## Computerized Practitioner Order Entry over the last decade: Progress and unsolved problems

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biomedical and health informatics

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## Topics for today

- What is CPOE, and why is it hard?
- What we have learned over the last decade
- What we don't know about CPOE
- CPOE project in UW Medicine
- Questions and discussion

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## Definition of CPOE

Computerized practitioner order entry is defined as a process which allows the ordering practitioner to use a computer to directly enter medical orders.

## What people say about CPOE

- "Experience has shown that it is hard to implement (physician order entry) successfully." Sittig JAMIA 1994
- "Implementation of a POE system ... is a systems change of the first magnitude, which is very difficult to accomplish." Bates JAMA 1998
- "I've been implementing products for II years and CPOE was by far the most complex, and hardest."
   Academic med center project manager 2011
- "Orders control everything."

Academic med center CEO 2011

• "The only thing harder to accomplish is opening a hospital for the first time."

## Reduction in serious medication errors

	Phase 1 Rate (Events/1000 Patient-Days, Mean)	Phase 2 Rate (Events/1000 Patient-Days, Mean)	% Difference	P
Nonintercepted serious medication errors	10.7	4.86	-55	.01
Preventable ADEs	4.69	3.88	-1/	.37
Nonintercepted potential ADEs	5.99	0.98	-84	.002
All ADEs	16.0	15.2	-5	.77
Nonpreventable ADEs	11.3	11.3	0	.99
All potential ADEs	11.7	3.38	-71	.02
Intercepted potential ADEs	5.67	2.4	-58	.15

\*Paired comparison between phase 1 and 2 made using t test including only the 6 units in both

phases.

†Sum of nonintercepted potential ADEs and preventable ADEs.



[Bates et al, JAMA, 1998]

### Selected Strategies to Improve Medication Safety

• Adopt a system-oriented approach to medication error reduction.

• Implement standard processes for medication doses, dose timing, and dose scales in a given patient care unit.

- Standardize prescription writing and prescribing rules.
- · Limit the number of different kinds of common equipment.
- · Implement physician order entry.
- Use pharmaceutical software.
- Implement unit dosing.
- · Have the central pharmacy supply high-risk intravenous medications.

 Use special procedures and written protocols for the use of high-risk medications.

 Do not store concentrated solutions of hazardous medications on patient care units.

- Ensure the availability of pharmaceutical decision support.
- Include a pharmacist during rounds of patient care units.
- Make relevant patient information available at the point of patient care.
- Improve patient knowledge about their treatment.

[To Err is Human, Institute of Medicine, 2000, page 183]

### The NEW ENGLAND JOURNAL of MEDICINE

Table 2. Selected Electronic Functionalities and Their Level of Implementation in U.S. Hospitals.						
Electronic Functionality	Fully Implemented in All Units	Fully Implemented in at Least One Unit	Implementation Begun or Resources Identified*	No Implementation, with No Specific Plans		
		percent oj	fhospitals			
Clinical documentation						
Medication lists	45	17	18	20		
Nursing assessments	36	21	18	24		
Physicians' notes	12	15	29	44		
Problem lists	27	17	23	34		
Test and imaging results						
Diagnostic-test images (e.g., electrocar- diographic tracing)	37	11	19	32		
Diagnostic-test results (e.g., echocardio- graphic report)	52	10	15	23		
Laboratory reports	77	7	7	9		
Radiologic images	69	10	10	10		
Radiologic reports	78	7	7	8		
Computerized provider-order entry						
Laboratory tests	20	12	25	42		
Medications	17	11	27	45		
Decision support						
Clinical guidelines (e.g., beta-blockers af- ter myocardial infarction)	17	10	25	47		
Clinical reminders (e.g., pneumococcal vaccine)	23	11	24	42		
Drug-allergy alerts	46	15	16	22		
Drug-drug interaction alerts	45	16	17	22		
Drug–laboratory interaction alerts (e.g., digoxin and low level of serum potas- sium)	34	14	21	31		

Jha et al, N Engl J Med 2009;360:1628-38.



### Protocol

is built of

Order sets

is built of

**Preconfigured orders** 

is built from

Order dialog

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Slide courtesy of Bill Galanter, MD

## The Rationale for Order Sets

- Reduce the time required to enter orders
- Reduce errors and increase accuracy during order entry
- Increase completeness of orders
- "Built in" decision support and evidence driven care
- Reduce variability in the care process and enhance compliance with "best practices"

## Example Order Set: General Admit Orders

🤐 Careset - General Admit Orderset		
Component General Admit Orders Last Modified 10/18/04 DOT	Order Details T;N	Order Entry Directions 🛱
Click on Ad Hoc Charting Icon, double-click on HT/WT/ALLERGIES		
DIAGNUSIS: Click on Pt Info Tab, then problem list; Right-Click to "Add Problem".		
Admit to	OBSERVATION, Requested date/time: T;N	
Condition	T;N	
Isolation symptoms	Requested date/time: T;N	
NURSING:		
Vital signs per unit routine	Requested date/time: 1;N	
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CALL PROVIDER:		
Call provider for	Requested date/time: T;N	
ONLY stable, uncomplicated patients admitted to Medicine (House or Specialty) are eligible for Nightfloat admission.		
Nightfloat admits only: Call overnight SENIOR RESIDENT until 0730 then call INTERN		
NUTRITION - Refer to Nutrition Clinical Category for other Diet Options		
NPO	NPO start date/time: T;N	
Standard Formula	Requested date/time: T;N	
Breast Feeding	Requested date/time: T;N	Standard Diet Orders
Standard Diet	Diet type: Clear liquid, Requested date/time: 1;N	
Standard Diet	Diet type: Fuil liquid, Requested date/time: 1 (N	
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	rrequested date/time. 1,14	
NOTE: Decrease Potassium for patients with poor renal function or hyperkalemia, increase if risk fo hypokalemia (diuretics, digoxin). Suggested maintenance fluid rate is: 4ml/kg for the first 10kg, 2ml/kg for each kg between 10 and 20kg, then 1ml/kg for every kg over 20kg. For Weight less than 12 kg:	Ho	ouse wide Standard IV infusions
D5 1/4NS + potassium chloride 20 mEq/L 1000 mL	IV + P0 mL/hr, routine, Start date/time 09/26/05 18:2	20
D5 1/4NS 1000 mL	IV NEED RATE, routine, Start date/time 09/26/05 18	3:20
For Weight greater than 12 kg:		
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D5 1/2NS 1000 mL	IV NEED RATE, routine, Start date/time 09/26/0518	3:20
Heparin Flush for Peripheral IV Orderset		
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III acetaminophen	15 mg/kg rectally Q 4 hrs PRN for fever	

Slide courtesy of Matt Eisenberg, MD

EST, ORDERSONLINE8 11620297 7197 PCP: **Allergies** (11-13-2005)	Inpatient 2 years Male DCW: 13.00 kg (04-18-2006)	z911 - Z00150
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earch Results		
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After Hours Recovery Orderset	Central Line Outpatient Orderset CF Admit Orderset	ED Bronchiolitis Orderset
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Anesthesia NPO Orderset	Coagulation and Hematology Lab Orderset	ED Dehydration Orderset
Antesthesia Pie Op Orderset	Continuous Renal Replacement Therapy Orderset	ED Fever 0-30 Days Orderset
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)Baclofen Test Admit Orderset Bacterial Endocarditis Prophylaxis Orderset	Cyclophosphamide Infusion Orderset Cystic Fibrosis Admit Orderset	ED Interim Admit Orderset ED Intubation Orderset
Blood Cultures Orderset Bone and Joint Infection Admit Orderset	Cystic Fibrosis Lab Orderset	ED Intussusception Orderset ED Ketamine Sedation Orderset
Bronchiolitis Admit Orderset	Day Surgery Orderset	ED Laceration Orderset
Bronchoscopy Pocification Orderset	Dental Day Surgery Orderset	ED Migraine Orderset
Cardiac Surgery Anesthesia Pre Op Orderset	Dermatology Day Surgery Orderset	ED Observation Admit Orderset
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)Cardiac Surgery General Transfer Orderset )Cardiac Surgery Heart Transplant Immunosuppression Orderset	<ul> <li>Discharge Orderset</li> <li>DKA Admit Orderset</li> </ul>	
Cardiac Surgery Heart Transplant Post Op Orderset Cardiac Surgery Heart Transplant Pre Op Admit Orderset	Eating Disorder Med Admit Orderset	
Cardiac Surgery Heart Transplant Thymoglobulin (ATG)Orderset	ECLS Initiation Orderset	
Cardiac Surgery Mediastinal Irrigation Orderset	ECMO Initiation Orderset	
Cardiac Surgery Post Op Ward Orderset	Constrainingeneric orderset	
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	$\bigcirc$	$\bigcirc$						
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8	PrecAUTIONS:     Pregnant: YES: NO: A     Fall Risk    Mental Status Changes     May remove immobilizing device during procedure	ALLERGIES Isolation						
	May discontinue Telemetry for transport and during pr      RADIOLOGY     NUCLEAR MEDICINE     ULTRASOUND     Check all boxes that apply     PREGNANT:     EDCby LMP of     Prev US onatwks     TRANSPLANT:     Type:     Date of TX	rocedure       Other:         CT       MRI         WEIGHT(required)       Creatinine(required)         Check all boxes that apply       PACEMAKER or DIABETES         DIABETES       NEURO STIMULATOR         B/P MEDS       ANEURSYM CLIPS         RECENT BARIUM STUDY       ANXIOLYSIS to be administered onior to MRI (only if ot < 65.						
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	RELEVANT HISTORICAL DATA: <u>ADMITTING DIAGNOSIS</u> : Surgery: Lab, X-I DATE:TIME:ATTENDING ORDERING <b>MD SIGNATURE</b> : PLEASE PRINT NAME	Ray           PHYSICIAN (required)           UWP #           BEEPER #						
	TECHNOLOGIST COMMENTS:							
	Film Used           14X17         14X14         11X14         10X12         9X9           8X10         CONTRAST USED         0	PLACE EXAM FORM HERE						
	PT.NO	UW Medicine Harborview Medical Center – UW Medical Center University of Washington Physicians Seattle, Washington RADIOLOGY PHYSICIAN ORDERS						
	DOB	*U0809* WHITE – MEDICAL RECORD						







### EpicCare is worth the time and effort (33 clinicians responding)

INTERNATIONAL JOURNAL OF MEDICAL INFORMATICS 79 (2010) e58-e70



journal homepage: www.intl.elsevierhealth.com/journals/ijmi

## Anatomy of a failure: A sociotechnical evaluation of a laboratory physician order entry system implementation

### Linda W. Peute<sup>a,\*</sup>, Jos Aarts<sup>b</sup>, Piet J.M. Bakker<sup>c</sup>, Monique W.M. Jaspers<sup>a,\*</sup>

<sup>a</sup> Department of Medical Informatics, Academic Medical Center, Univer Los Angeles Times: Hospital Heeds Doctors, Suspends Use of Software Page 1 of 3 <sup>b</sup> Institute of Health Policy and Management, Erasmus MC, Rotterdam <sup>c</sup> Department of Quality and Process Innovation, Academic Medical Ce ARTICLE INFO ABSTRACT Los Angeles Times AIR CANADA 🕷 Article history: Objective: To investigat Received 31 January 2008 puterized Physician Or Received in revised form process and to analyze 20 May 2009 academic medical setti http://www.latimes.com/news/printedition/california/la-me-cedars22jan22,0,1528318.story?coll=la-headlines-pe-california Accepted 29 June 2009 how to manage challen implementations. CALIFORNIA Methods: The themes s ysis of literature on CP Keywords: **Hospital Heeds Doctors, Suspends Use of Software** Computerized Provider Order Entry reference model for 20 : tation process with 11 CPOE related project docume Human Factor Engineering user discussion rounds Success and failure factors Cedars-Sinai physicians entered prescriptions and other orders in it, but called it unsafe. By Charles Ornstein Times Staff Writer January 22 2003 Cedars-Sinai Medical Center, the largest private hospital in the West, is suspending use of a multimillion-dollar computerized system for doctors' orders after hundreds of physicians complained that it was endangering patient safety and required too much work. Ironically, the computer software was designed to do the opposite: Reduce medical errors, allow doctors to track orders electronically, and warn them about dangerous drug interactions and redundant laboratory work.

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# Mortality rates pediatric hospitals before and after CPOE



Fig 1. Observed mortality rates (presented as a normalized % of predicted mortality) during the 18-month study period are plotted according to quarter of year. Observed mortality rates were consistently better than predicted before CPOE implementation, but this relationship did not remain after CPOE implementation. \*P < .05 and tP = .07, (observed vs predicted mortality, z statistic). Q, quarter.



# What is Medical Informatics? (attributed to Homer Warner)

Technology 10%

Medicine 10%

Sociology 80%



## Topics for today

- What is CPOE, and why is it hard?
- What we have learned over the last decade
- What we don't know about CPOE
- CPOE project in UW Medicine
- Questions and discussion

## Unintended consequences of CPOE

Ash et al, J Am Med Inform Assoc. 2007;14:415–423

- More/new work issues
- Workflow issues
- Never ending demands
- Paper persistence
- Communication issues

- Emotions
- New kinds of errors
- Changes in power structure
- Overdependence on technology

### CPOE is part of Meaningful Use

structured data of these elements. Therefore, in support of the HITECH Act in meeting the statutory requirements, we have expanded the core set of measures to include these fundamental elements to improve patient care. Below we list the objectives included in the core set of meaningful use objectives. -Use CPOE -Implement drug to drug and drug allergy interaction checks —E-Prescribing (EP only) -Record demographics —Maintain an up-to-date problem list -Maintain active medication list -Maintain active medication allergy list

—Record and chart changes in vital signs

-Record smoking status

updates, and 5 minutes listening to suggestions and comments.

### PROBLEMS ENCOUNTERED

During the first three months of inpatient use of CPRS, the main problems described by users are summarized in Table 2. Some of the problems listed in this table affect specific user groups more than others, while some (system availability) affect all users

### Physicians

in house espond to are 2 or The most common problems described by physicians are the length of time required to enter orders, difficulties entering outpatient medications for inpatients, difficulty in handling orders when patients are transferred, and interruption of workflow required

Payne TH, The transition to direct practitioner order entry in a teaching hospital: the VA Puget Sound Experience. Proc AMIA Annu Fall Symp, 1999.

Medicine session in Surgical p training. iff receive ort session fts receive lable on all uides are

the first

## Devices for entering orders in the hospital







## Layers of infrastructure

Care delivery, clinical mission, quality

Results review, documentation, CPOE

EMR with interfaces

Point-of-care devices

Network, fixed and wireless

Power, HVAC



## Total and overridden allergy alerts

[Abookire et al Proc AMIA 2000]



## CPOE effects on workflow

Niazkhani et al. J Am Med Inform Assoc. 2009;16:539–549.

Beneficial	Detrimental
Order turn around time	Time spend entering orders
Remote access	Usability
Time for antibiotics to reach patient	In-person communication
Improved order legibility	Shifting responsibilities
Reduction in verbal orders	Communication of STAT orders

## **Resumption** lag

## The time taken to re-orient and resume a primary task at the end of an interruption

J Am Med Inform Assoc 2010;17:575-583.





Trafton JG, Altmann EM, Brock DP, et al. Preparing to resume an interrupted task: effects of prospective goal encoding and retrospective rehearsal. Int J Hum Computer Stud 2003;58:583e603.

### Effect of point-of-care computer reminders on physician behaviour: a systematic review [Shojania et al CMAJ 2010;182]



Figure 2: Median absolute improvements in adherence to processes of care between intervention and control groups in each study. Each study is represented by the median and interquartile range for its reported outcomes; studies with single data points reported only one eligible outcome.



biomedical and health informatics

## Order entry and physician time

- Early experience at BWH in Boston
  - Time-motion study[Bates et al, Proc SCAMC 1994]
  - Writing orders on computer took ~2x as long: 44 min for medical and 73 min for surgical house officers
  - Medical house officers recovered  $\frac{1}{2}$  this time
- Later BWH experience: Time entering orders increased from 2.1% to 9.0% [Bates et al.AMIA Proc 2000]
- Regenstrief inpatient experience: Time entering inpatient orders doubled.
- After 15 years' tailoring, Regenstrief outpatient system probably time neutral [Overage et al JAMIA 2001]
- VA CPRS experience: CPRS required 11-19 minutes for inpatient admission orders [Lovis et al, JAMIA 2001]

## Topics for today

- What is CPOE, and why is it hard?
- What we have learned over the last decade
- What we don't know about CPOE
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- Questions and discussion

## What don't we know?

- How much time does it take to enter orders?
- In newly implemented sites, does CPOE result in greater safety?
- What effect does CPOE have on costs of care?
- How can we best help clinicians write orders for safe, effective care?

#### ORIGINAL INVESTIGATION

#### HEALTH CARE REFORM

### Unintended Effects of a Computerized Physician Order Entry Nearly Hard-Stop Alert to Prevent a Drug Interaction

A Randomized Controlled Trial

Brian L. Strom, MD, MPH; Rita Schinnar, MPA; Faten Aberra, MD, MSCE; Warren Bilker, PhD; Sean Hennessy, PharmD, PhD; Charles E. Leonard, PharmD; Eric Pifer, MD

**Background:** The effectiveness of computerized physician order entry (CPOE) systems has been modest, largely because clinicians frequently override electronic alerts.

Methods: To evaluate the effectiveness of a nearly "hard stop" CPOE prescribing alert intended to reduce concomitant orders for warfarin and trimethoprim-sulfamethoxazole, a randomized clinical trial was conducted at 2 academic medical centers in Philadelphia, Pennsylvania. A total of 1981 clinicians were assigned to either an intervention group receiving a nearly hard stop alert or a control group receiving the standard practice. The study duration was August 9, 2006, through February 13, 2007.

**Results:** The proportion of desired responses (ie, not reordering the alert-triggering drug within 10 minutes of firing) was 57.2% (111 of 194 hard stop alerts) in the intervention group and 13.5% (20 of 148) in the control group (adjusted odds ratio, 0.12; 95% confidence interval, 0.045-0.33). However, the study was terminated early because of 4 unintended consequences identified among patients in the intervention group: a delay of treatment with trimethoprim-sulfamethoxazole in 2 patients and a delay of treatment with warfarin in another 2 patients.

**Conclusions:** An electronic hard stop alert as part of an inpatient CPOE system seemed to be extremely effective in changing prescribing. However, this intervention precipitated clinically important treatment delays in 4 patients who needed immediate drug therapy. These results illustrate the importance of formal evaluation and monitoring for unintended consequences of programmatic interventions intended to improve prescribing habits.

Trial Registration: clinicaltrials.gov Identifier: NCT00870298

Arch Intern Med. 2010;170(17):1578-1583



NTICOAGULANTS, ESPEcially warfarin, are the cornerstone of therapy for several diseases, including the prophylaxis and treatment of pulmonary embolism, venous thrombosis, and atrial fibrillation with embolization. Although anticoagulants confer significant benefits, they are tients using warfarin who initiated any of several antibiotic therapies, 69% of patients using trimethoprim-sulfamethoxazole exhibited clinically significant elevations in the international normalized ratio to greater than 4. Adverse bleeding events developed in 13% of the patients exposed to trimethoprim-sulfamethoxazole and in none of the other antibiotic groups stud-

B, A/ALLEN	MICU common orders
ADC VAAN DISML display Pharmacy alerts ♦ (click on alerts for more information) Zosyn no longer available-click here for information Amiodarone may enhance pharmacologic effects of hydantoin Admission admit to micu ►Apr 15 01:00 admit to service: red ►Apr 15 01:00 attending: snapper xxxx ►Apr 15 01:00 initiate collaborative path phase 1 ►Apr 15 08:00 initiate level of care: level 1 ►Apr 15 01:00 Diagnosis diagnosis: heart failure, congestive (428.0) ►Apr 15 01:00 patient specific data weight: 53.5kg/117.9lb; height: 154cm/6 Condition condition: guarded ►Apr 15 01:00 Vital signs measure weight qam 05 ►Apr 15 05:00 vital signs q2h ►Apr 15 00:57 Activity/limitations activity-bedrest ►Apr 15 01:00	<pre>1. emergency drugs / code in MICU &gt; 2. STAT labs / tests &gt; 3. next morning STAT labs / tests &gt; 4. QAM STAT labs / tests &gt; 5. MICU orders &gt; 6. medications &gt; 7. workups &gt; * * 8. initiate level of care:</pre>
Allergies no known allergies ►Apr 15 01:00	
Nursing instructions catheter drng-measure & record per unit save - to gravity drainage > Apr 15 01:00	gen 80 iv q12h ⊥
Print         Change display F2         D/C         C/S         Order sets F4	Image: Second systemImage: Second system <td< td=""></td<>

🖑 VistA CPRS in use by: Lovis,C	hristian (TEST)			٥×
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000-00-1929 May 03,1929 (70)	Provider: LOVIS,CF	100% Aspirin EC 325mg po QD		
Active Problems	Allergies / A	100% Aspirin EC 325mg i po QD #100 RX3		
Multiple Sclerosis	No Known	99% Aspirin EC 325mg po QD #30 RX3		
Bladder Dysfunction		99% Aspirin EC 325mg i po QD #90 RX3		
Cognition/Percentual Problems		99% Aspirin EC 325mg 1 po QD #30 RXII		
Lower Extremity Dysfunction		95% Aspirin Supp 325mg PR on admission		
Mobility Deficits		90% Aspirin ormy po qu 80% denirin Slma chemable no OD		
Upper Extremity Dysfunction	-	88% Aspirin Chewable 81mg no 0D #36 RX3		
Active Medications		88% Aspirin Chew 81mg i po 0D #108 RX3		
Heparin 25000u In Ini Soln	Pending	87% Aspirin EC 975mg (Easprin) po QID #120 RX3		
Integrilin/Placebo Study Inj	Pending	87% Aspirin Chewable 81mg po on admission		
Eptifibatide Inj	Pending	80% ASPIRATES		
Percent Lab Perculta		75% Aspirin 325 mg qd		
Retrieving in background		68% EC Aspirin 325mg po QD POD #2		
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	B	67% EC Aspirin 325mg po qd once extubated		
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	PI	64% Aspirin for cardiac prophylaxis		
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The New England Journal of Medicine

Special Article

### A COMPUTER-ASSISTED MANAGEMENT PROGRAM FOR ANTIBIOTICS AND OTHER ANTIINFECTIVE AGENTS

R. Scott Evans, Ph.D., Stanley L. Pestotnik, M.S., R.Ph., David C. Classen, M.D., M.S., Terry P. Clemmer, M.D., Lindell K. Weaver, M.D., James F. Orme, Jr., M.D., James F. Lloyd, B.S., and John P. Burke, M.D.

### ABSTRACT

**Background and Methods** Optimal decisions about the use of antibiotics and other antiinfective agents in critically ill patients require access to a large amount of complex information. We have developed a computerized decision-support program linked to computer-based patient records that can assist physicians in the use of antiinfective agents and improve the quality of care. This program presents epidemiologic information, along with detailed recommendations and warnings. The program recommends antiinfective regimens and courses of therapy for particular patients and provides immediate feedback ACED with an increasing loss of autonomy in the managed care marketplace, physicians often view the debate about the quality of care as simply about finding ways to reward them for doing less for patients and to control costs by the use of arbitrary rules for clinical care.<sup>1</sup> Skeptics view quality-of-care projects as a disguised form of marketing; this skepticism will not disappear until physicians can see quality-of-care efforts that make difficult decisions easier and more accurate.<sup>2,3</sup> Establishing systems for improving care is difficult, at best. for groups of specialist physicians. but it is next

biomedical and health informatics

NEJM1998; 338:232-238



# Display of past results [Tierney, Ann Intern Med 1987]

<b>1.PATIENT ID</b> 99999999-7	2.VISIT D	<b>OATE 3.TIME</b> 09:25	4.ORDER	ALD,CLEM	5.HOW ILL NO SX
6.TEST NAME		Previous value	S		
LYTES		Test Name	17 SEP 79	31 MAY 79	16 MAR 79
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## UW Medicine, Seattle

### • Hospitals

Harborview Medical Center UW Medical Center Seattle Cancer Care Alliance 949 beds, 51,000 admissions Northwest Hospital 281 beds, 11,246 admissions

### • Clinics

1.4 million outpatient and ER visits Northwest Hospital 463,804 outpatient and ER visits

### • Staff

1,200 attending physicians Northwest Hospital 624 medical staff 1,100 residents 800 medical students 1,200 nurses





http://www.nwhospital.org/aboutus/

# EHR and CPOE status at selected Seattle area medical centers

	April 2002	Sept 2008	Jan 2011
Children's Hospital and Medical Center	Signed contract, implementing	Inpatient and outpatient CPOE, results review	Full CPOE
Evergreen Medical Center	Signed contract, implementing	ER, results review, inpatient documentation, outpatient EHR	Implementing CPOE
Group Health Cooperative of Puget Sound	Signed contract	Outpatient CPOE and documentation, shared health record	Full CPOE
UW Medicine	Signed contract	Physician documentation, pharmacy, medical records, RN/ inpatient documentation	Implementing CPOE
Virginia Mason Medical Center	Signed contract, implementing	CPOE, clinic, working on MD documentation, inpatient RN documentation	Full CPOE
VA Puget Sound Health Care System	CPOE and EHR in production	Full inpatient, outpatient EHR with CPOE and documentation.	Full CPOE
Swedish Medical Center		Implementing CPOE and documentation	Full CPOE

## Inpatient CPOE project at UW Medicine



At same time: EpicCare Ambulatory Rollout



## CPOE project team



## CPOE project The numbers.

Number of orders: ~33,000 per day





## Order modalities

Department	Туре	
Anesthesia	Consults	
Anticoagulation Clinic	Consults	
Behavioral Medicine	Consults	
Blood Bank/Transfusion Services	Lab	
Bone Marrow Transplant	Consults	
Cardiac Cath Lab	Diagnostic Procedures	
Cardiology Diagnostics	Diagnostic Procedures	
Cardio-Thoracic Surgery	Consults	
Cerebrovacular Lab	Diagnostic Procedures	
Chaplain service	Consults	
Chart Request	PDS	
Chemical Dependency	Rehab	
Colorectal Surgery	Consults	
Computerized Tomography	Imaging	
Dermatology	Consults	
Dialysis	Procedures	
Echocardiography	Diagnostic Procedures	
EEG	Diagnostic Procedures	
Electrocardiology	Diagnostic Procedures	
EMG	Diagnostic Procedures	
ENT	Consults	
Enterostomal Care	Consults	
EOG/ERG (Ocular Procedures)	Diagnostic Procedures	
Evoked Potential	Diagnostic Procedures	
Gamma Knife	Diagnostic Procedures	
Gastroenterology & Hepatology	Consults	
General Lab	Lab	
Geriatrics	Consults	
GI Endoscopy	Diagnostic Procedures	
Grid Mapping Procedures	Diagnostic Procedures	
Gynecologic Oncology	Consults	
Hematology/Oncology	Consults	
Infectious Disease	Consults	
Internal Medicine	Consults	
Interpreter Services	Consults	
IV Therapy	IV Therapy	
Life Center NW	Consults	
Lithotripsy	Consults	
Long Term Epilepsy Monitory	Diagnostic Procedures	
Mammography	Imaging	
Meals	Dietary	
Medical	Consults	

## Summary

- Despite the decade's experience, CPOE is regarded as the most challenging clinical computing project at most sites
- There is broader understanding of the risks CPOE implementations pose, and enthusiasm for enhancing decision support.
- Much evidence supporting CPOE benefits derives from before-after study design. There are few randomized trials.
- UW Medicine at long last has embarked on an inpatient CPOE projected projected to go live in 2012

## Topics for today

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