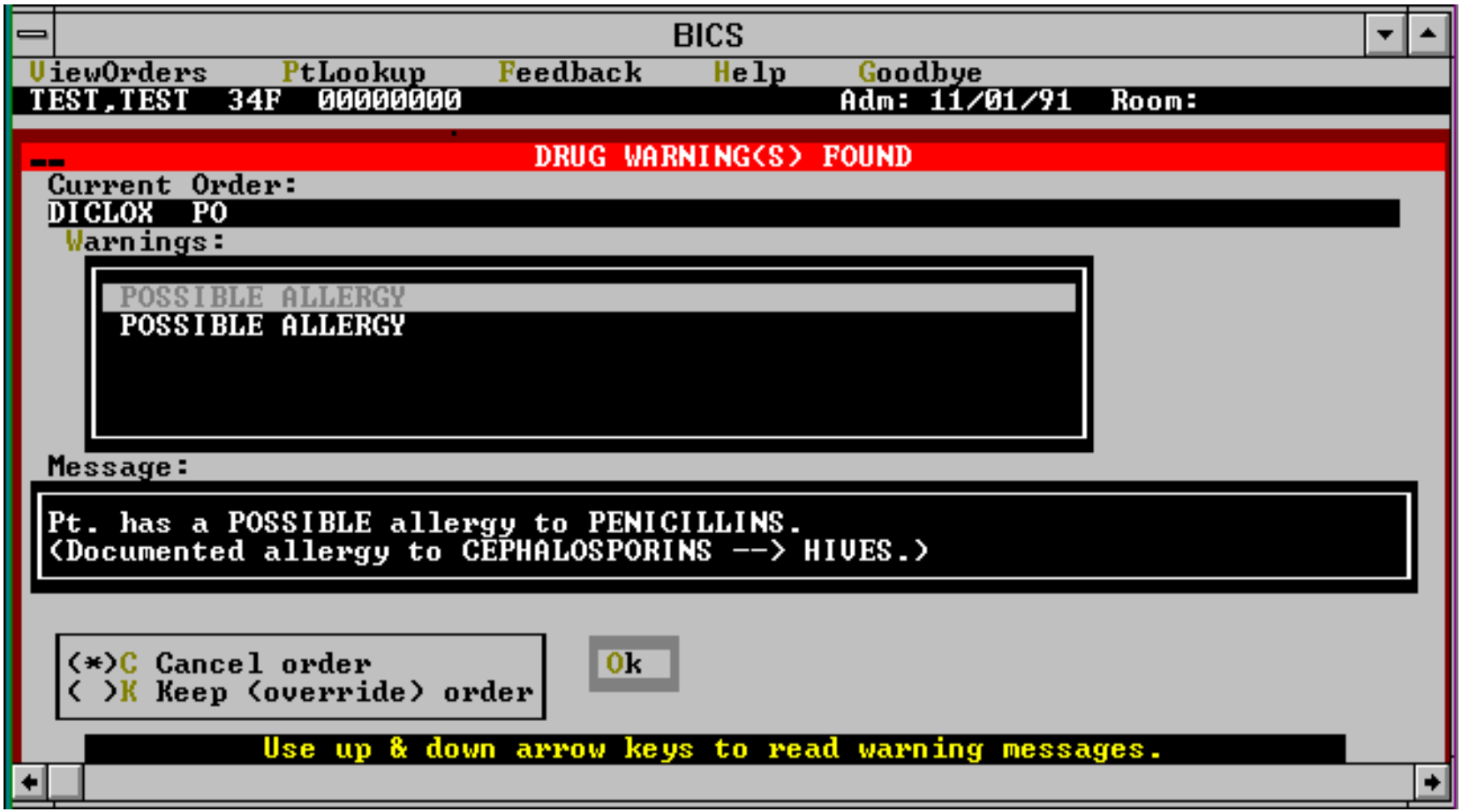
***JAMA* 1997;277:307-311**

Improving the Quality of Drug Ordering with Order Entry

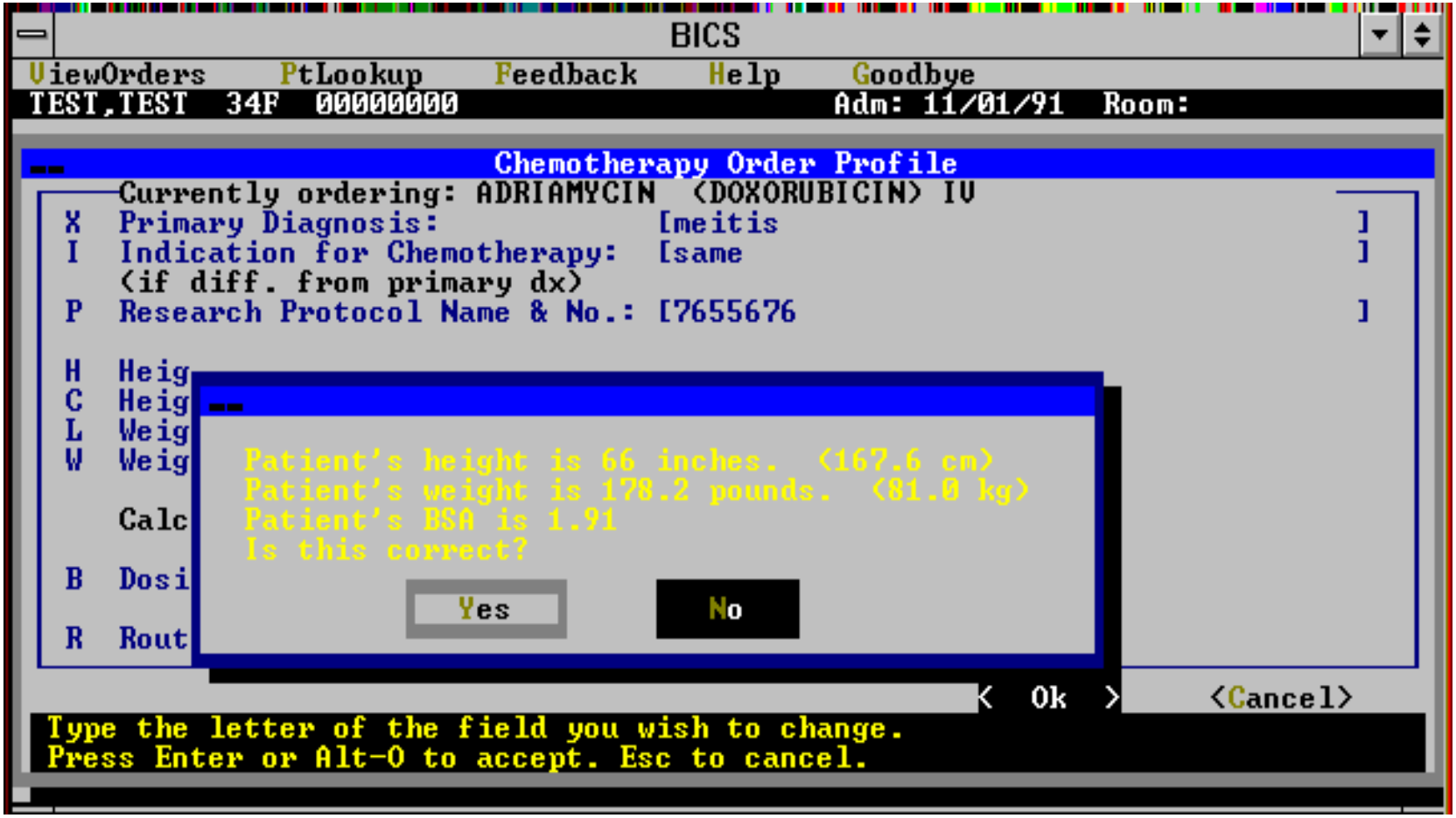
- Streamline, structure process
  - Doses from menus
  - Decreased transcription
  - Complete orders required
- Give information at the time needed
  - Show relevant laboratories
  - Guidelines
  - Guided dose algorithms
- Perform checks in background

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

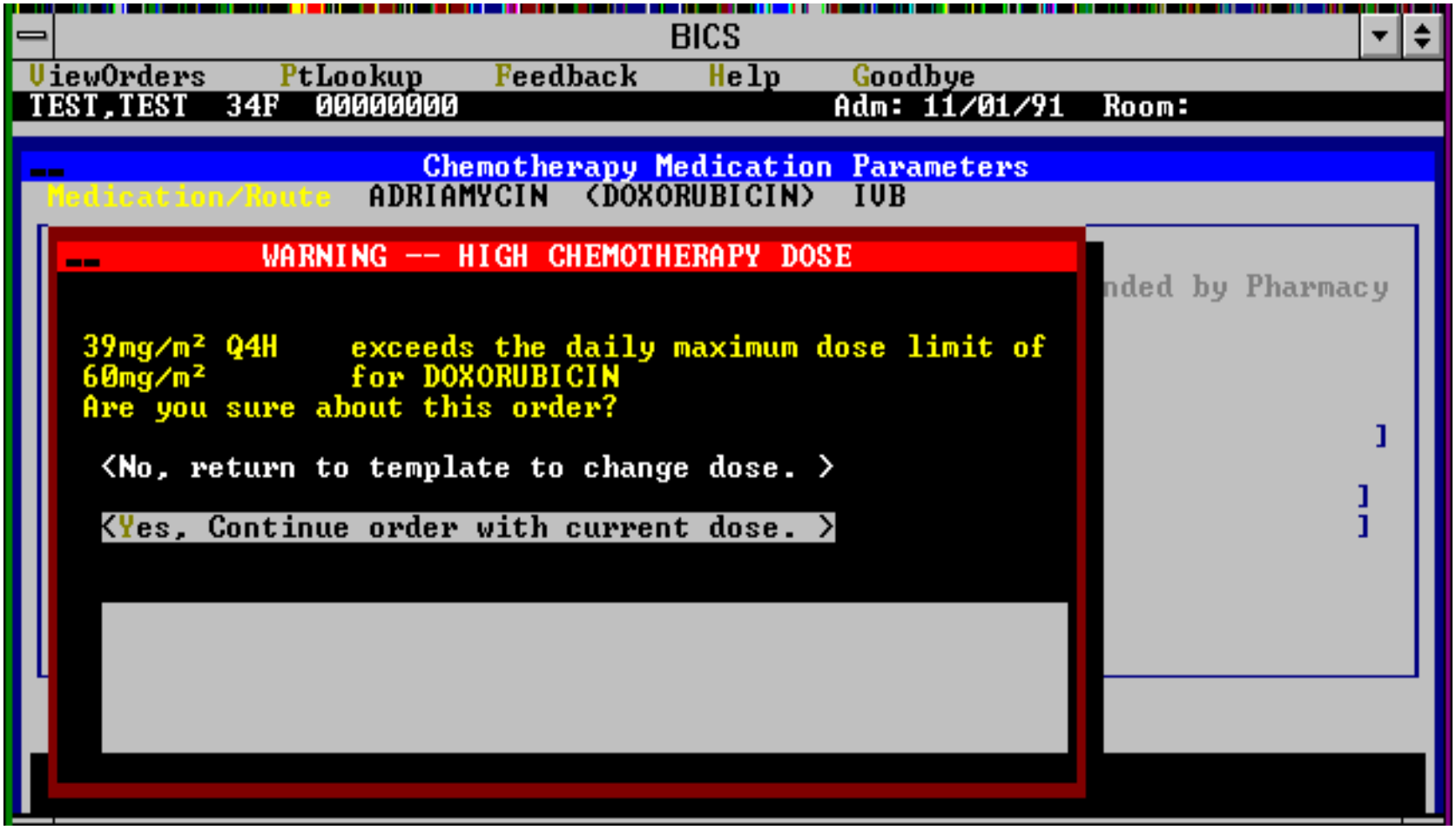
Allergy to Medication



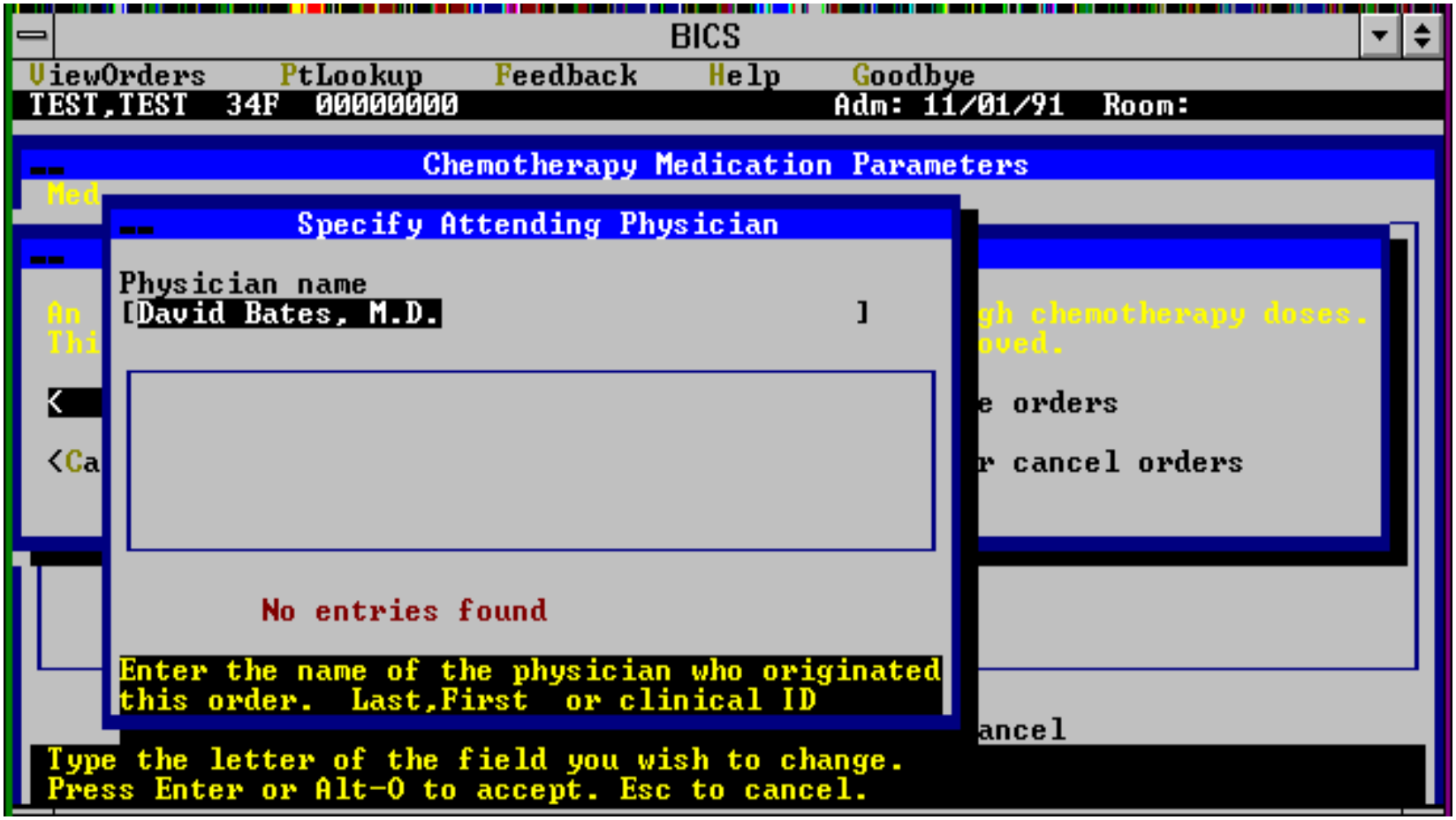
Chemotherapy Order: Patient Characteristics



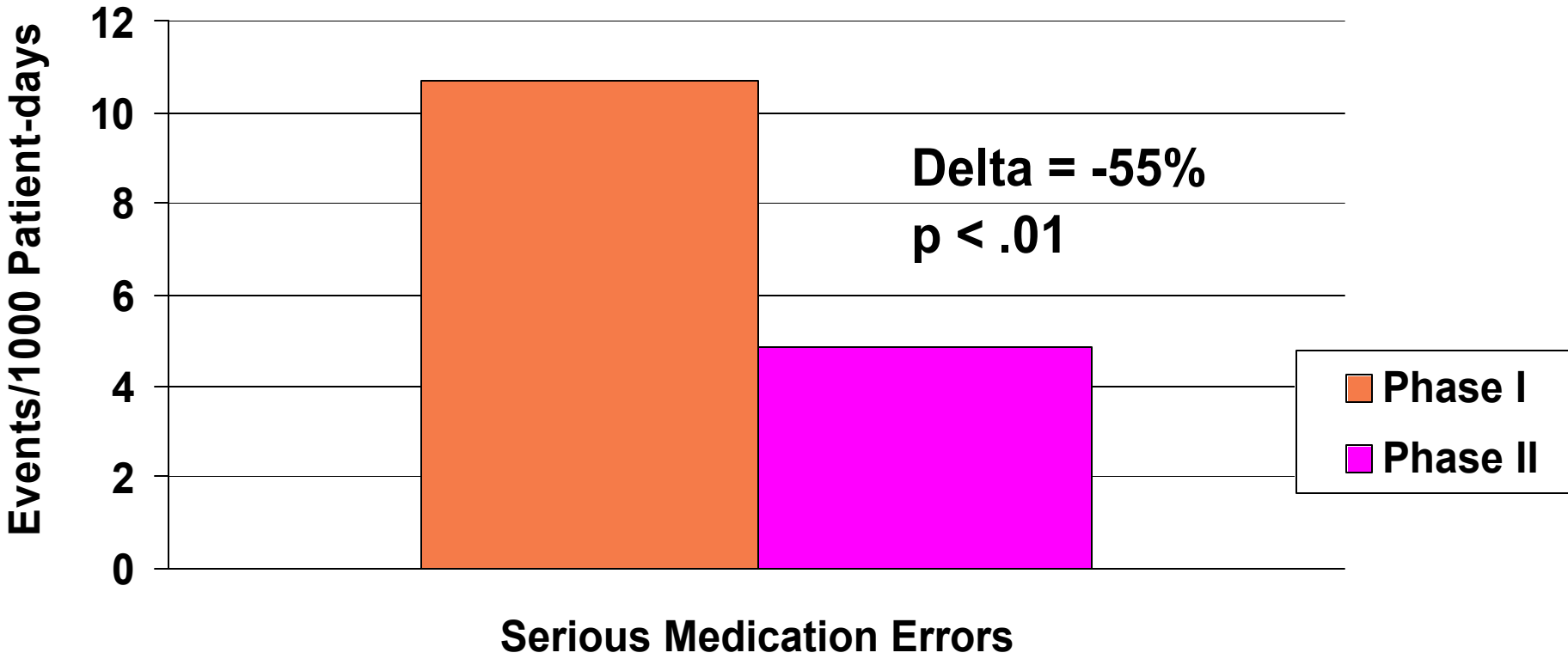
High Chemotherapy Dose Warning



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

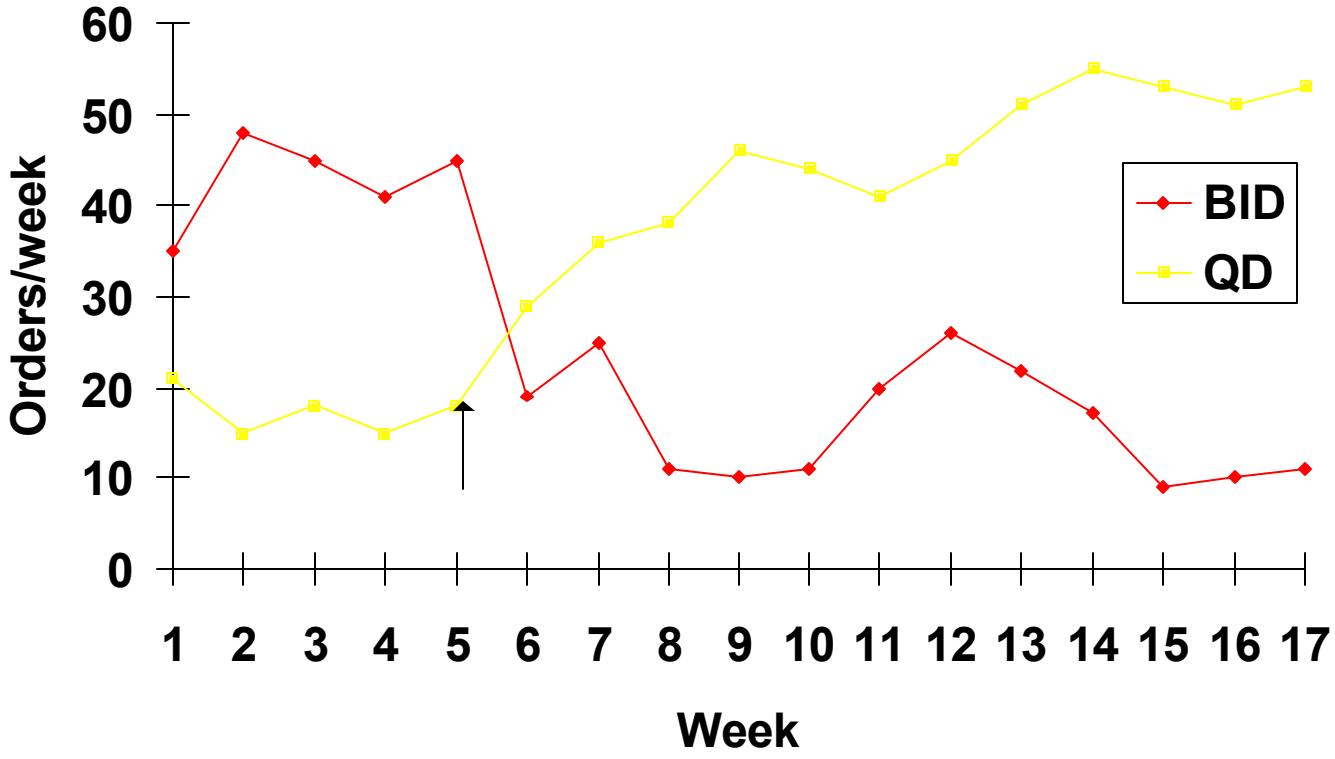
- For markedly abnormal results (K, Na, glucose, Hct)
  - Allows consideration of other factors
  - Direct interface with paging system
- "Before" data
  - Median time to rx 2.5 hours
  - For 25% > 5.3 hours
- RCT results
  - Mean time to rx 11% shorter ($p<.0003$)
  - Mean time to resolution 29% shorter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

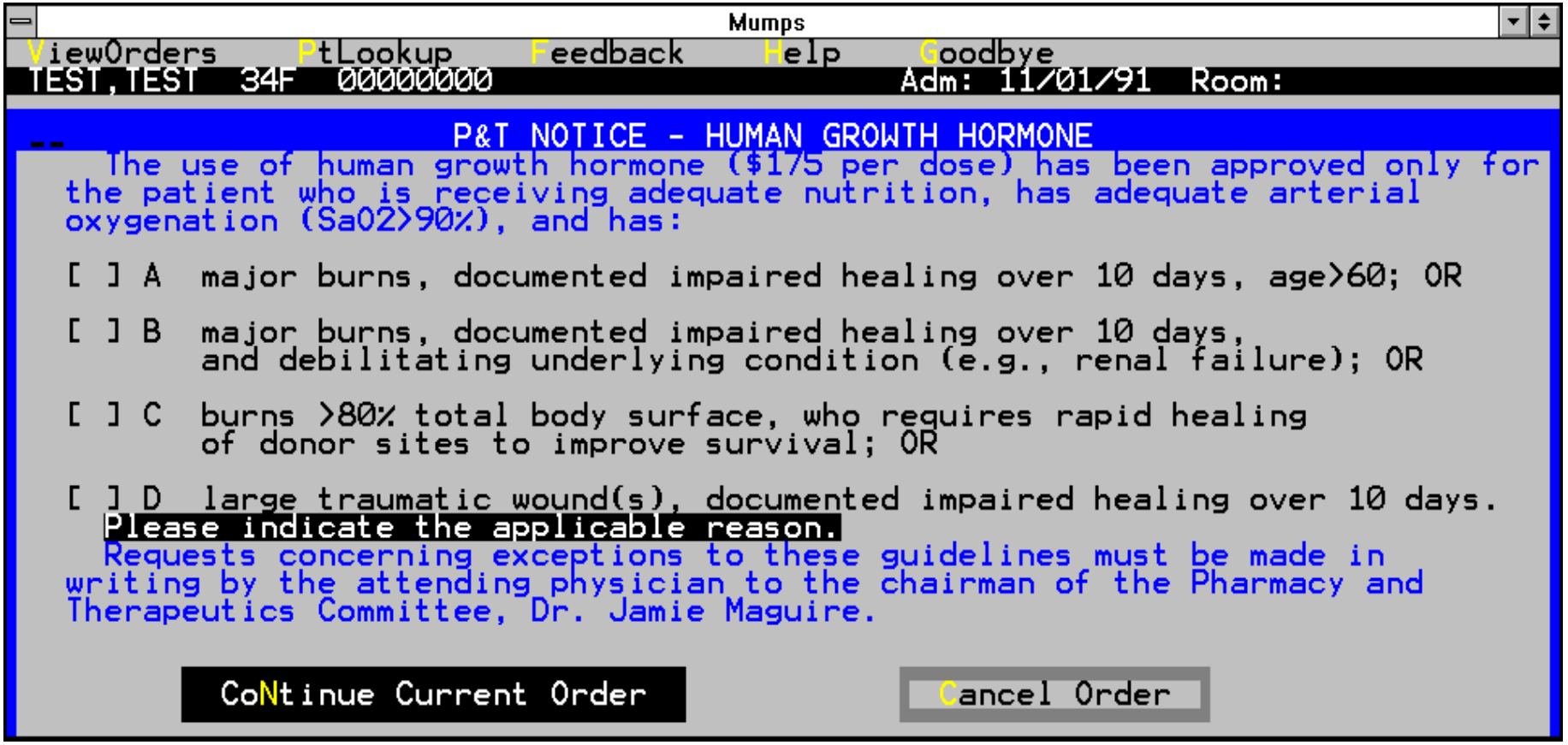
Other Laboratory Evaluations

- 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

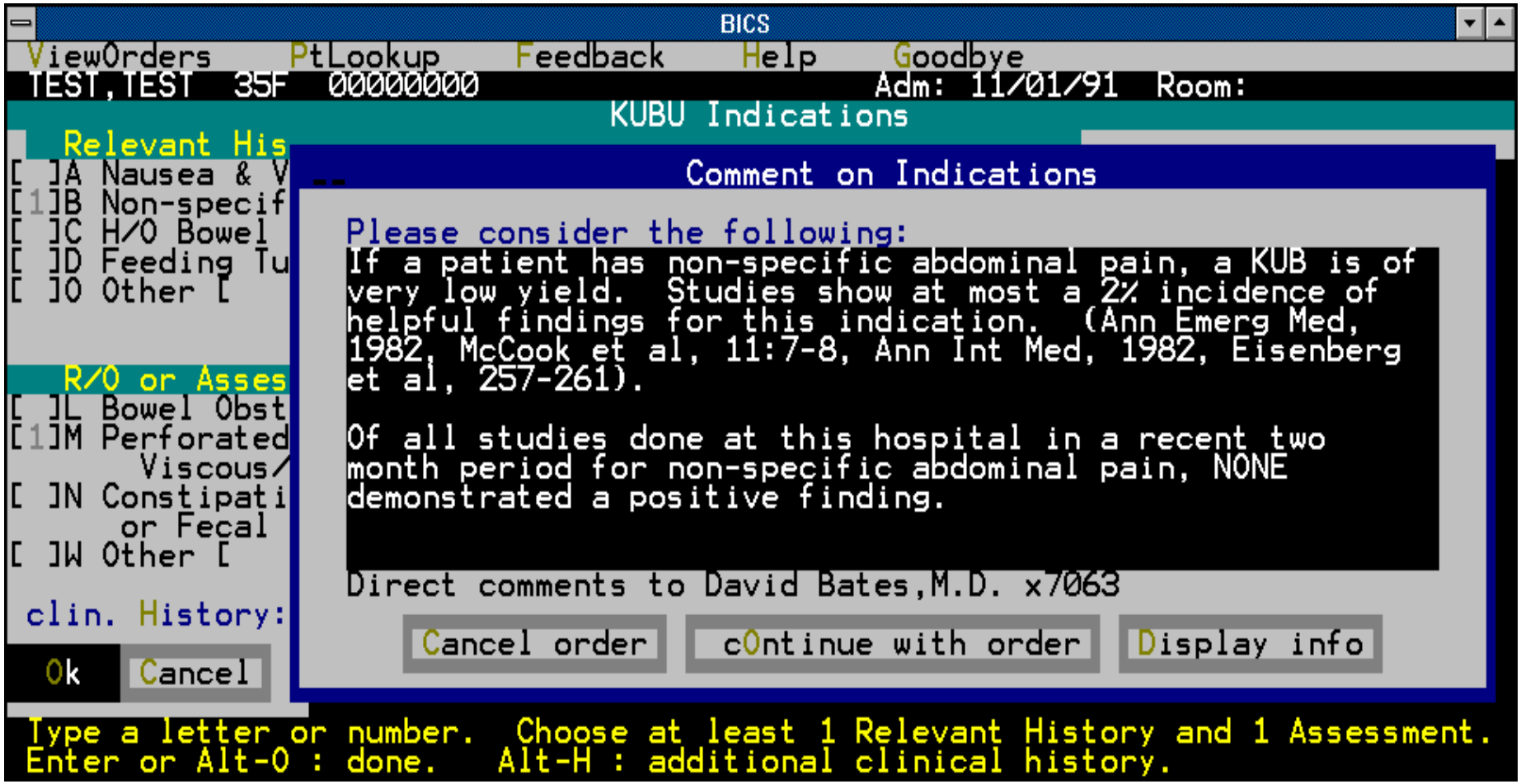
Guidelines: Vancomycin RCT

- 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

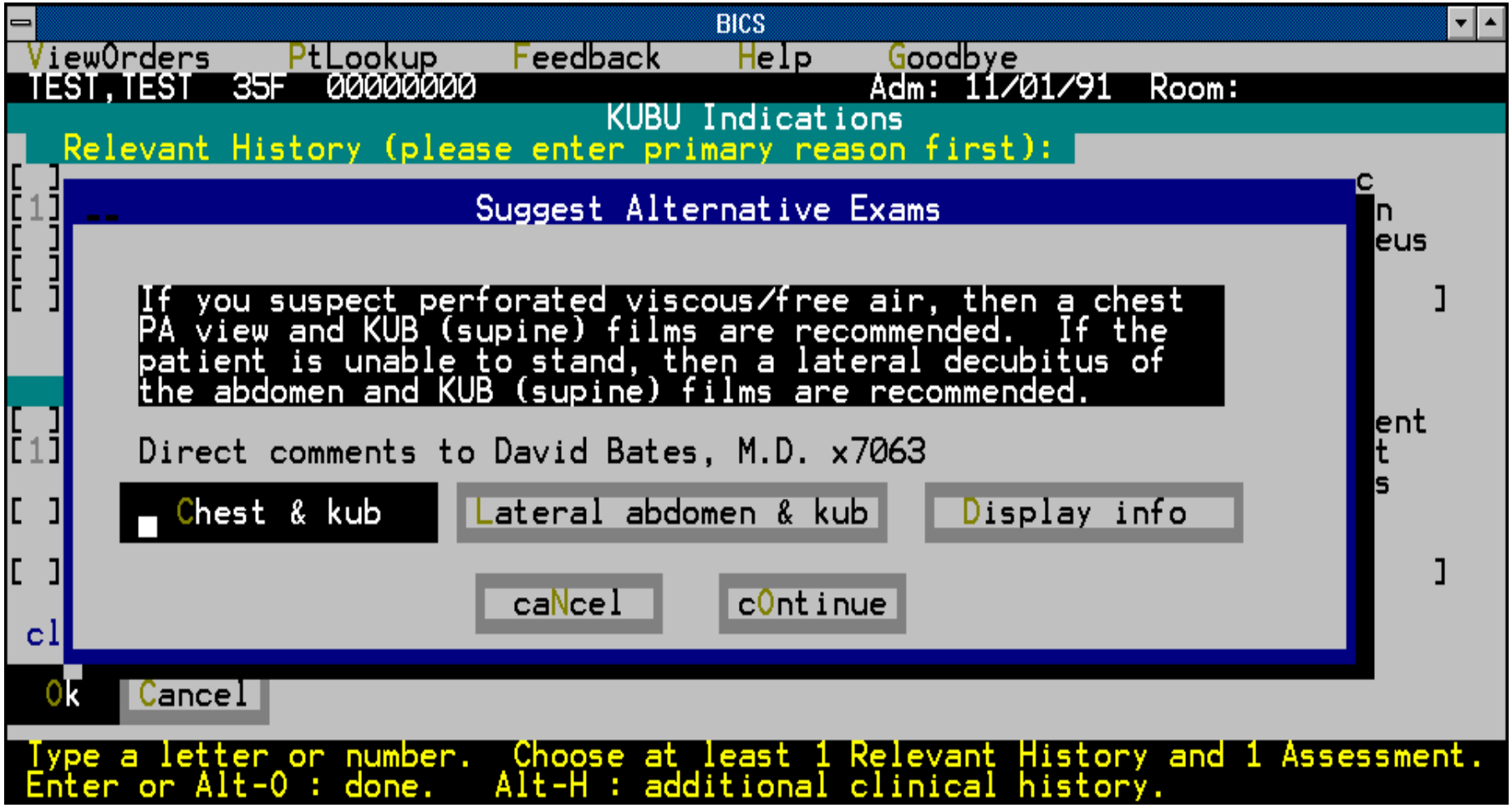
Guideline for Expensive Agent



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

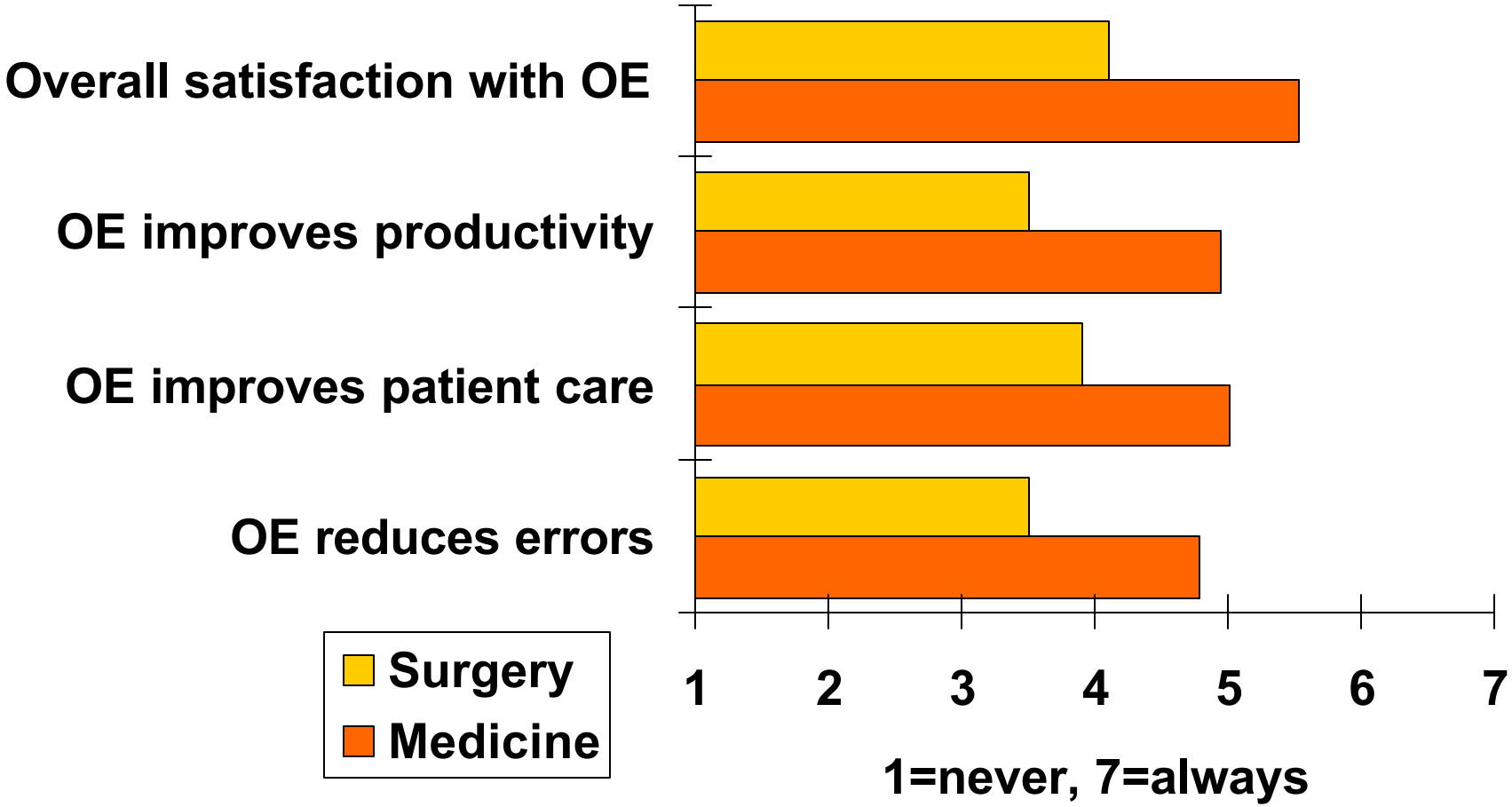
Order Entry and Critical Paths

- 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

Michael Sperling (MS690) | BPG | Summary (Chart) | (BWH)

Select | Desktop | Patient Chart: Summary | Custom | Reports | Sign | Results | Help | Feedback

Notes | Family and Social His

VITAL SIGNS: 08/17/2000

BP 120/80 **PULSE** 77 **RESP** 20 **TEMP** 98.4 **Height** N/A **Weight** 147

Reminders

ent has coronary artery disease on problem list and aspirin is not on the medication list. Recommend aspirin.
ent is overdue for Mammogram (rec: q 1 year).
ent has CAD and/or CHD risk equivalent and is overdue for total cholesterol and/or LDL cholesterol (rec: q 1 year)

Medications	Problems	Procedures	Allergies
oid 100 QD **[N]**	Coronary artery disease	Hysterectomy	Codeine
l 20 TID **[N]**	Congestive heart failure	Appendectomy	Sulfa
pril 20 QD **[N]**	Hypothyroidism **[N]**	Ptca	
	Sinusitis		
	Hypertension **[N]**		
	Gerd **[N]**		

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

PATIENT GATEWAY

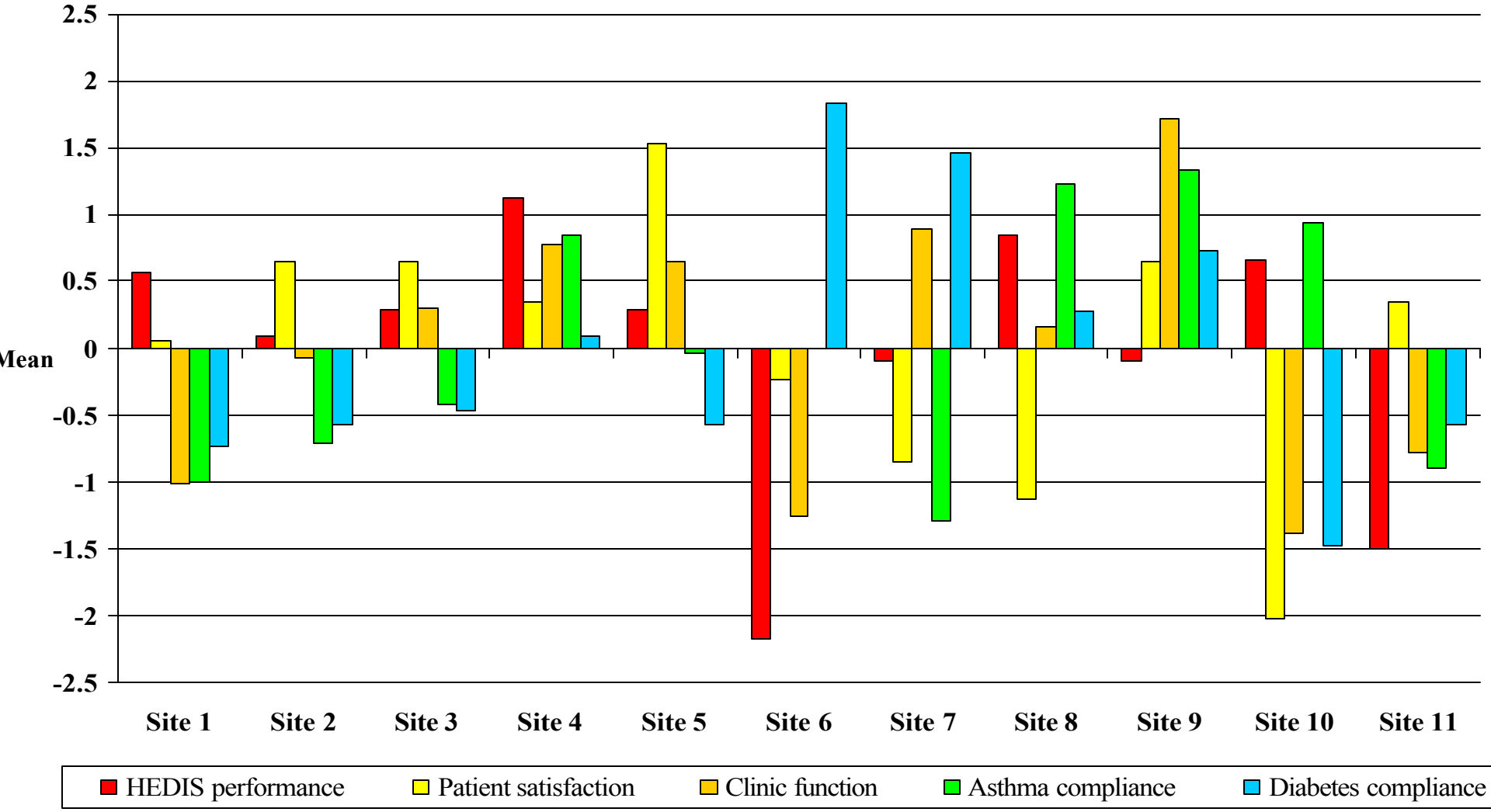
elcome

Welcome Bilbo Oetest

You have no new messages in your Inbox.

THE BRIGHAM AND WOMEN'S PHYSICIAN GROUP provides comprehensive adult medical care, from routine health screening to complex diagnostic evaluations. Our 10-physician general medicine practice includes a nephrologist, endocrinologist and cardiologist. All of these physicians are affiliated with Brigham and Women's Hospital and are faculty of Harvard Medical School.

Comparison of Site Scores on Five Quality Domains



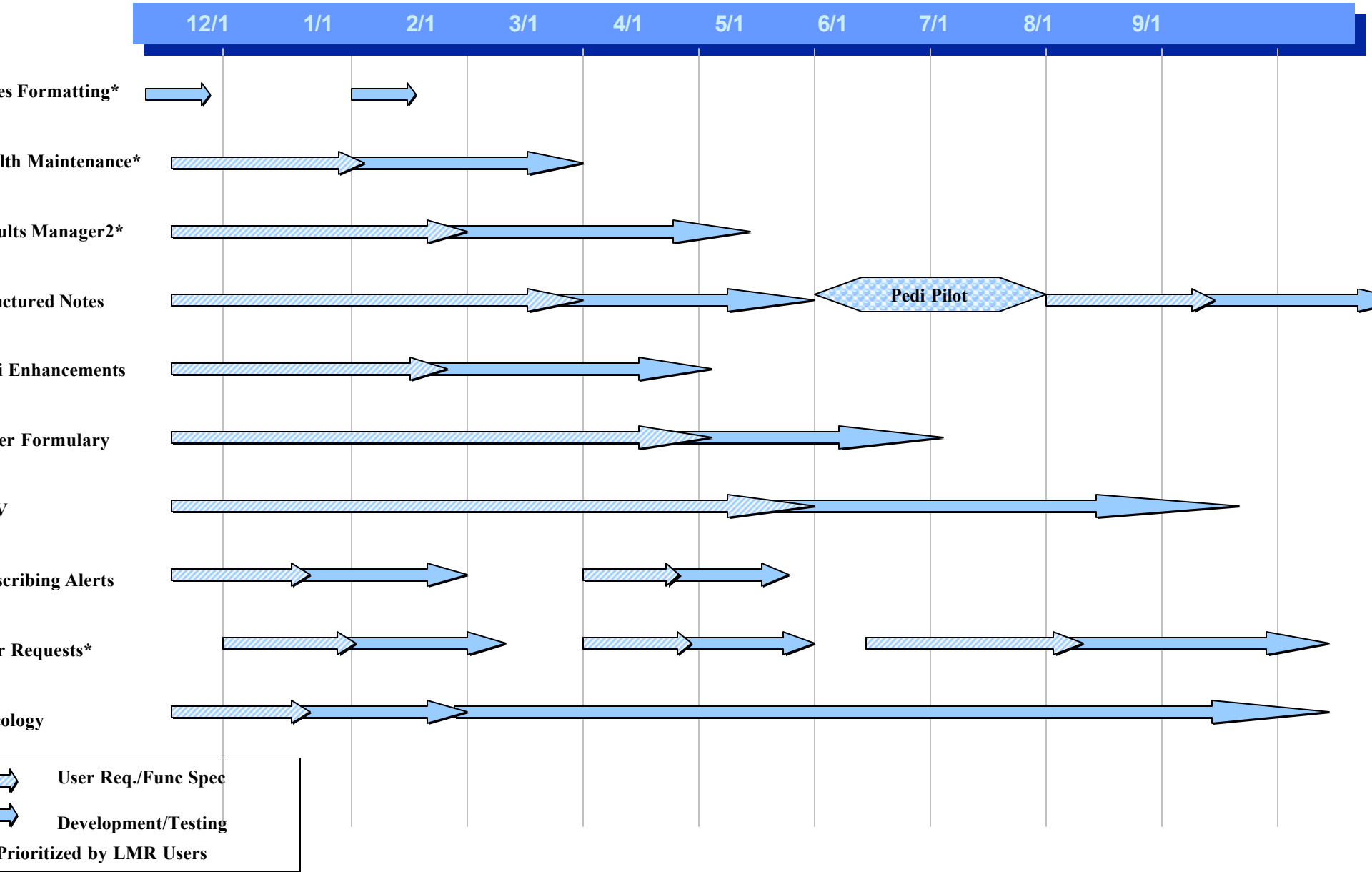
Percent of Patients Seen at Another Partners Hospital

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