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Computerized Provider Order Entry

J. Marc Overhage

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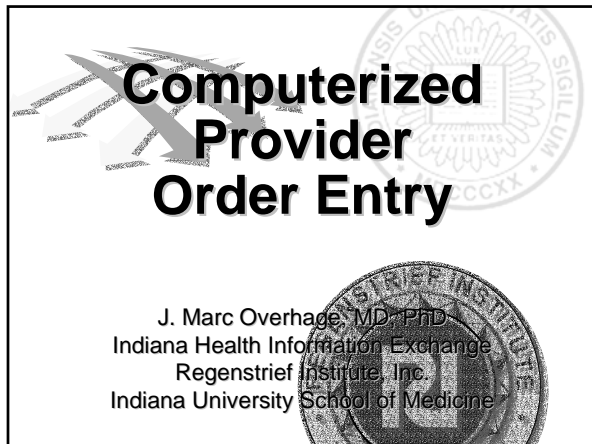
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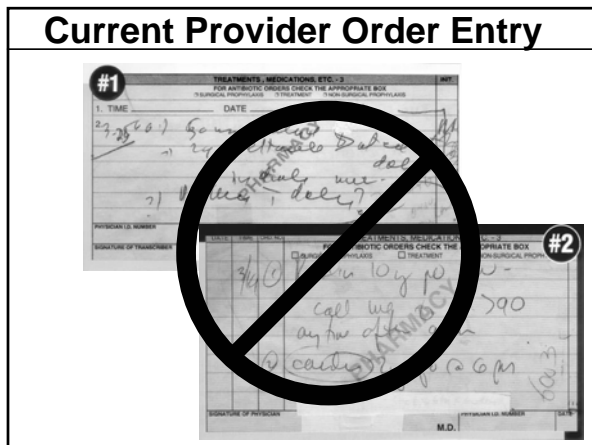
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Computerized Provider Order Entry

J. Marc Overhage, MD, PhD
 Indiana Health Information Exchange
 Regenstrief Institute, Inc.
 Indiana University School of Medicine




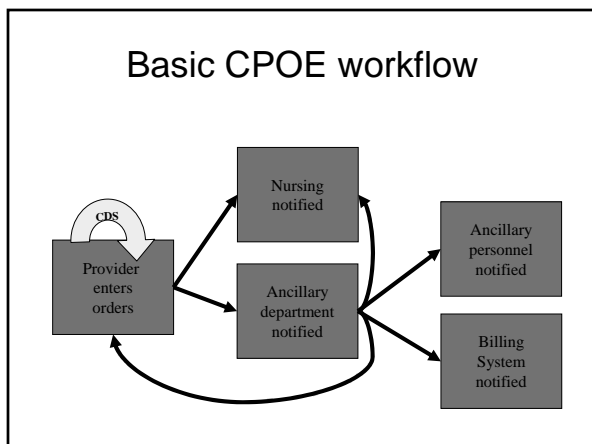

Current Provider Order Entry

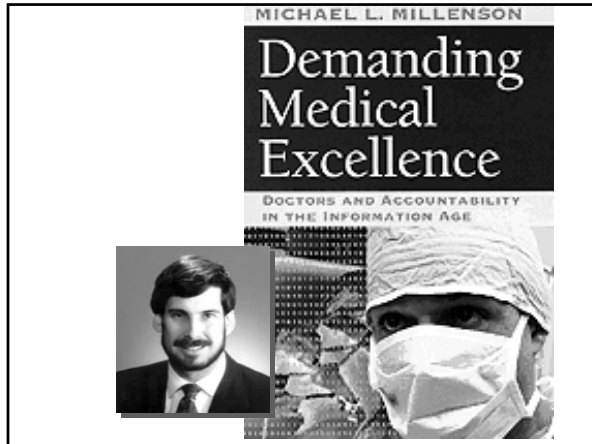


What is CPOE?

CPOE is a computer application that accepts physician orders and may provide clinical decision support.

- Medications
- Diagnostic studies including laboratory tests
- Ancillary services
- Nursing orders
- Consultation requests



- ❖ There are serious problems in quality
 - *Between the health care we have and the care we could have lies not just a gap but a chasm.*
- ❖ The problems come from poor systems...not bad people
 - *In its current form, habits, and environment, American health care is incapable of providing the public with the quality health care it expects and deserves.*
- ❖ We can fix it... but it will require changes

In a rising tide of information...

- ❖ Clinical decision-making is becoming progressively more difficult
 - we know more about the human body, how it works, and how it fails
 - we know more about individuals
- ❖ Information we need is not always available at the moment we need it
- ❖ Too much poorly organized information is little better than too little information

It is simply unrealistic to think that individuals can synthesize in their heads scores of pieces of evidence, accurately estimate the outcomes of different options, and accurately judge the desirability of those outcomes for patients.

David M. Eddy, MD, PhD

JAMA 1990

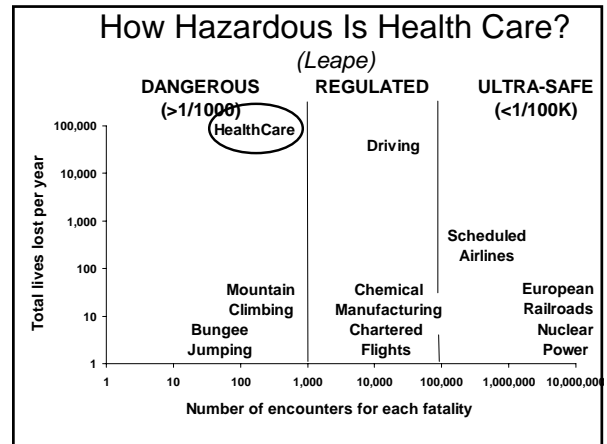
...many of these errors are probably due to man's limitations as a data processor rather than to correctable human deficiencies

Clement McDonald, MD

NEJM 1976

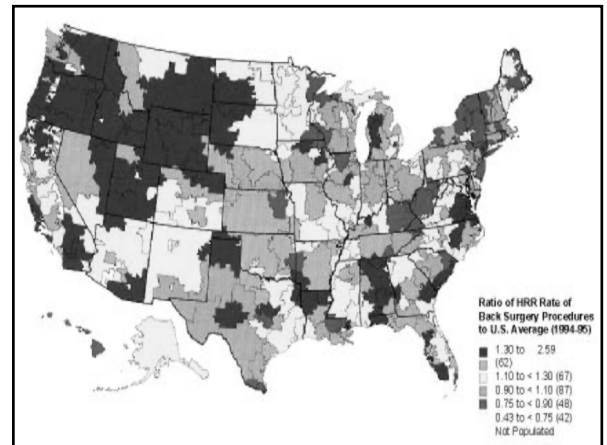
Man – a creature made at the end of the week, when God was tired.

Mark Twain



Inappropriate Variation Exists

- ◆ Variation in hospitalization rates; “decision to treat” – Wennberg et al
- ◆ High rates of care judged inappropriate or equivocal – Rand: Brook, Chassin, Leape, et al
- ◆ Variation in the process of care; the “manner of treatment”
- ◆ Variation in “expert” opinion; perceived treatment outcomes – Eddy



Effect of Inappropriate Variation

- ◆ Destroys trust
 - Damages the physician-patient relationship
 - For individual patients and the general public
- ◆ Increases errors
 - Usually at handoffs
 - Creating hassle and potentially harming patients
- ◆ Wastes resources
 - Through resulting inefficiencies

Standardize the care process

- ◆ Are we doing the right thing?
- ◆ Are we doing things right?
- ◆ How can we be certain that it is done right the first time every time?

Reed James, LLC

Reasons for Inappropriate Variation

- ◆ Complexity
- ◆ Lack of valid clinical knowledge (poor evidence)
- ◆ Subjective judgment / uncertainty
- ◆ Human error
 - Humans are inherently fallible information processors – Clem McDonald MD

Doing the Right Thing Complexity

- ◆ “The complexity of modern American medicine exceeds the capacity of the unaided human mind” – *David Eddy MD*
- ◆ How many factors can the human mind simultaneously balance to optimize an outcome – *Alan Morris MD*

Doing the Right Thing Poor evidence

- ◆ Evidence based medicine is a set of skills which allow critical appraisal of the literature
- ◆ Emphasis on literature more than opinion
- ◆ Evidence is often gray, decisions black/white



Doing the Right Thing Poor evidence

- ◆ Percentage of practice with evidence
 - 10% Williamson 1979
 - 10-20% OTA 1975
 - <20% OMRA
- ◆ The rest is opinion
 - This doesn't make it wrong
 - Much of it probably works
 - May not represent the best patient care

Doing the right thing Subjective judgment / uncertainty

- ◆ Subjective evaluation is notoriously poor across groups or over time
- ◆ Enthusiasm for unproven methods – *Mark Chassin, MD*

Doing the Right Thing Expert opinion

The telephone is an amazing invention, but who would ever want to use one of them?

President Rutherford B. Hayes, 1876

The Japanese auto industry isn't likely to carve out a big slice of the U.S. market.

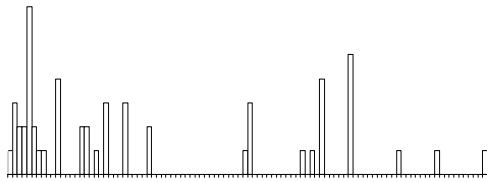
Business Week, 1968

There is no reason for any individual to have a computer in their home.

President, Digital Equipment Corp, 1977

The Experts Speak 1984

Expert opinion on valve failure



The Knowledge Processing Problem

- ◆ Good News
 - Medical knowledge, accompanied by evidence-based understanding of clinical “best practices” is advancing at an accelerating pace.
- ◆ Bad News
 - This pace already far exceeds our ability to disseminate that knowledge and far outpaces the ability of individual clinicians to keep up.

Converting research to care

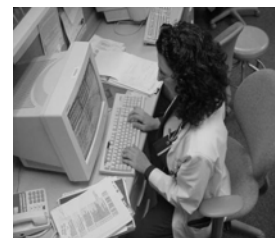


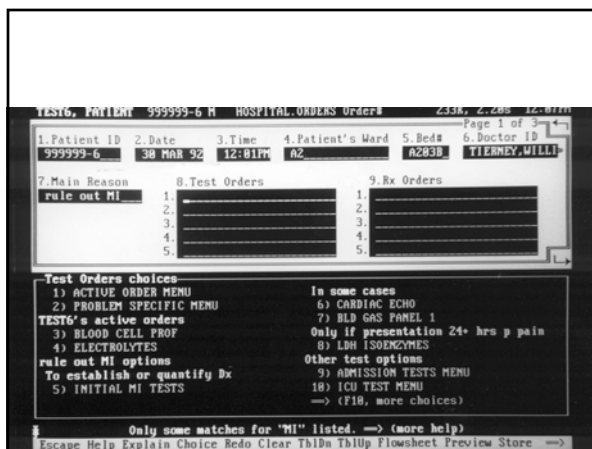
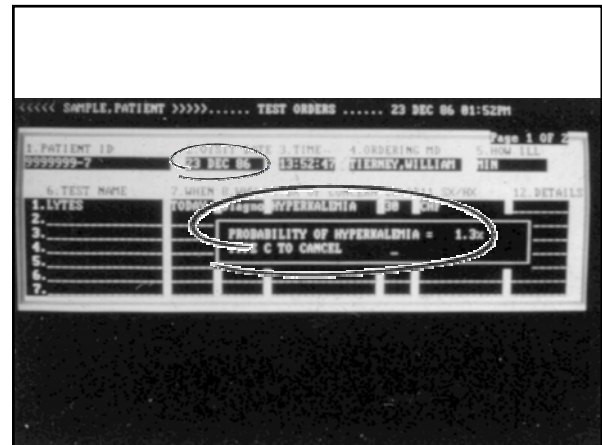
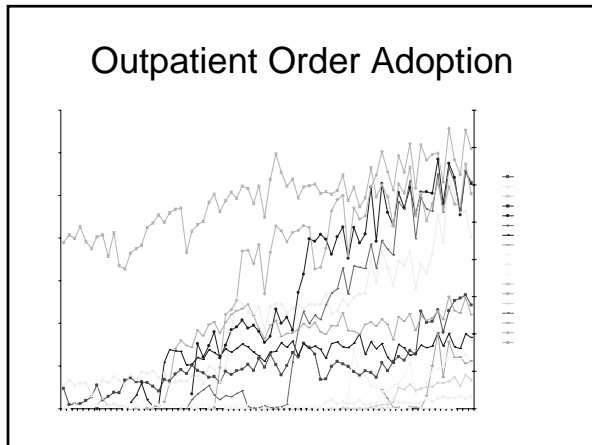
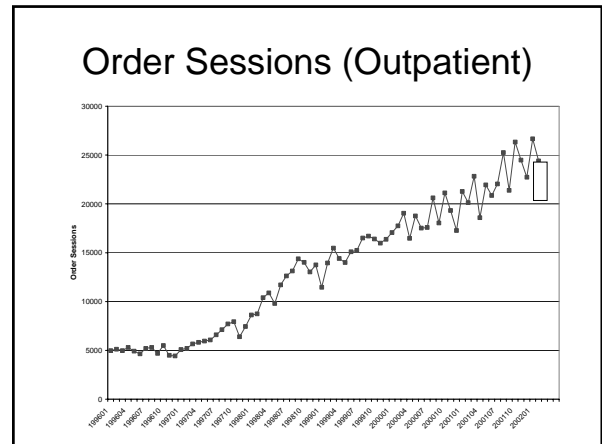
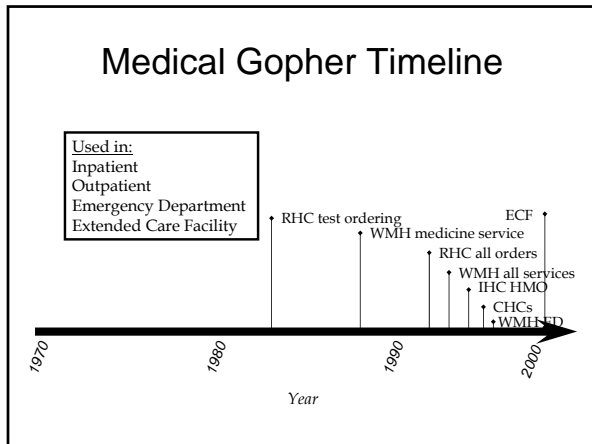
Medical Gopher Order Shaping Tools

- ◆ Problem oriented menus
- ◆ Commented choice lists
- ◆ Active menus
- ◆ Cost
- ◆ Last result for selected tests
- ◆ “Counter detailing” comments
- ◆ Drug-drug and Drug-diagnosis interactions
- ◆ Reminders

On-line Feedback Advantages

- ◆ Can suggest NOT doing something AFTER an order has been initiated
- ◆ Can ask for qualifying data that computer does not have
- ◆ Computer knows context once an order has been selected
- ◆ Provide feedback when ordering





- ### Simple Informational Interventions
- ◆ Display of costs
 - ◆ Restriction of orderables to formulary
 - ◆ Allergy and drug interaction checks– “careful”
 - ◆ Menus that subtly biased MDs to less expensive options
 - ◆ Active logic to re-direct from one option to another
 - ◆ Control frequency or repetition of orders (Miller)

Indication Specific Sigs Per drug

Gopher [REGEN] AREV

TEST4.PATIENT 9999-4 F B DAILY ORDERS Order# 240K .11s 10/14/98 04:42PM

1. Patient ID 2. Date 3. Time 4. Patient's Ward 5. Bed# 6. Doctor ID
 9999-4 14 OCT 98 04:46PM AS 5200A LINDBERGH, DON

7. Main Problem 8. Visit Reason 9. Order Type
 10. Test Orders 11. Other Orders

1. Fill Size/Conc.?
 2. Instructions?
 3. Comments?

1. IUI prophylaxis (duration)
 2. IUI prophylaxis PO HS M (duration)
 3. IUI prophylaxis PO Q12H M (duration)
 4. IUI prophylaxis PO Q12H M 7 days
 5. IUI prophylaxis PO Q12H M (duration)
 6. IUI prophylaxis PO Q6H M (duration)
 7. IUI prophylaxis PO Q6H M 7 months
 8. IUI prophylaxis BID M 7 months
 9. IUI prophylaxis for HIV w/ CD4<200 or prev. PCP (other regimens ok)
 10. IUI prophylaxis for HIV w/ CD4<200 or prev. PCP (other regimens ok)
 11. IUI prophylaxis for HIV w/ CD4<200 or prev. PCP (other regimens ok)
 12. IUI prophylaxis for HIV w/ CD4<200 or prev. PCP (other regimens ok)
 13. IUI prophylaxis for HIV w/ CD4<200 or prev. PCP (other regimens ok)
 14. IUI prophylaxis for HIV w/ CD4<200 or prev. PCP (other regimens ok)
 15. IUI prophylaxis for HIV w/ CD4<200 or prev. PCP (other regimens ok)
 16. IUI prophylaxis for HIV w/ CD4<200 or prev. PCP (other regimens ok)
 17. IUI prophylaxis for HIV w/ CD4<200 or prev. PCP (other regimens ok)
 18. IUI prophylaxis for HIV w/ CD4<200 or prev. PCP (other regimens ok)
 19. IUI prophylaxis for HIV w/ CD4<200 or prev. PCP (other regimens ok)
 20. IUI prophylaxis for HIV w/ CD4<200 or prev. PCP (other regimens ok)

Cost, Past Result, Comments

Revelation

DEMO2.PATIENT 66666-9 M W RELEASE Order# 119K .33s 03:49PM

1. Patient ID 2. Date 3. Time 4. Location 5. Doctor ID
 66666-9 05 MAR 95 03:42PM MED1 OVERHAGE, JOSEPH M

CXR (PA&LAT), price = \$73.85
 PA & Lateral Chest XRay: If worried about rib fx, get rib films. Remember, portable gives frontal views only.

1. When? NOW
 2. Reason for study? New occurrence of (increase in) cough
 3. Details?
 4. Comments?

When choices
 1) STAT
 2) NOW
 3) TODAY
 4) BEFORE NEXT VISIT
 5) ON NEXT VISIT

Prompt for formulary constrained indications

Gopher [REGEN] AREV

TEST4.PATIENT 9999-4 F B DAILY ORDERS Order# 235K .05s 10/14/98 04:50PM

VANCOMYCIN INJ, eg 50 MG/ML is \$14.82 per 10 ML VIAL

When treating pseudomonas colitis order VANCOMYCIN ORAL instead of VANCOMYCIN INJ. The Pharmacy and Therapeutics Committee has established guidelines for limiting Vanc use to reduce development of resistant organisms.

Fill in the blanks in the following text:
 1000 mg IUIPE Q12H Compliant with P&T guidelines, the reason for Vancomycin inj is (RESTRICTED TO FOLLOWING REASONS ONLY)

RESTRICTED TO FOLLOWING REASONS ONLY choices
 1) prophylaxis for (prophylaxis)
 2) empiric therapy for (therapy)
 3) Beta-lactam allergy for proven or highly-suspected gram-pos
 4) culture-proven gram-positive infection requiring use of van

Drug allergy

Clinical Application Suite Tuesday, Apr 11, 2000

CLAUS, SANTA C

Medications

ERYTHROMYCIN 500 MG QID PO 45.000
 COUMADIN (WARFARIN) 5 MG QD PO 45.000

ALLERGIES: Demerol, Penicillin

Drug Allergy/Sensitivity Warning
 You are ordering PENICILLIN V POTASSIUM. The patient has a documented allergy to Penicillins (Reaction: Mental Status Change)

Med: PENICILLIN V POTASSIUM
 Dose:
 Frequency:
 Dispense:
 Refills:
 PRN:
 No Substitutes:
 Patient Educated:
 Prescription:
 Don't Expire Start Date: 01/1/00 End Date:

Therapeutic Duplication

Shah, James O

Major warning summary

WARNING: You are prescribing aspirin PO.

Therapeutic Duplication for ASPIRIN.
 An active order for aspirin exists and may represent therapeutic duplication by category nonsteroidal anti-inflammatory drugs

Therapeutic Duplication for NAPROXEN.
 Major Drug-Drug Interaction aspirin + warfarin.

GENERAL AVOID: Aspirin, even in small doses, may increase the risk of bleeding in patients on oral anticoagulants by inhibiting platelet aggregation and inducing gastrointestinal lesions.
 MANAGEMENT: Aspirin-containing products, including topical products, should be avoided in patients on anticoagulants. Alternatively, a lesser degree of anticoagulation, if feasible, may allow aspirin and an oral anticoagulant to be safely combined. Patients should be advised to promptly report any signs of bleeding to their physician, including pain, swelling, headache, dizziness, weakness, prolonged bleeding from cuts, increased menstrual flow, vaginal bleeding, nosebleeds, bleeding of gums from brushing, unusual bleeding or bruising, red or brown urine, or red or black stools. Patients should also be counseled to avoid any other over-the-counter salicylate products..._asa/ibuprofen

Passive Menus

Revelation

DEMO2.PATIENT 66666-9 M W RELEASE Order# 155K .28s 03:37PM

1. Patient ID 2. Date 3. Time 4. Location 5. Doctor ID
 66666-9 05 MAR 95 03:36PM MED1 OVERHAGE, JOSEPH M

6. Visit Reason
 CHF

7. Pharmacy Site
 REGENSTRIEF

8. Medications
 1. MORPHINE INJ
 2. ENALAPRIL
 3. CAPTOPRIL
 4. BENAZEPRIL
 (F10, none choices)

9. Test Orders
 1.
 2.
 3.
 4.
 5.

Medications choices
 Adjuvant in pulmonary edema
 11) MORPHINE INJ
 ACE inhibitors prolong life in sys dysfunction R:5810
 Increase to full doses as patient tolerates
 12) ENALAPRIL
 13) CAPTOPRIL
 14) BENAZEPRIL
 (F10, none choices)

Active Menus

Revelation DEMO2.PATIENT 66666-9 M W RELEASE Order# 123K, .06s 03:44P

EMALAPRIL specifics
 1.Pa Price : \$5.55
 666 ACTIVE: EMALAPRIL (5 MG) 0.5 TAB(S) PO QD quan=QS 6 MON. Ord=09 FEB
 6.U1 95, last refill=02 ...
 7.Ph Consider using lower cost benazepril. Causes chronic cough in up to
 REG 2% of patients. Danger of hyperkalemia in diabetics and when Creat >
 3 caused 2 deaths at local hosp.

SUGGESTED ORDER MENU

Choices

- * 1) REVISE
- 2) D/C
- 3) RENEW
- 4) RENEW 1 MO
- 5) RENEW 2 MO
- 6) RENEW 3 MO
- 7) RENEW 6 MO
- 8) RENEW 12 M
- 9) NO ACTION

2. NO ACTION ECOTRIN EQW 325 MG PO QAM
 Consider a less expensive ACE inhibitor such as
 3. OMIT LISINAPRIL
 Increase to intermediate dose because BP still
 elevated [G:24]
 4. REVISE EMALAPRIL 10 mg PO QAM
 because allergic from CHF-consider adding [G:205]
 5. ORDER DIGOXIN .125 mg PO qAM
 Hypertension [G:124]
 Up/Down-arrows to move, Spacebar or choice# changes choice
 F3 to edit order, F8 to accept all, Esc to back out

Rejecting a Suggestion

Revelation DEMO2.PATIENT 66666-9 M W RELEASE Order# 119K, .06s 10:41P

DIGOXIN specifics
 1.Pa Price : \$5.08
 666
 6.U1
 7.Ph
 REG

SUGGESTED ORDER MENU

Choices

Please explain why you have REJECTED this recommendation for DIGOXIN.

1.Reason I disagree with recommendation
 2.Comment still

Reason choices

- 1) Computer data is in error
- 2) Patient refuses
- 3) Already ordered elsewhere
- 4) Already done with poor results
- 5) Patient is allergic to medication
- 6) I disagree with recommendation
- 7) Defer, leave to primary MD
- 8) Defer, other priorities today

Gopher drug order for gentamicin

Order Entry Gopher EREGN3 - AREV

TEST, CARE INPAT 1342549-1 F B RELEASE Order# 133K, .00s 05/23/00 09:41AM

1.Provider ID 2.Visit Reason 3.Any Orders

GENTAMICIN INJ, eg 4 MG/ML is 17c per 1 ML
 CREATININE 0.9 on 14 NOV 1996.

WISHARD -- [Generic] [*** OUTDATED FORMULARY *** (Valid until: 01 JAN 2000)]
 1.Pill Size/conc.7
 2.Instructions? 1:2

Fill in the blanks in the following text:
 (Wt= 74 KG @ 2> IVSP 1XONLY STAT then; 2
 Q8H based on es I

DOSE choices

- 1) mild infection
- 2) 1 mg/kg
- 3) Moderate/severe infection
- 2) 1.67 mg/kg
- 3) Enter your own dose

Corollary orders for gentamicin

Order Entry Gopher EREGN3 - AREV

TEST, CARE INPAT 1342549-1 F B RELEASE Order# 136K, .27s 05/23/00 09:42AM

ACTION GENTAMICIN LEVEL (Price = \$32.00)

- 1) ORDER
- 2) REVISE
- 3) OMIT

GENTAMICIN INJ recommendations menu

monitor for adequate treatment and to avoid toxicity

1. ORDER GENTAMICIN LEVEL
 Measure trough (just before dose) and peak (30 min after infusion) with the 4th dose Ixonly
 monitor renal function and be prepared to adjust dosage

2. ORDER CREATININE
 Ixonly now then Q MONDAY AND THURSDAY

Fill size Quantity Refills

]=Select Order, Number=Action, F3=Edit Order, F8=Accept All, ESC

Substitution alerts

ViewOrders PtLookup Feedback Help Goodbye
 TEST,TEST 34F 00000000 Adn: 11/01/91 Room:

MEDICATION ORDER

In community-acquired pneumonia the relevant organisms covered by a 3rd generation cephalosporin can be well covered with cefuroxime (a 2nd generation cephalosporin). This switch will help delay the emergence of multi-drug resistant organisms and reduce the cost of treatment by half.

In patients who do not need broad spectrum gram-positive and gram-negative coverage, regimens such as TMP/SMX or ampicillin are appropriate.

Change order to ceFuroxime (2nd generation cephalosporin)

Keep the original order CEFOTAXIME

order Other (e.x. TMP/SMX, ampicillin)

Ok Cancel

Enter all or part of the route (PO, MG, IU, etc).

Prompt for formulary constrained indications

Gopher (REGEN) - AREV

Auto

TEST4.PATIENT 9999-4 F B DAILY ORDERS Order# 235K, .05s 10/14/98 04:50PM

Page 1 of 4

6.Doctor ID
 A LINDBERGH, DON

er Orders

When treating pseudomonas colitis order VANCOMYCIN ORAL instead of VANCOMYCIN INJ. The Pharmacy and Therapeutics Committee has established guidelines for limiting Vanc use to reduce development of resistant organisms.

Fill in the blanks in the following text:
 1000 mg IUPB Q12H . Compliant with P&T
 guidelines, the reason for Vancomycin inj is
 (RESTRICTED TO FOLLOWING REASONS ONLY)

RESTRICTED TO FOLLOWING REASONS ONLY choices

- 1) prophylaxis for (prophylaxis)
- 2) empiric therapy for (therapy)
- 3) Beta-lactam allergy for proven or highly-suspected gram-pos
- 4) culture-proven gram-positive infection requiring use of vanc

Formulary alternatives support

Network Gopher
 DEMO2,PATIENT 66666-9 M W DAILY ORDERS Order# 140K, 2.20s 03:44PM

1. Price = \$400
 666 HMG-CoA reductase inhibitor indicated for the treatment of primary hypercholesterolemia (maximum reduction 24-26%). Dosage adjustment may be required in patients with significant hepatic dysfunction.

1.
 2.
 3.

RECOMMENDED BLOCKING ORDERS

Lovastatin deleted from Wishard formulary (11/94) per P&T committee. Lovastatin rxs 20 mg/day will be changed to fluvastatin 40 mg/day. Lovastatin rxs > 20mg/day will be changed to SIMVASTATIN 2:1 (mg LOU:mg SIM). Change will save Wishard \$40,000 per year. [msg:81]

1. OMIT FLOVASTATIN
 2. OMIT SIMVASTATIN
 Original order
 3. OMIT LOVASTATIN

Up/Down-arrows to move, Spacebar or choice# changes choice
 F3 to edit order, F8 to accept all, Esc to back out

Choices
 1) ORDER
 2) REVISE
 * 3) OMIT

Recruitment to Studies

9999-3 M W RELEASE Order# 192K, 1.65s 02/09/99 11:32AM

CONSENT FOR BACK PAIN STUDY
 This is a randomized trial evaluating an educational program for patients with acute low back pain

1) ORDER
 2) REVISE
 3) OMIT

SUGGESTED ORDER MENU

If this patient's back pain is acute (current episode < 90 days), they may qualify for a study evaluating a psychosocial program

1. ORDER

...this patient has acute back pain (current episode < 90 days) and is competent for interview. Research assistants may contact pt if eligible (No actions needed by nursing)

+=Select Order, Number=Action, F3=Edit Order, F8=Accept All, ESC

Capturing Clinical Data

Revelation
 nb on C: THE MEDICAL GOPHER IS AT YOUR SERVICE 182K, .11s 11:10PM
 4.09 Stn: MARC Loc: MED1 User: MARC Copyright 1992 CAM

Enter the patient's name and the type of order to write or press ESC to abort.

Enter the patient's sitting blood pressure, weight (lbs) and NYHA class.
 Press [Esc] if you do not know a result or [F9] for an explanation.

1. WEIGHT MD (lbs)? 183
 2. SYS BP SII MD (mm hg)? 186
 3. DIA BP SII MD (mm hg)? 98
 4. FUNCTIONAL CLASS (NYHA)? 3

Data entry instructions
 New York Heart Association functional classification for patients with congestive heart failure.
 0-no symptoms even with maximum exertion
 1-symptoms with maximum exertion

F9 for more => <more help>



Outcomes

RESULTS CHANGES OVER TIME

Bar chart showing completion percentages for various categories.

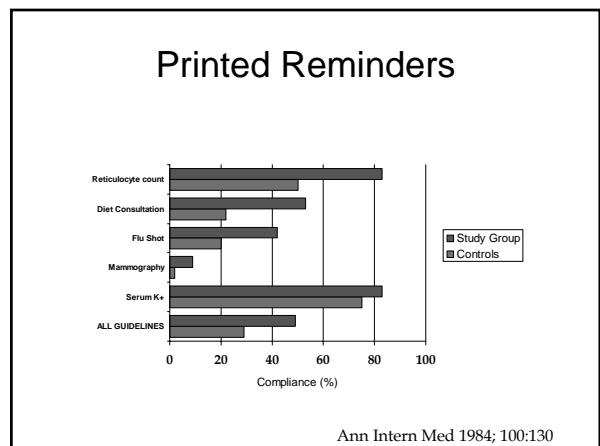
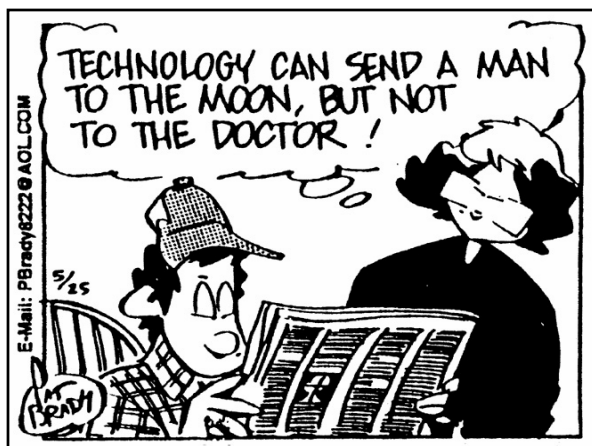
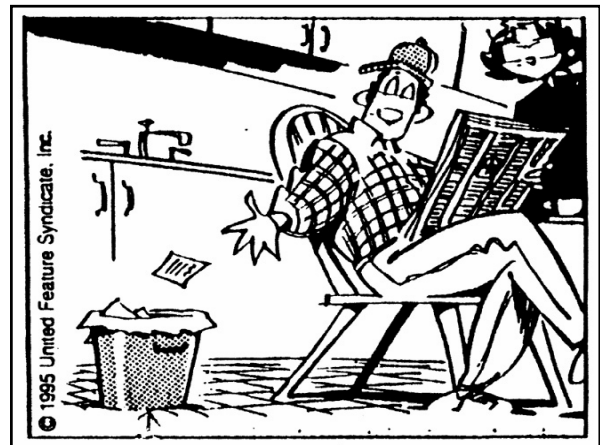
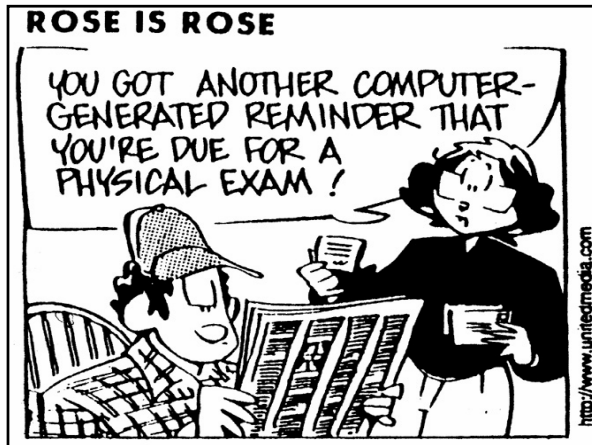
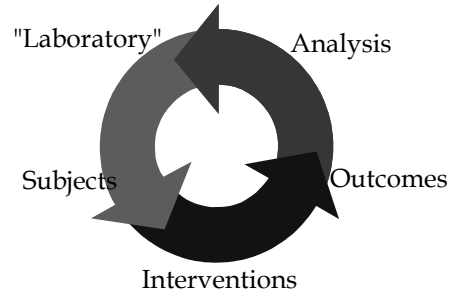
Line graph showing 'RESULTS CHANGES OVER TIME' with 'Total' and 'Study' lines plotted against 'Time'.

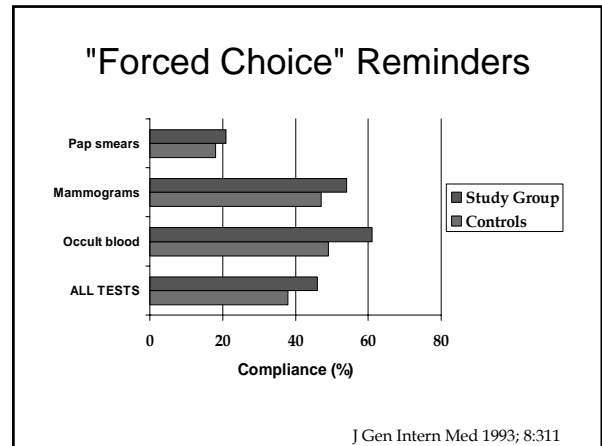
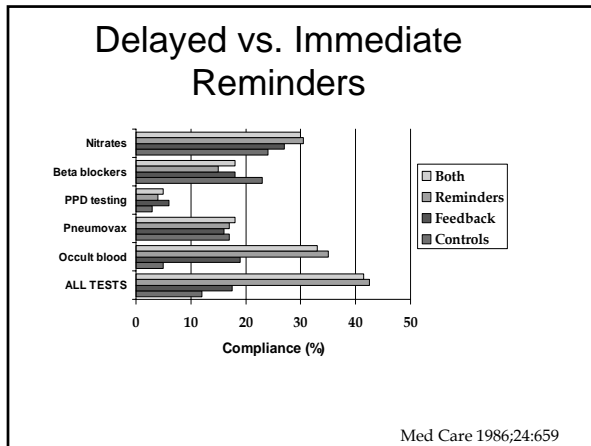
RESULTS CHANGES OVER TIME	TIME	TOTAL	STUDY
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
33	34	35	36
37	38	39	40
41	42	43	44
45	46	47	48
49	50	51	52
53	54	55	56
57	58	59	60
61	62	63	64
65	66	67	68
69	70	71	72
73	74	75	76
77	78	79	80
81	82	83	84
85	86	87	88
89	90	91	92
93	94	95	96
97	98	99	100

Achieving the best outcomes

- ◆ Informatics innovations are expensive!
 - capital \$\$\$ invested
 - personnel time re-engineering processes
- ◆ Purchasers should know the marginal gain to expect from their investment
- ◆ Effects of informatics innovations should be tested in real clinical environments

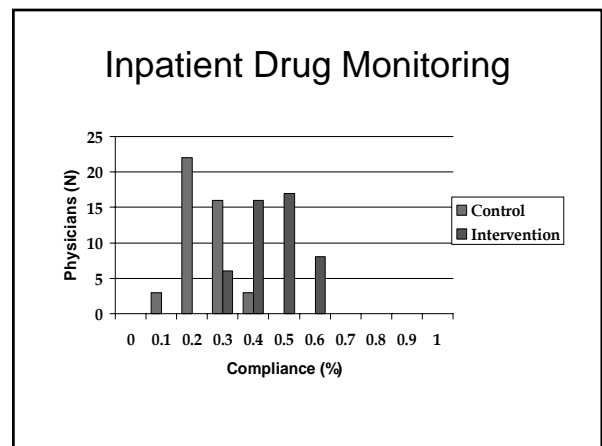
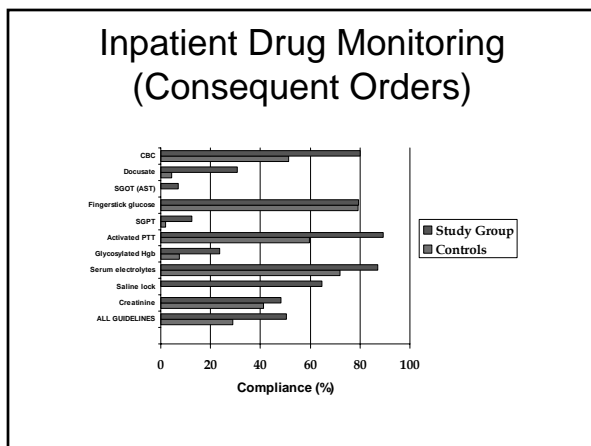
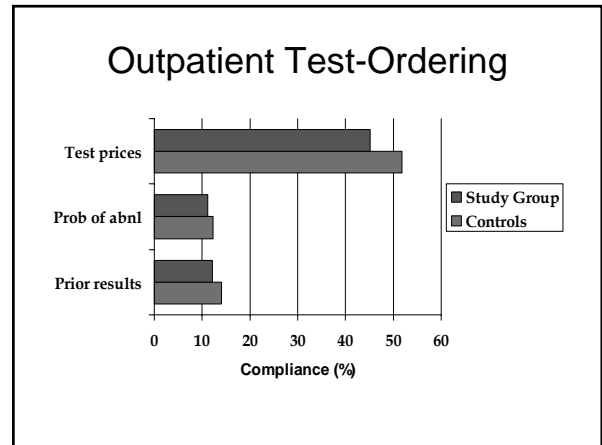
Research or quality cycle

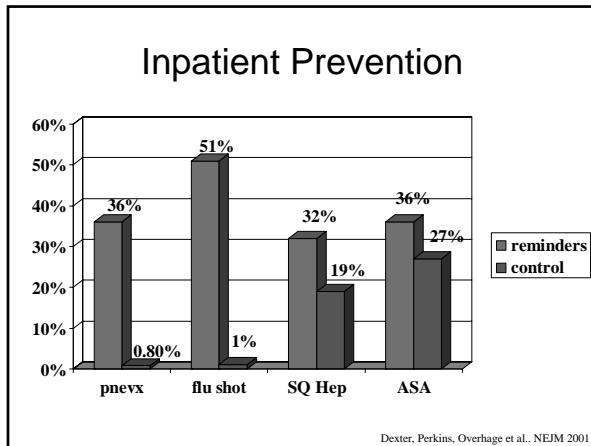




Pharmacy Savings

- 18% reduction in total costs
- Prescription compliance with plan-specific formularies
- Doctors write correct Rx the first time
- Fewer call-backs from pharmacist





CPOE Can Help Reduce Errors

- ◆ Brigham and Women's Hospital launched its first CPOE in 1993
- ◆ Since then, they have documented a 54% reduction in serious medication errors
- ◆ Resulted in 62% reduction in preventable ADE's

Improved Quality

- ◆ CPOE allows for physician reminders of best practice or evidence-based guidelines
- ◆ Indiana University study
 - Pneumococcal vaccine in eligible patients
0.8% → 36.0%
 - Heparin prophylaxis
18.9% → 32%

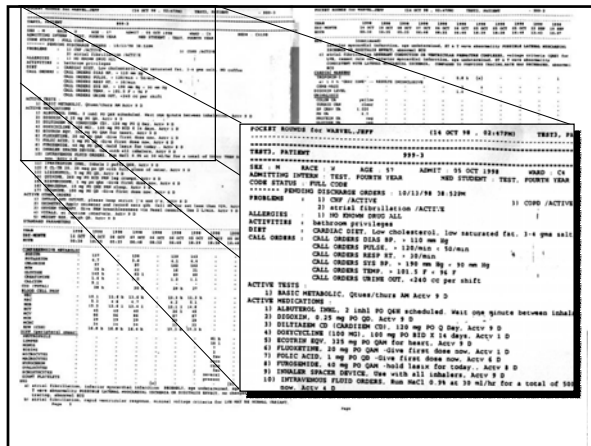
Medication Cost Savings

- ◆ Brigham and Women's CPOE system includes several alerts targeted to specific high-cost drugs. The alerts provide a possible less expensive alternative
- ◆ Example of savings—Odansetron TID vs. QID
 - TID dosing used 5.9% → 93.5%
 - Estimated savings: \$250,000

Improved Efficiency

- ◆ Maimonides Medical Center (Bronx, NY)
- ◆ 700 bed teaching hospital
- ◆ After CPOE, found substantial reduction in order processing time
 - Physician order to receipt by pharmacy
3.4 hours → 0.5 hours
 - Physician order to Delivery to Patient Care Area
4.6 hours → 1.4 hours
- ◆ Estimate 12% ↓ in LOS following CPOE





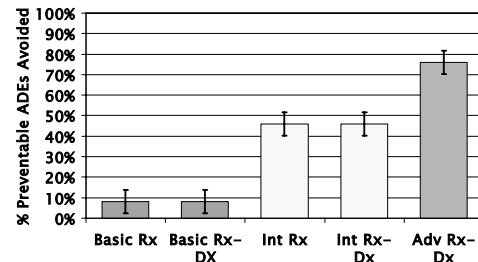
YEAR	2001	2001	2001	2001
DAY-MONTH	12 JUL	11 JUL	11 JUL	11 JUL
HOURL	04:14	16:28	09:00	08:51
COMPREHENSIVE METABOLIC (continued)				
POTASSIUM	3.0 l	-	-	3.6
CHLORIDE	105	-	-	107 h
CO2 (TOTAL)	22	-	-	22
BUN	7	-	-	9
CREATININE	1.0	-	-	1.0
GLUCOSE	110 h	-	-	87
CALCIUM	7.3 l	-	-	7.4 l
PROTEIN TOTAL	5.0 l	-	-	5.0 l
ALBUMIN	2.0 l	-	-	2.0 l
BILI TOTAL	0.1	-	-	0.1
ALK PHOS	44 l	-	-	44 l
SGOT (AST)	69 h	-	-	72 h
SGPT (ALT)	56 h	-	-	62 h

ACPOE System Classification

Class	Medication (Rx) OE	Diagnostic (Dx) OE
1: Basic Rx-only	Structuring data capture, passive references	
2: Basic Rx-Dx		
3: Intermediate Rx-only	Rx & Order-specific decision support, with some patient data	
4: Intermediate Rx-Dx		
5: Advanced Rx-Dx	Sophisticated Rx & Order-specific decision support, with most patient data, EDI	

Center for Information Technology Leadership

Clinical Benefits: How Effective Is ACPOE?



Center for Information Technology Leadership

Concerns

- Physicians overloaded with feedback
 - How best to deliver "out of band" feedback
- No dedicated time for chronic disease management
 - Provide feedback during "administrative time"?
- Physicians may feel like the computer is intruding on their practice of medicine



CDSS Issues

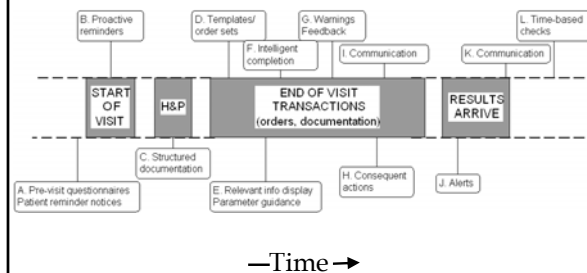
- ◆ Guideline selection (5%)
- ◆ Reminder "stacking"
 - How do you prioritize? Weighting?
 - How do you get preventive care to "bubble up" high enough to get done?
- ◆ Conflicting recommendations from guidelines.
 - Who resolves these?
- ◆ Inserting feedback at the right point in the care process
 - Acute issues compete for provider's attention
 - Must be provided while there is still an opportunity to change the actions taken
- ◆ Data issues
 - Data must be structured and coded
 - How are these data captured
 - Operational databases
 - Direct provider entry
 - Create process to obtain specific data
 - Standardization of concepts & terminology
- ◆ Time

CDSS Triggers

- ◆ Local variation
- ◆ Threshold issues
- ◆ May be difficult or impossible to get the data
 - PFTs in every asthmatic
- ◆ Who will pay for the test



CDSS Insertion Points



CDSS Data problems

- ◆ Definition
- ◆ Availability
- ◆ Completeness
- ◆ Reliability
- ◆ Changes over time
- ◆ Representations
- ◆ Need for inference

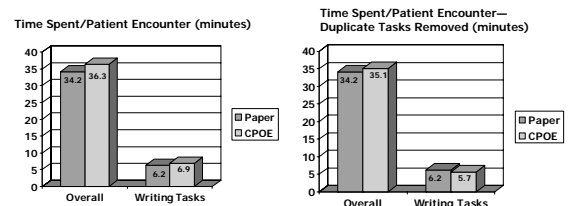


Definitions/Weasel words

- ◆ Undefined/poorly defined
 - Organic heart disease – MVP?, mild mitral regurgitation on echocardiogram?
 - Abnormal EKG – non specific ST-T wave changes?, Occasional PVCs?
- ◆ Vocabularies not standardized

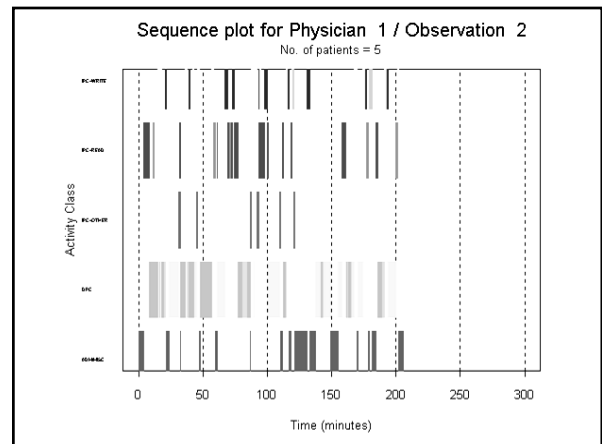
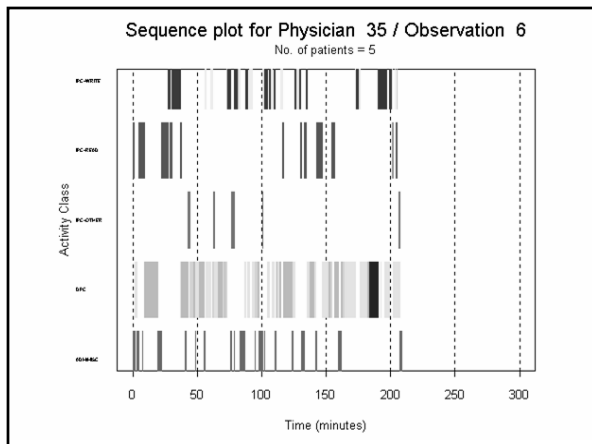
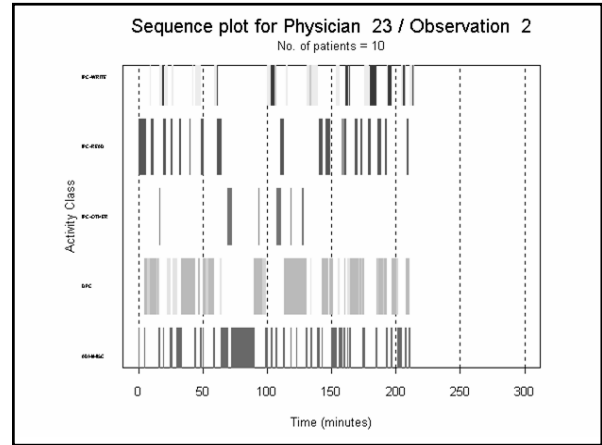
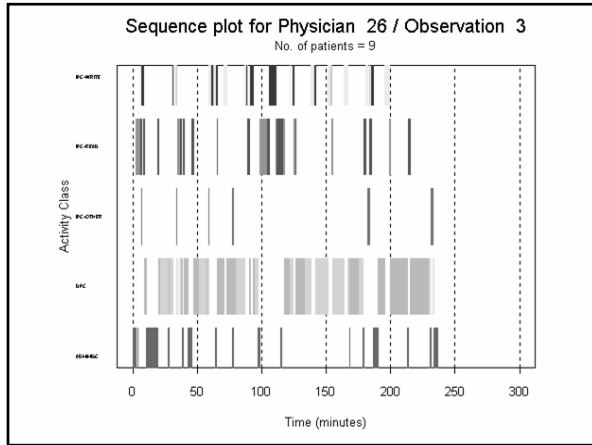
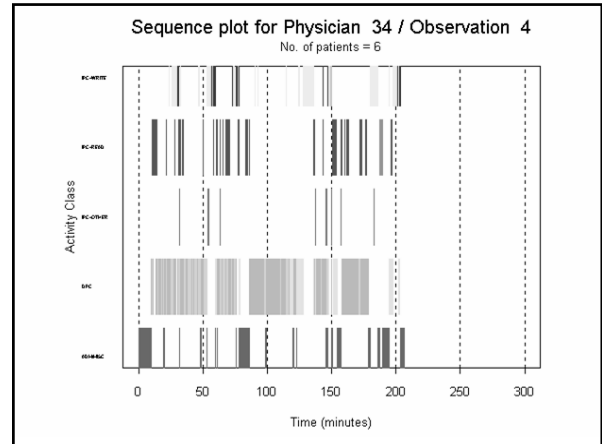
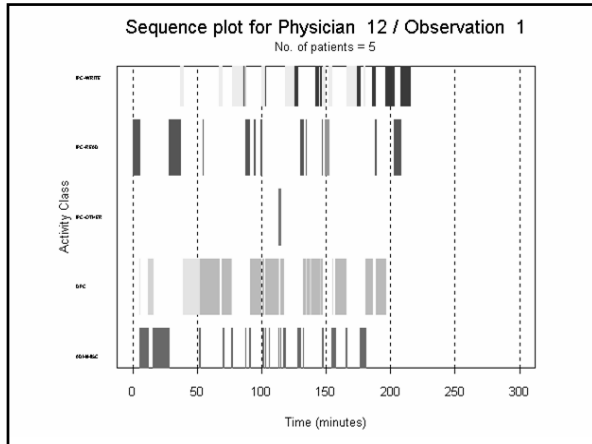


CDSS Time



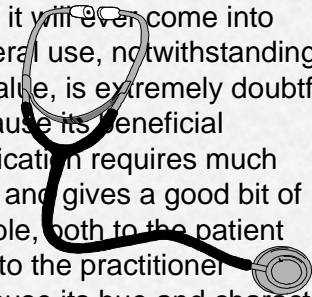
Evidence shows that CPOE adds less than one minute to the time physicians spent writing orders and overall only added 1-2 minutes per patient encounter. As physicians gained experience with the system, the time for orders actually decreased.

Overhage JAMA 2001



That it will ever come into general use, notwithstanding its value, is extremely doubtful because its beneficial application requires much time and gives a good bit of trouble, both to the patient and to the practitioner because its hue and character are foreign and opposed to all our habits and associations.

The London Times in 1834



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