

# Preventing the Unintended Adverse Consequences of CPOE

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# Oregon is in the Northwest U.S.



# Portland is the city of roses



# Portland is also in the shadow of Mount St. Helen's

- We have experience with unintended consequences!
- If you cannot prevent them, you can at least try to manage them



# CPOE implementation has its upsides and downsides

## Outline

- Background
- Methods
- Results
  - Unintended adverse consequences
  - Prevention of them



# What is computerized physician order entry (CPOE)?

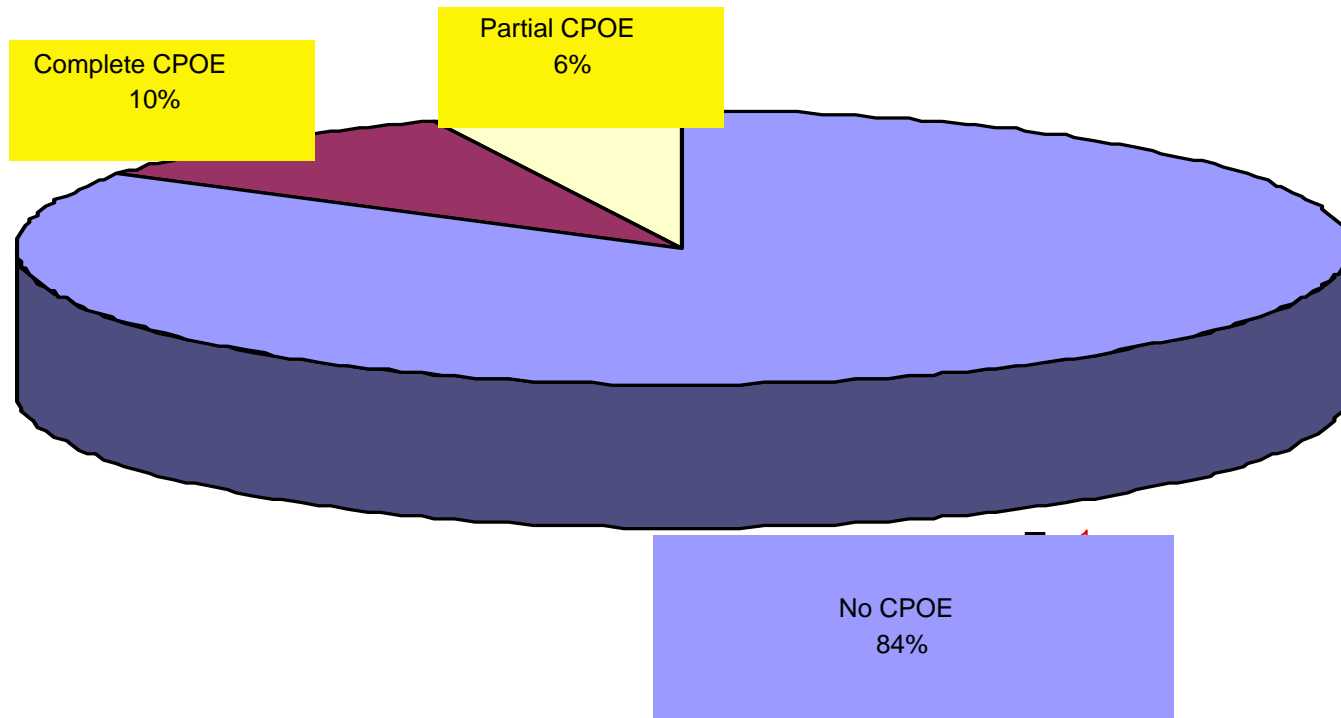
Process which allows a physician to use a computer to directly enter medical orders

Usually part of a suite of clinical applications



# Our two surveys showed that adoption of CPOE is low

CPOE in U.S. Hospitals 2003



## We turned to qualitative methods

- To find out why CPOE has not diffused
- To identify success factors for implementing computerized physician order entry
- To describe unintended consequences

# There are frightening stories about the unintended consequences of CPOE

- Story 1: University of Virginia
- Story 2: Cedars-Sinai
- Story 3: Pediatric mortality

# The Virginia story had a happy ending

The University of Virginia story told by Massaro

Interns look and feel like this, and they revolted



# It ended with collaboration

- The administration, clinical leaders, and house officers met weekly
- Developed time saving order sets



# Stories of Cedars and one pediatric hospital made headlines

- Cedars Sinai experienced a revolt by physicians
- Han et al. paper about increased pediatric mortality
- Han et al. Unexpected increased mortality after implementation of a commercially sold CPOE system. Pediatrics 2005.



# The story of another pediatric hospital did not make headlines

- Study by Del Beccaro et al. showed no increased mortality
- Listened to users and implemented with care
- Del Beccaro et al. Pediatrics 2006



# Methods: The POE team (POET) is multidisciplinary

- Joan S. Ash, Ph.D., M.L.S., M.B.A.
- Dean F. Sittig, Ph.D.
- Richard H. Dykstra, M.D.
- Emily M. Campbell, R.N., M.S.
- Ken P. Guappone, M.D.
- James Carpenter, R.Ph., M.S.



# Then we did fieldwork

- Five sites for success factors study
- Five hospitals for unintended consequences study



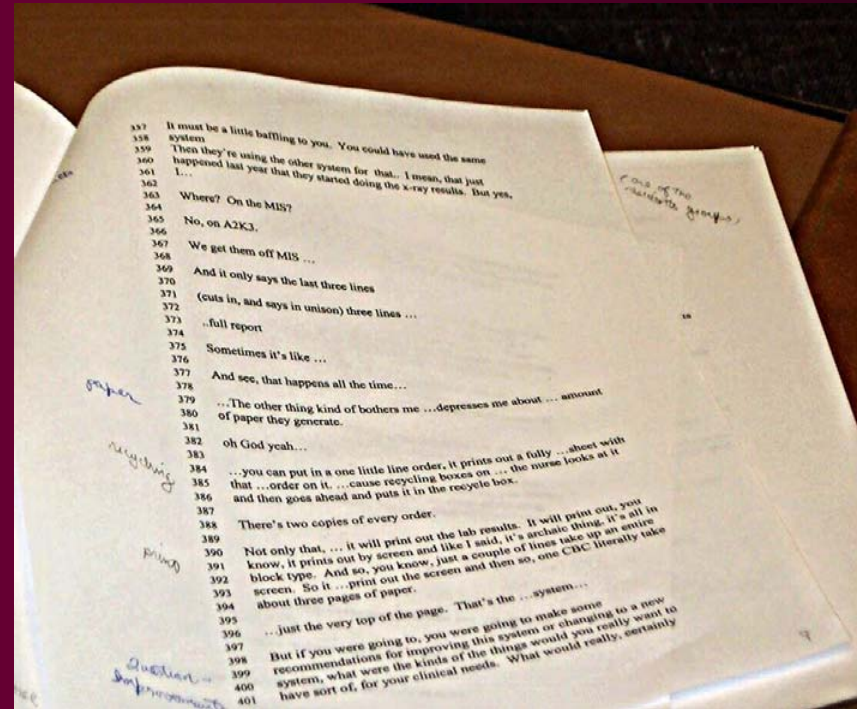
# We used multiple researchers, methods, sites, and types of subjects to assure trustworthiness

- Observation: 784 person-hours
- Interviews, focus groups: 87
- Over 2000 pages of data



# We analyzed the data iteratively, individually

- Coding the transcripts
- Use of software
- Building themes



# We met to conduct team analysis

- 2,173 pages of data
- 86 analysis meetings
- Agreement on patterns and themes
- Found 380 unintended consequences



# Positive Consequence

“he turns the patient instructions on the screen to the patient and they go over it line by line, clarifying any questions. Patient finds error”

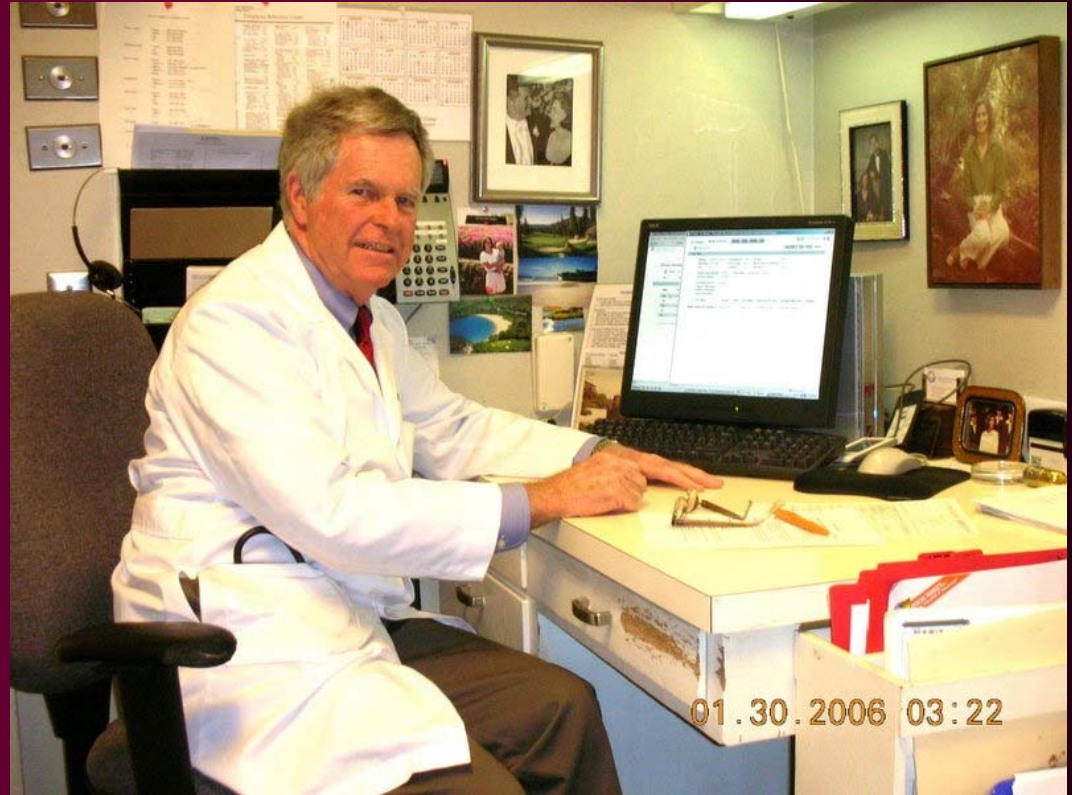
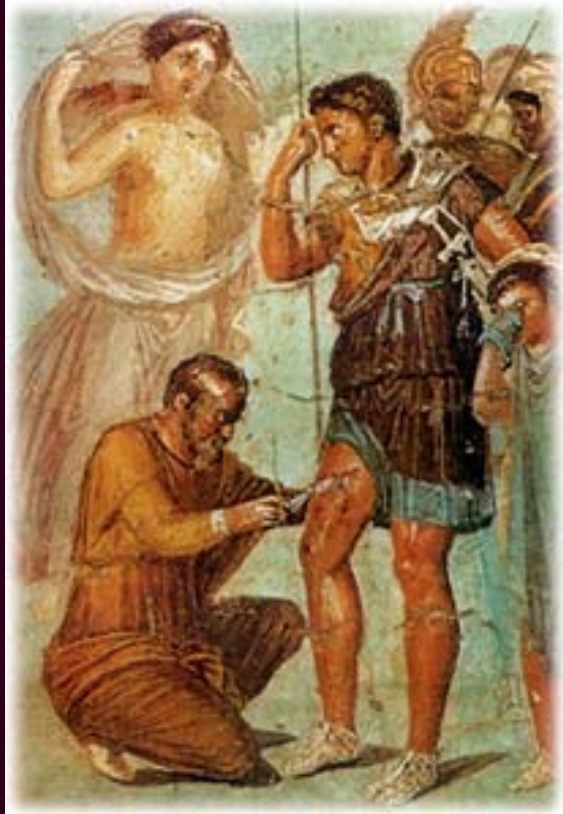


# Types of unintended adverse consequences we identified

- More/new work for clinicians
- Workflow issues
- Never ending system demands
- Paper persistence
- Changes in communication patterns
- Emotions
- New kinds of errors
- Changes in the power structure
- Overdependence on the technology



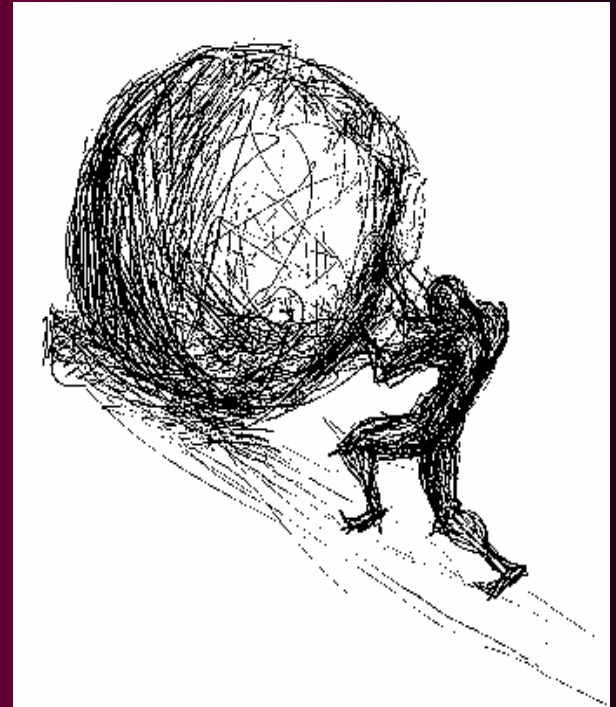
# CPOE creates new work for clinicians and changes their workflow



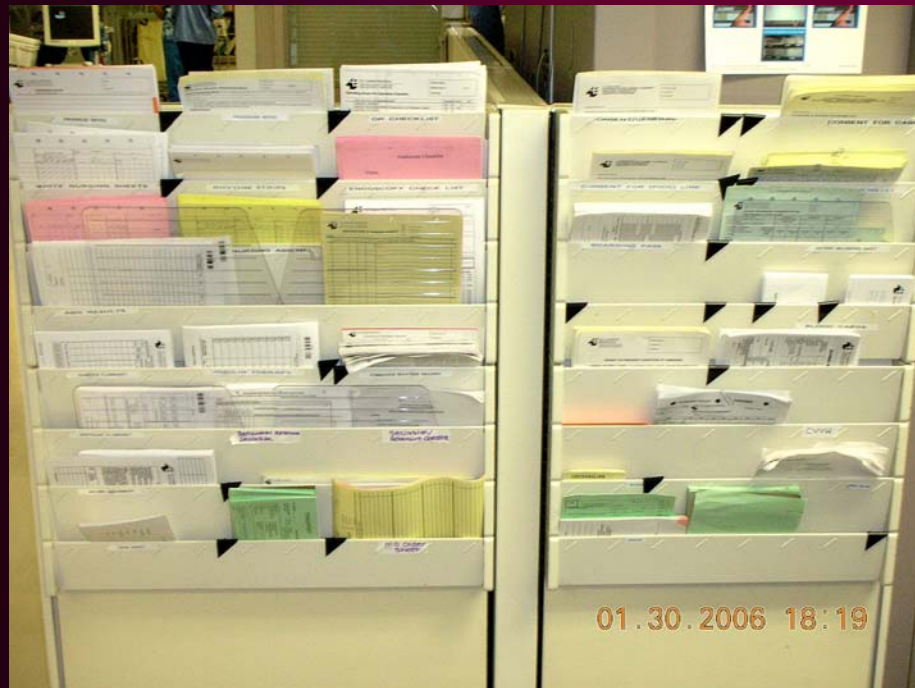
- Enter new data; re-entry of data; no double checks
- Respond to alerts
- Expend extra time in completing non-routine, complex orders

# CPOE causes never ending system demands for information technology organization

- Demand for hardware & software purchase, implementation, and maintenance
- Personal order sets are difficult to standardize, update, or maintain over time
- Users demand more sophisticated functionality



# Paper persistence means hospitals are not “going paperless”



**Paper used as temporary, handwritten data storage system.**

**Paper used as portable, disposable, computer display interface**

***“ We produce 1.6 million pieces of paper per month - printed or copied –half is related to clinical care...we destroy 40% of that paper”***

**Your hospital will be paperless, the same day  
my bathroom is...**

**Michael Shabot, M.D.**

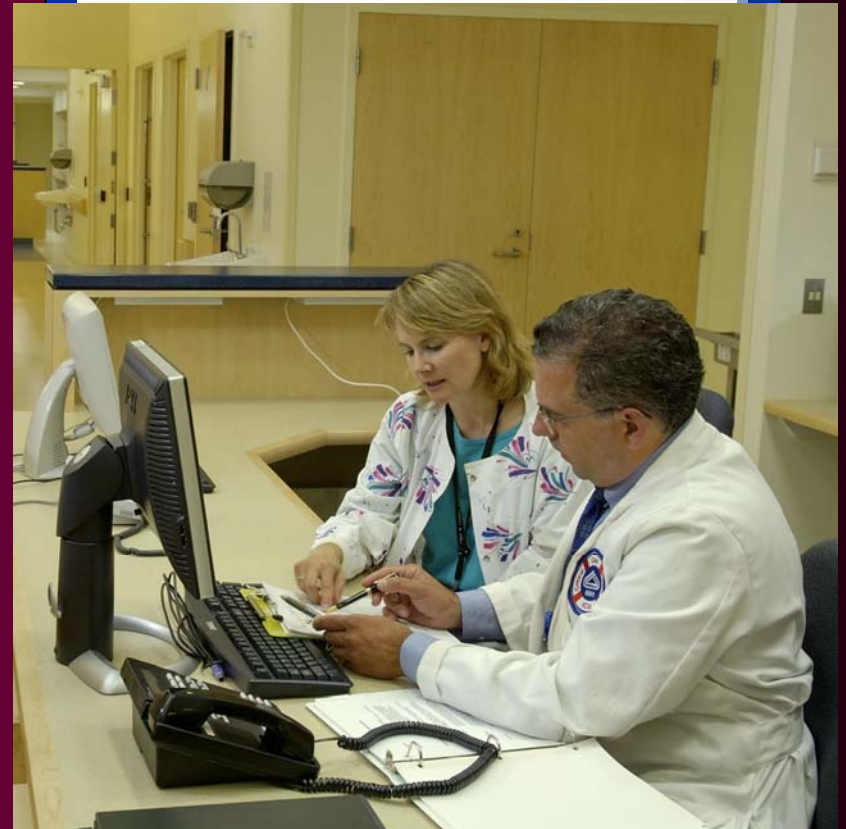
RUSSELL C. COILE, JR.

**THE PAPERLESS  
HOSPITAL**  
HEALTHCARE IN A  
**DIGITAL AGE**



# CPOE alters communication among providers, ancillary services, and clinical departments

- Causes reductions in face-to-face communication
- Causes “illusion of communication,” belief that the proper people will see it and act upon it
- Causes depersonalization



# Emotions run high

- CPOE evokes strong emotional responses
  - strongly negative
  - highly positive emotions
- Strong positive correlation between time system is in place and positive emotions



# CPOE can cause insidious silent errors

Pick lists for data entry  
promote juxtaposition  
errors

- *“I ordered the test that was right next to the one I thought I ordered, you know, right below it. My little thingie had come down and I clicked and I'm lookin' at this one but in fact I clicked on the thing before. By that time I turned my head and I'm hitting return and typing my signature and not seeing it”*

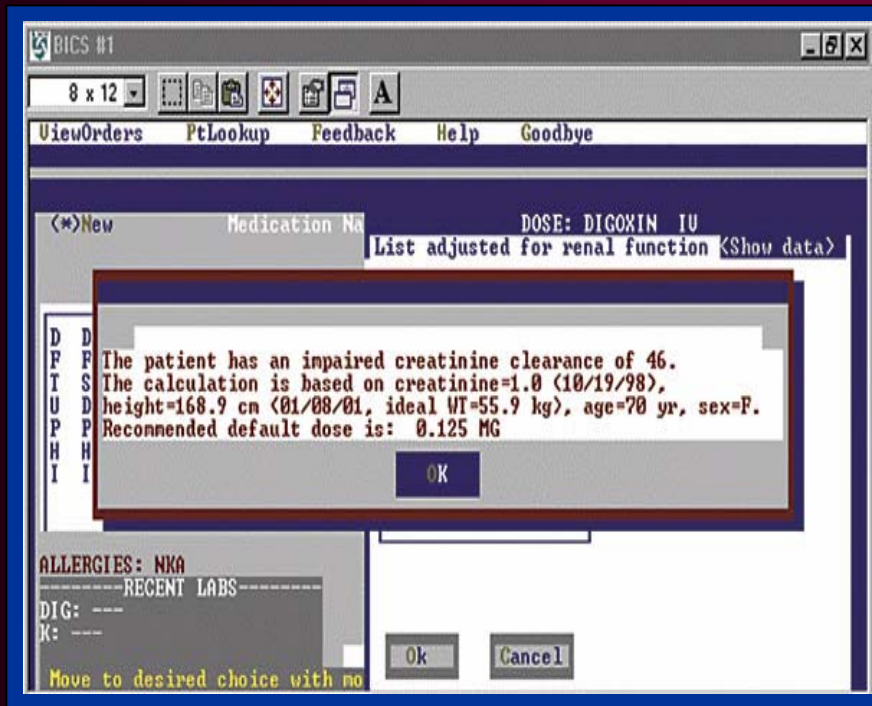


# CPOE causes changes in the power structure

- Loss of clinician autonomy
- Administration and I.T. gain power
- Clinical decision support can “tell doctors how to practice”
- Coalitions



# Clinical care becomes over dependent on the computing infrastructure



- System failures wreak havoc unless good downtime procedures exist
- Reliance on clinical decision support may reduce learning
- *“If its in the computer it must be right!”*

How can we prevent, manage,  
or overcome these unintended  
consequences?

# Prevention is related to time issues

- Speed of order entry
- Speed of full order process
- Life cycle of implementation
- Address workflow and emotions



# Prevention is related to multidimensional integration

- Systems integration
- Integration into workflow
- Fit with integrated health care delivery system
- THE HUB
- These address workflow, communication, more work, and emotions



Prevention of all unintended consequences categories is related to adequate financial resources



# Prevention is related to meeting information needs

- Technical aspects: quality of application, customizability
  - Entering dot in required field
- These address workflow, power, communication, emotions



# Prevention is related to value to users and tradeoffs

- Value: remote entry, legibility, decision support
- Tradeoffs: time, rigidity, adapting to upgrades
- These address workflow, power, communication, more work, overdependence, emotions



# Prevention is related to the existence of special people

- Administrative leaders
- Clinical leaders, champions, curmudgeons
- Bridgers / support staff, help at the elbow
- Training
- Vendor
- These address all of the types of unintended consequences



# Prevention is related to organizational culture

- Organizational culture
  - Administrative commitment, vision
  - Trust
- Leadership open to feedback, collaboration
- Collaborative project management-- CIS
- These can address all types of unintended consequences



# Prevention is related to continuous improvement through evaluation and learning

- Careful planned evaluation
- Continuous modification
- Involvement and feedback
- Address all types of unintended consequences



# Our conclusion is that it is possible to prevent many unintended consequences

- The goal is to better understand them
- To learn more about them with evaluation research
- Realize how complex CPOE is

Questions?

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