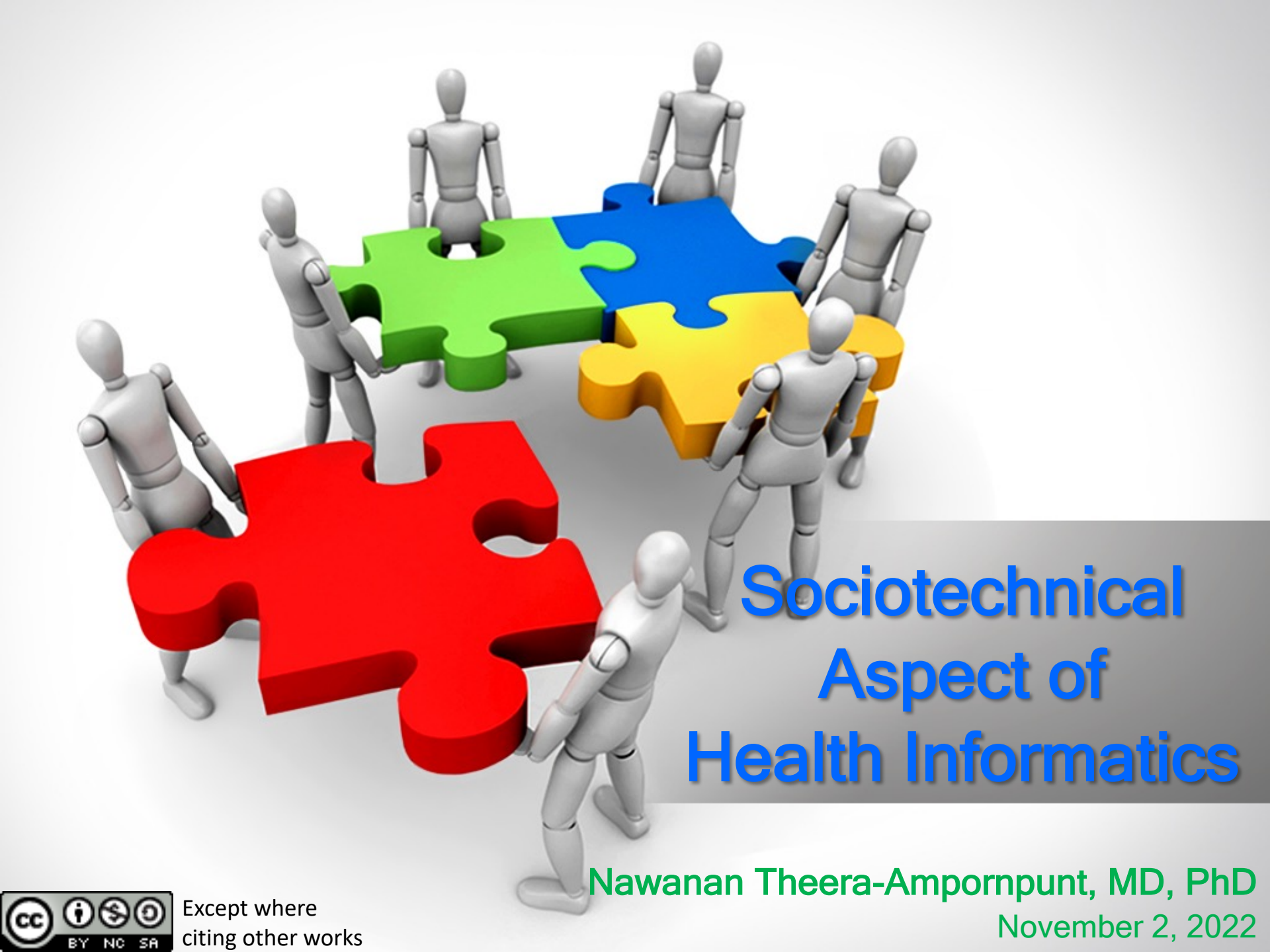


Sociotechnical Aspect of Health Informatics

Nawanan Theera-Ampornpunt, MD, PhD

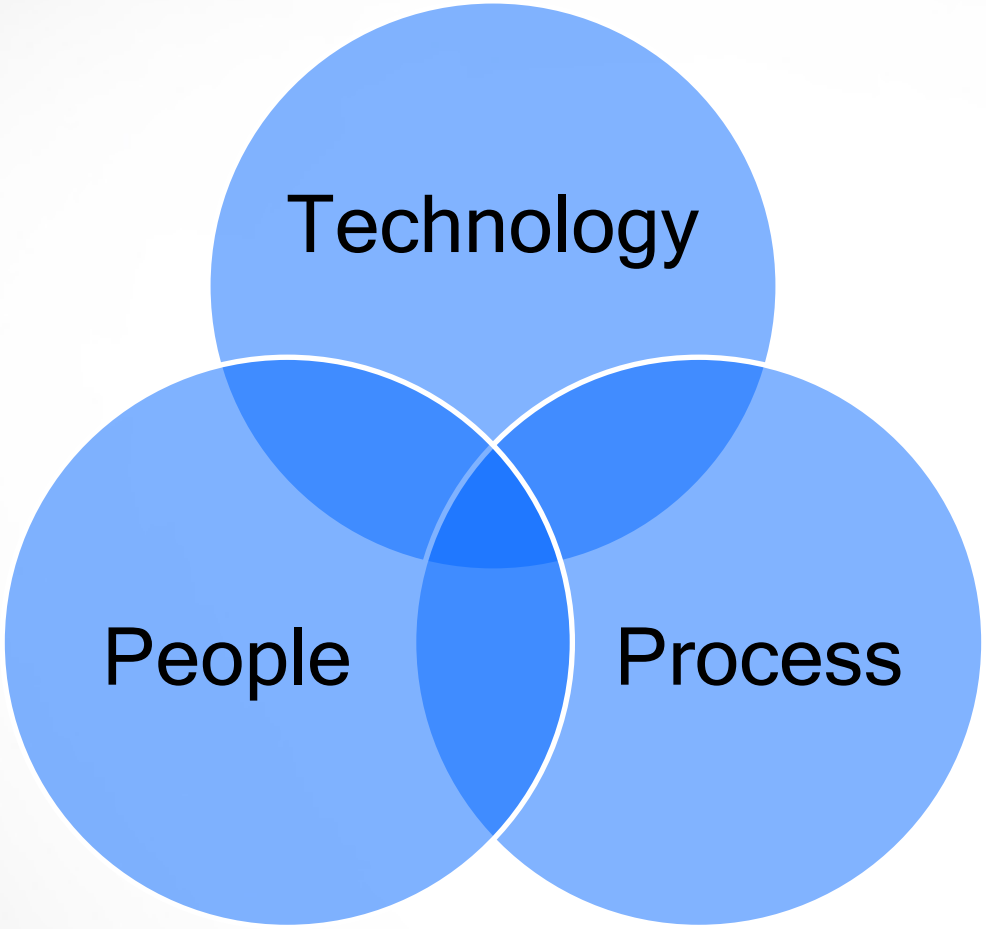
November 2, 2022

Sociotechnical Systems

- Coined in 1960s by Eric Trist, Ken Bamforth & Fred Emery
- “An approach to complex organizational work design that recognizes the interaction between people and technology in workplaces.” (Wikipedia)
- “Interaction between society's complex infrastructures and human behaviour.” (Wikipedia)

http://en.wikipedia.org/wiki/Sociotechnical_system

People-Process-Technology



"People & Organizational Issues" (POI)

- POI focuses on interactions between people and technology, including designing, implementing, and deploying safe and usable health information systems and technology.

- AMIA POIWG addresses issues such as
  - How systems change us and our social and clinical environments
  - How we should change them
  - What we need to do to take the fullest advantage of them to improve [...] health and health care.
  - Our members strive to understand, evaluate, and improve human-computer and socio-technical interactions.

http://www.amia.org/programs/working-groups/people-and-organizational-issues

"People & Organizational Issues" (POI)

- We bring varied perspectives, methods, and tools from
  - Humanities, Social science, Cognitive science
  - Computer science and informatics
  - Business disciplines
  - Patient safety
  - Workflow
  - Collaborative work and decision-making
  - Human-computer interaction & Usability
  - Human factors
  - Project and change management
  - Adoption and diffusion of innovations
  - Unintended consequences
  - Policy.

http://www.amia.org/programs/working-groups/people-and-organizational-issues

Health IT Successes & Failures

White Paper ■

Health IT Success and Failure: Recommendations from Literature and an AMIA Workshop

Bonnie Kaplan, PhD, Kimberly D. Harris-Salamone, PhD

Kaplan & Harris-Salamone (2009)

Health IT Successes & Failures

What success is

- Different ideas and definitions of success
- Need more understanding of different stakeholder views & more longitudinal and qualitative studies of failure

What makes it so hard

- Communication, Workflow, & Quality
- Difficulties of communicating across different groups makes it harder to identify requirements and understand workflow

Kaplan & Harris-Salamone (2009)

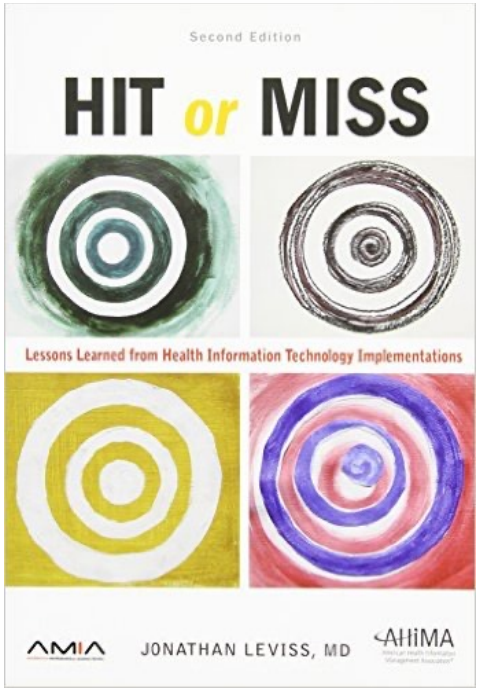
Health IT Successes & Failures

What We Know—Lessons from Experience

- Provide incentives, remove disincentives
- Identify and mitigate risks
- Allow resources and time for training, exposure, and learning to input data
- Learn from the past and from others

Kaplan & Harris-Salamone (2009)

H.I.T. or Miss: Lessons Learned from Health Information Technology Implementations



1st Edition
Leviss (Editor)
(2010)

2nd Edition
Leviss (Editor)
(2013)

Health IT Change Management

Managing Change:
An Overview

NANCY M. LORENZI, PHD, ROBERT T. RILEY, PHD

Lorenzi & Riley (2000)

Health IT Change Management

Reasons for Contemporary System Failures

Category	Examples
Communication	Ineffective outgoing communication Ineffective listening Failure to effectively prepare the staff for the new system
Culture	Hostile culture within the information systems organization Hostile culture toward the information systems area No strategies to nurture or grow a new culture
Underestimation of complexity	Missed deadlines and cost overruns Lost credibility
Scope creep	Failure to define and maintain original success criteria Failure to renegotiate deadlines and resources if criteria do change

Lorenzi & Riley (2000)

Health IT Change Management

Organizational	No clear vision for the change Unintended consequences Ineffective reporting structure Staff turnover Staff competency Provision of a technical "fix" to a management problem Lack of full support of "boss(es)" Roles and responsibilities not clearly defined or understood by everyone Several people vying to be "in charge" Adequate resources not available from the beginning Failure to benchmark existing practices Inability to measure success

Lorenzi & Riley (2000)

Health IT Change Management

Technology	System too technology oriented Poor procurement Lure of the leading (bleeding) edge Inadequate testing
Training	Inadequate or poor-quality training Poor timing of training—too early or too late
Leadership issues	Leader too emotionally committed Leader's time over committed Too much delegation without control Failure to get ownership in the effort Leader's political skills weak "Lying" to get initial approval

Lorenzi & Riley (2000)

Considerations for a successful implementation of CPOE

Considerations
Motivation for implementation
CPOE vision, leadership, and personnel
Costs
Integration: Workflow, health care processes
Value to users/Decision support systems
Project management and staging of implementation
Technology
Training and Support 24 x 7
Learning/Evaluation/Improvement

Ash et al. (2003)

Minimizing MD's Change Resistance

- Involve physician champions
- Create a sense of ownership through communications & involvement
- Understand their values
- Be attentive to climate in the organization
- Provide adequate training & support

Riley & Lorenzi (1995)

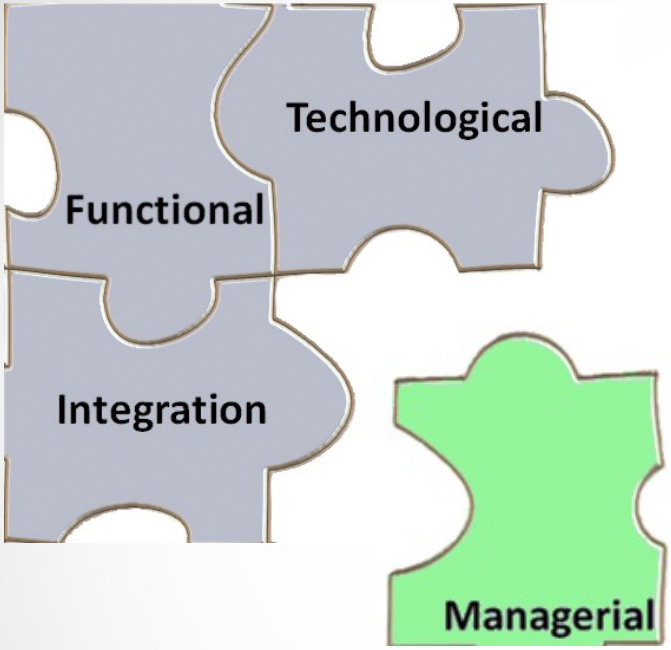
Reasons for User Involvement

- Better understanding of needs & requirements
- Leveraging user expertise about their tasks & how organization functions
- Assess importance of specific features for prioritization

- Users better understand project, develop realistic expectations
- Venues for negotiation, conflict resolution
- **Sense of ownership**
- Pare & Sicotte (2006): Physician ownership important for clinical information systems

Ives & Olson (1984)

The Missing Piece in IT Adoption



Proposed Addition

Technological Sophistication

Functional Sophistication

Integration Sophistication

Managerial Sophistication

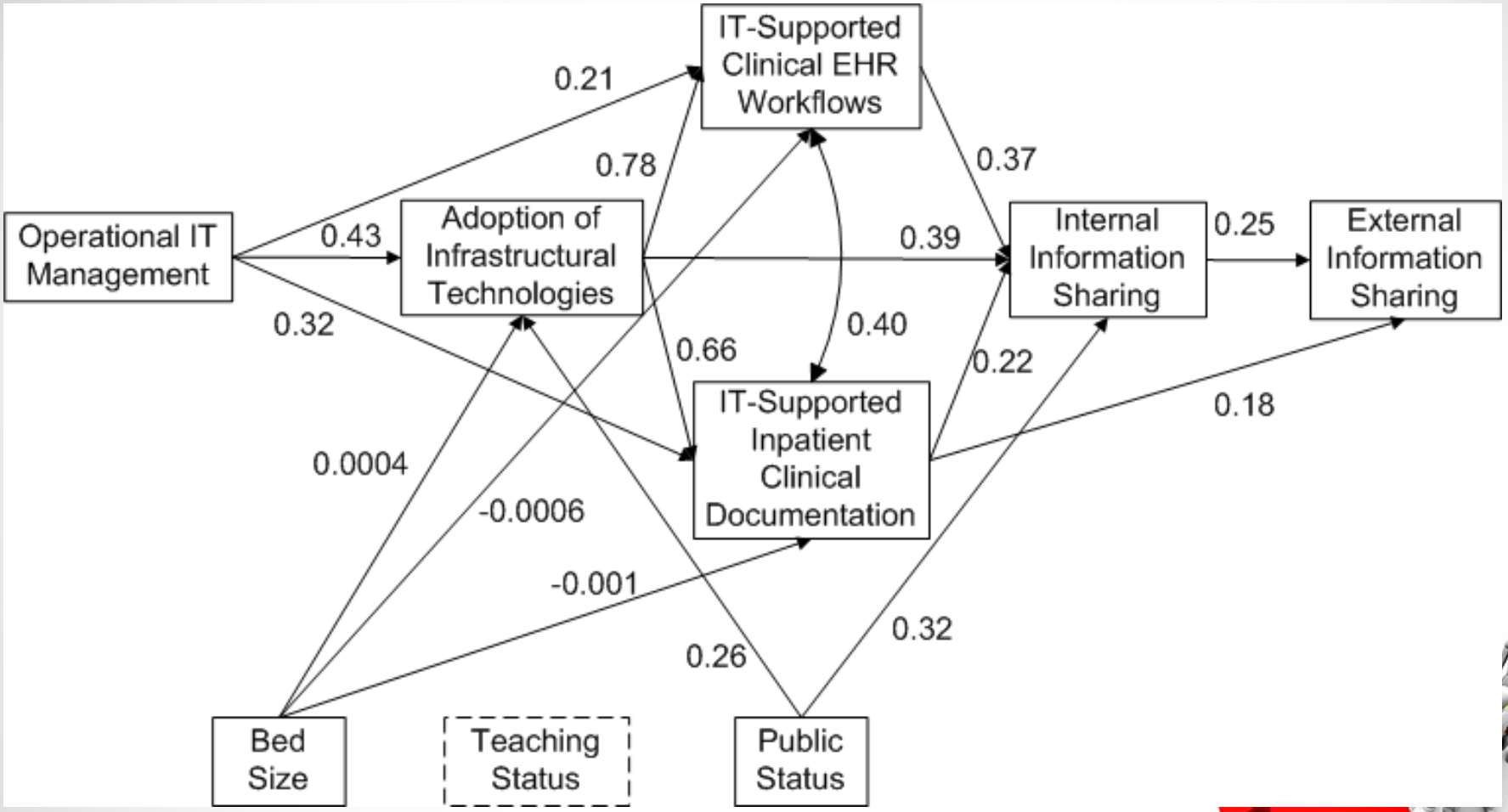
Theera-Ampornpunt (2011)

Critical Success Factors in Health IT Projects

- Communications of plans & progresses
- Physician & non-physician user involvement
- Attention to workflow changes
- Well-executed project management
- Adequate user training
- Organizational learning
- Organizational innovativeness

Theera-Ampornpunt (2011)

Theory of Hospital Adoption of Information Systems (THAIS)



Theera-Ampornpunt (2011)

The "Special People"

Implementing computerized physician order entry: the importance of special people

Joan S. Ash *, P. Zoë Stavri, Richard Dykstra, Lara Fournier

Division of Medical Informatics and Outcomes Research, School of Medicine, Oregon Health & Science University, 3181 SW Sam Jackson Park Road, Portland, OR 97201-3098, USA

Ash et al. (2003)

The "Special People"

- Administrative Leadership Level
  - CEO
    - Provides top level support and vision
    - Holds steadfast
    - Connects with the staff
    - Listens
    - Champions
  - CIO
    - Selects champions
    - Gains support
    - Possesses vision
    - Maintains a thick skin
  - CMIO
    - Interprets
    - Possesses vision
    - Maintains a thick skin
    - Influences peers
    - Supports the clinical support staff
    - Champions

Ash et al. (2003)

The "Special People"

- Clinical Leadership Level
  - Champions
    - Necessary
    - Hold steadfast
    - Influence peers
    - Understand other physicians
  - Opinion leaders
    - Provide a balanced view
    - Influence peers
  - Curmudgeons
    - "Skeptic who is usually quite vocal in his or her disdain of the system"
    - Provide feedback
    - Furnish leadership
  - Clinical advisory committees
    - Solve problems
    - Connect units

Ash et al. (2003)

The "Special People"

- Bridger/Support level
  - Trainers & support team
    - Necessary
    - Provide help at the elbow
    - Make changes
    - Provide training
    - Test the systems
  - Skills
    - Possess clinical backgrounds
    - Gain skills on the job
    - Show patience, tenacity, and assertiveness

Ash et al. (2003)

Unintended Consequences of Health IT

- "Unanticipated and unwanted effect of health IT implementation" (ucguide.org)

- Must-read resources
  - Ash et al. (2004)
  - Campbell et al. (2006)
  - Koppel et al. (2005)

Unintended Consequences of Health IT

Viewpoint Paper ■

Some Unintended Consequences of Information Technology in Health Care: The Nature of Patient Care Information System-related Errors

JOAN S. ASH, PHD, MLS, MARC BERG, MD, PHD, ENRICO COIERA, MBBS, PHD

Ash et al. (2004)

Unintended Consequences of Health IT

- Errors in the process of entering and retrieving information
  - A human-computer interface that is not suitable for a highly interruptive use context
  - Causing cognitive overload by overemphasizing structured and “complete” information entry or retrieval
    - Structure
    - Fragmentation
    - Overcompleteness

Ash et al. (2004)

Unintended Consequences of Health IT

- Errors in the communication and coordination process
  - Misrepresenting collective, interactive work as a linear, clearcut, and predictable workflow
    - Inflexibility
    - Urgency
    - Workarounds
    - Transfers of patients
  - Misrepresenting communication as information transfer
    - Loss of communication
    - Loss of feedback
    - Decision support overload
    - Catching errors

Ash et al. (2004)

Unintended Consequences of Health IT

- Errors in the communication and coordination process
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    - Catching errors

Ash et al. (2004)

Unintended Consequences of Health IT

Types of Unintended Consequences Related to Computerized Provider Order Entry

Emily M. Campbell, RN, MS, Dean F. Sittig, PhD, Joan S. Ash, PhD, Kenneth P. Guappone, MD, Richard H. Dykstra, MD

Campbell et al. (2006)

Unintended Consequences of Health IT

Table 2 ■ Unintended Consequences and Their Frequencies of Occurrence

Unintended Consequence	Frequency (%) $n = 324$
More/new work for clinicians	19.8
Workflow issues	17.6
Never ending system demands	14.8
Paper persistence	10.8
Changes in communication patterns and practices	10.1
Emotions	7.7
New kinds of errors	7.1
Changes in the power structure	6.8
Overdependence on technology	5.2
Total	100

Campbell et al. (2006)

Unintended Consequences of Health IT

Role of Computerized Physician Order Entry Systems in Facilitating Medication Errors

Ross Koppel, PhD
Joshua P. Metlay, MD, PhD
Abigail Cohen, PhD
Brian Abaluck, BS
A. Russell Localio, JD, MPH, MS
Stephen E. Kimmel, MD, MSCE
Brian L. Strom, MD, MPH

Context Hospital computerized physician order er
garded as the technical solution to medication ord
source of preventable hospital medical error. Publis
duces medication errors up to 81%. Few researche
existence or types of medication errors facilitated b

Objective To identify and quantify the role of CP
risks.

Design, Setting, and Participants We perform

Koppel et al. (2005)

Unintended Consequences of Health IT

Table. Frequencies of Reported Medication Ordering Errors and Error Risks Involving the CPOE System (n = 261 Respondents)

Error Type	Error Frequency During Past 3 Months, %					
	Never	Less Than Once a Week	About a Few Times a Week	About Once a Day	More Than Once per Day	Missing Response, %
Information Errors*						
Used CPOE to determine low dose for infrequently used medications	27.3	34.6	28.5	7.3	2.3	0.3
Used CPOE to determine the range of doses for infrequently used medications	18.5	40.4	27.3	10.8	3.1	0.3
Delayed for several hours canceling medication because of fragmented CPOE display	48.6	29.0	12.0	6.2	4.2	0.6
Observed a gap in antibiotic therapy because of unintended delay in reapproval of antibiotic	16.9	43.5	26.9	6.9	5.8	0.3
Human-Machine Interface Flaws†						
Not able to quickly tell which patients ordering for because of poor CPOE display	45.4	32.3	12.3	5.0	5.2	0.3
Been uncertain about patients' medications because of multiple CPOE displays	28.5	25.4	23.4	11.7	10.9	1.5
Delayed ordering because CPOE system down	16.3	45.0	33.1	8.8	4.6	0.3
Had difficulty specifying medications and problems ordering off-formulary medications	8.5	37.1	30.9	12.0	11.6	0.6

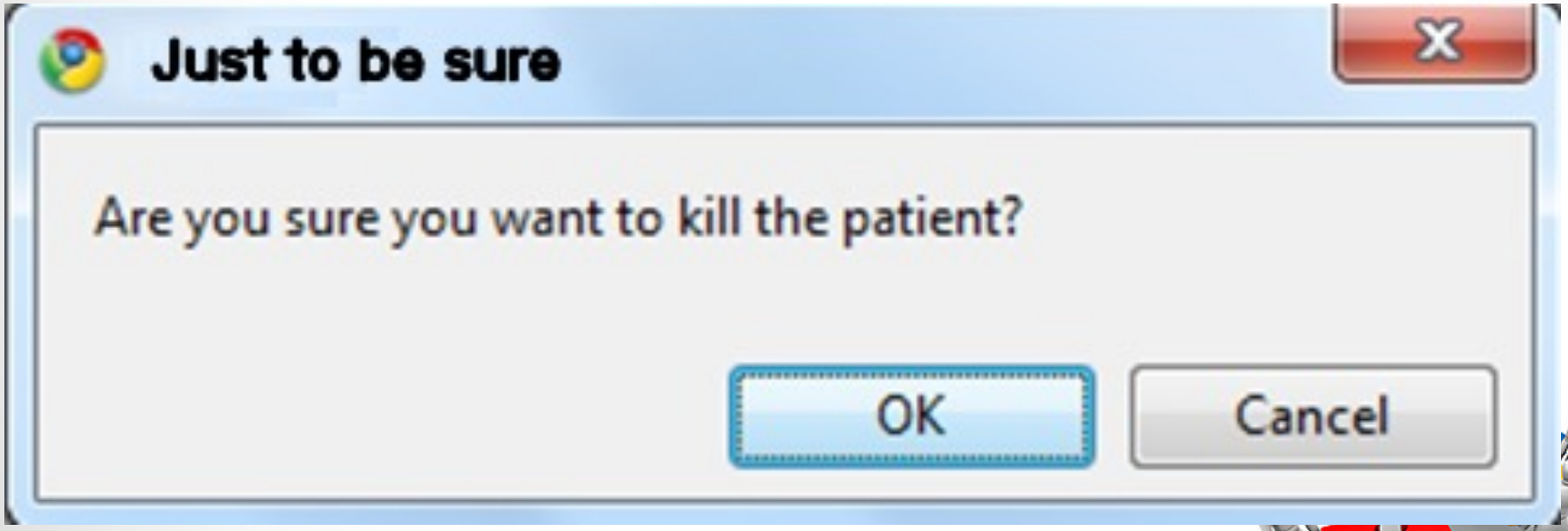
Abbreviation: CPOE, computerized physician order entry.
*Generated by fragmentation of data and failure to integrate the hospital's several computer and information systems.
†A reflection of machine rules that do not correspond to work organization or usual behaviors.

Koppel et al. (2005)

Unintended Consequences of Health IT

Some Risks of Clinical Decision Support Systems

- Alert Fatigue



Unintended Consequences of Health IT

Workarounds

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