Principles of Health IT Application in Healthcare

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For Ramathibodi M.S. & Ph.D. Programs in Data Science for Healthcare & Clinical Informatics

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Manufacturing

Image Source: Guardian.co.uk

Banking

Image Source: http://www.oknation.net/blog/phuketpost/2013/10/19/entry-3

Health care

ER - Image Source: nj.com

Health care

(At an undisclosed nearby hospital)

Why Health care Isn't Like Any Others?

- Life-or-Death
- Many & varied stakeholders
- Strong professional values
- Evolving standards of care
- Fragmented, poorly-coordinated systems
- Large, ever-growing & changing body of knowledge
- High volume, low resources, little time

But...Are We That Different?

Banking

Input → Process → Output

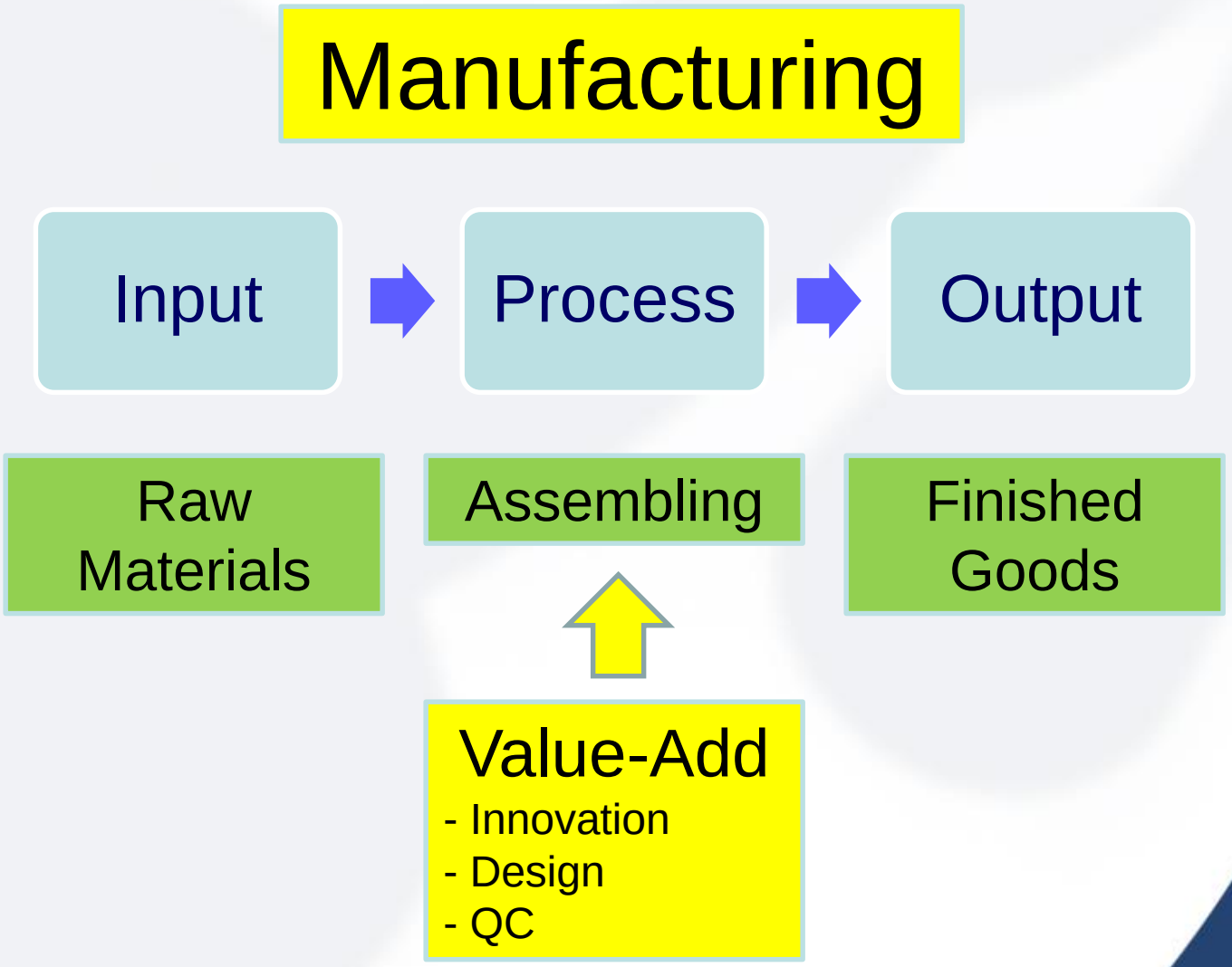
Location A

Transfer

Value-Add
- Security
- Convenience
- Customer Service

Location B

But...Are We That Different?



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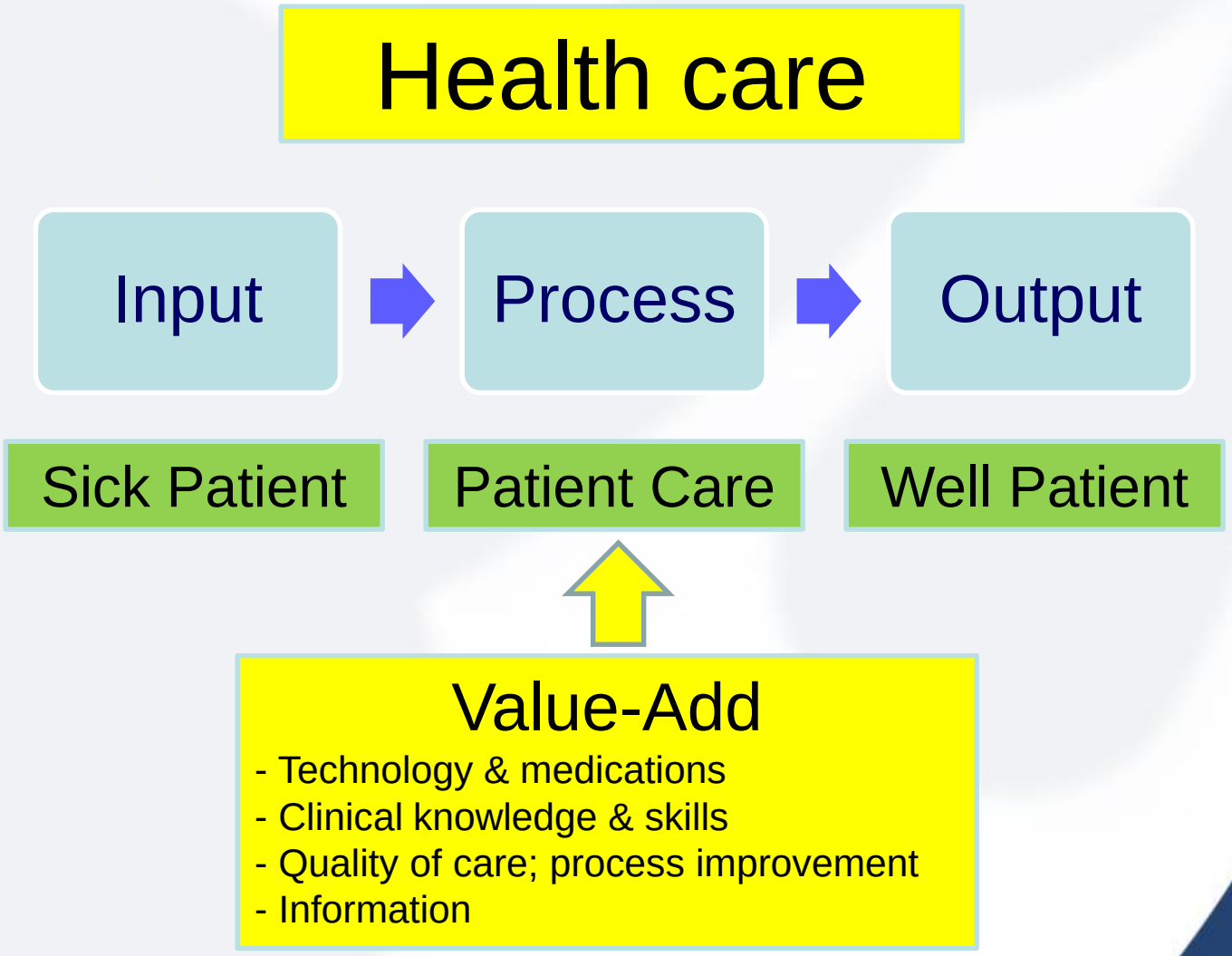
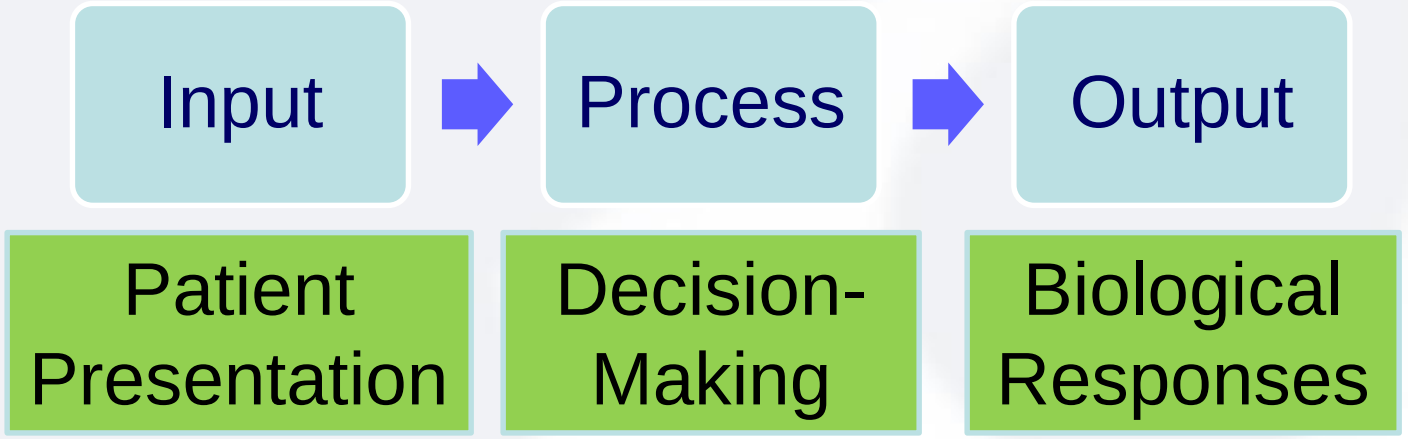
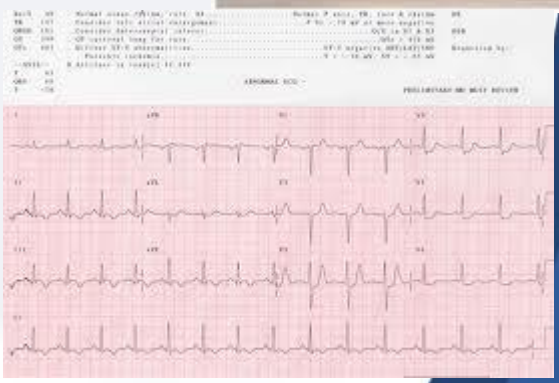


Why Health care Isn't Like Any Others?

- Large variations & contextual dependence



Information is Everywhere in Medicine



Shortliffe EH. Biomedical informatics in the education of physicians. JAMA. 2010 Sep 15;304(11):1227-8.

“Information” in Medicine

Biomedical Informatics in the Education of Physicians

Edward H. Shortliffe, MD, PhD

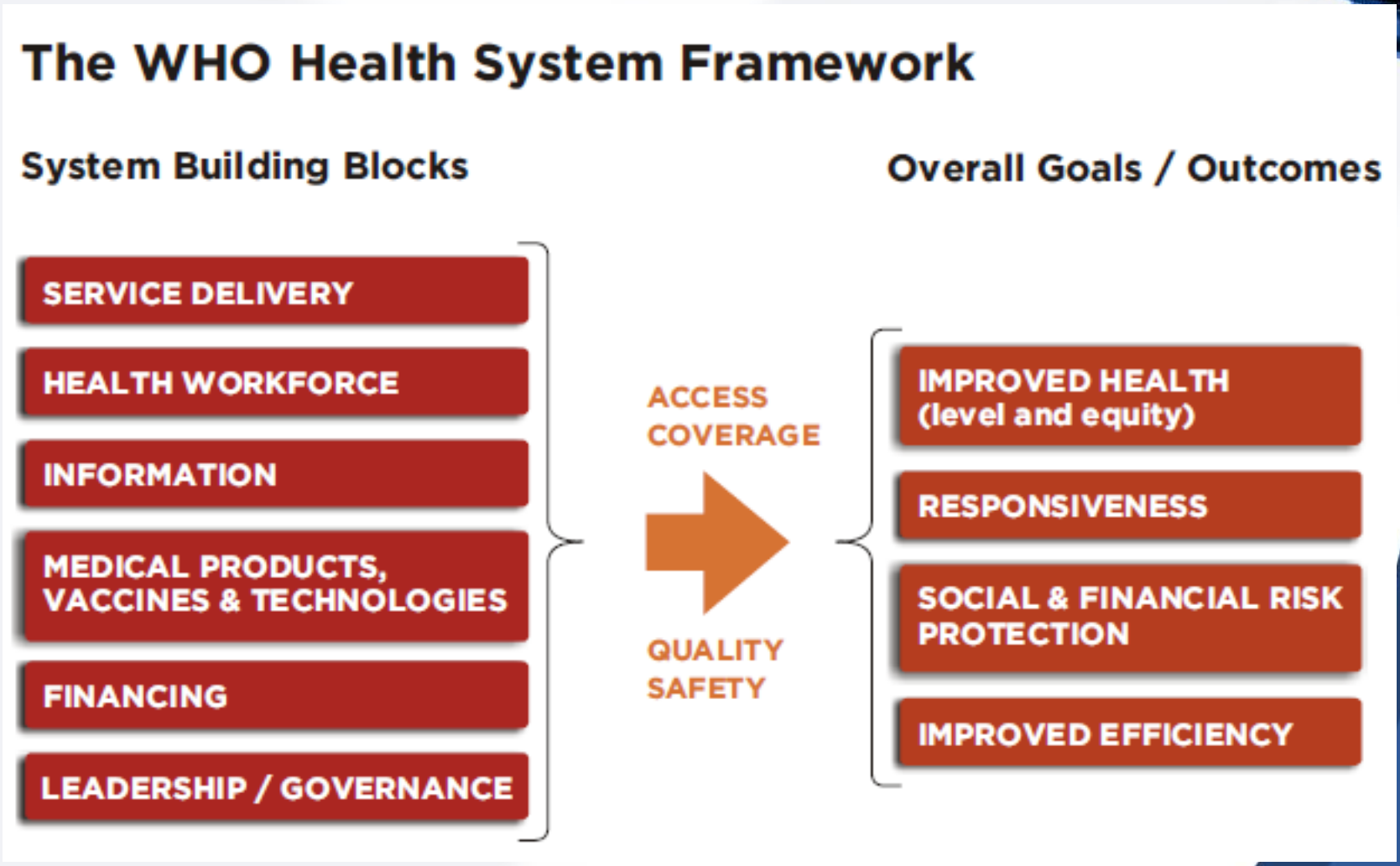
A formal discipline has emerged over the last few decades,[1] initially termed “medical informatics” but subsequently

WHEN I FIRST MEET WITH PRECLINICAL MEDICAL students, I make a point of asking them what they believe will receive the greatest focus of their attention once they are in clinical practice. The most common response, not surprisingly, is patients, and yet it is clear to experienced practitioners that the correct answer is information—in the service of their patients. The need for information underlies essentially all

WHO Six Building Blocks of Health System

WHO (2009)

WHO Health System Framework



WHO (2009)

Health IT

Use of information and communications technology (ICT) in health & healthcare settings

Source: The Health Resources and Services Administration, Department of Health and Human Service, USA

eHealth

Use of information and communications technology (ICT) for health; Including

- Treating patients
- Conducting research
- Educating the health workforce
- Tracking diseases
- Monitoring public health.

Sources: 1) WHO Global Observatory of eHealth (GOe) (www.who.int/goe)
2) World Health Assembly, 2005. Resolution WHA58.28

Slide adapted from: Mark Landry, WHO WPRO & Dr. Boonchai Kijsanayotin

eHealth & Health IT

eHealth ≈ Health IT

Slide adapted from: Dr. Boonchai Kijsanayotin

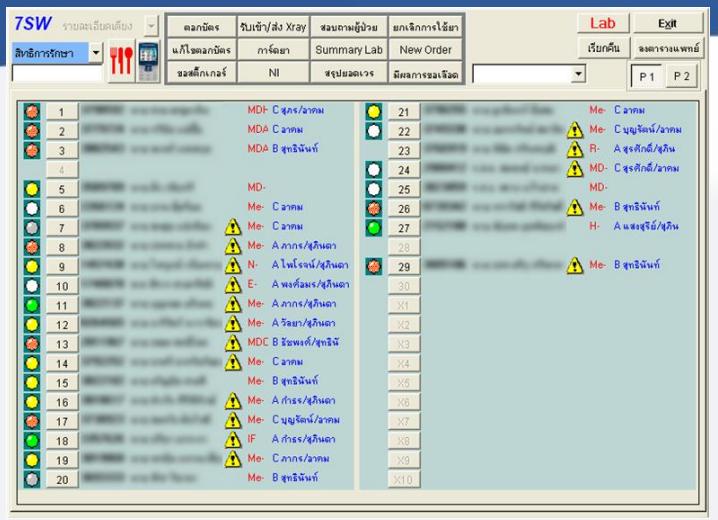
The Anatomy of Health IT

Health ← Goal

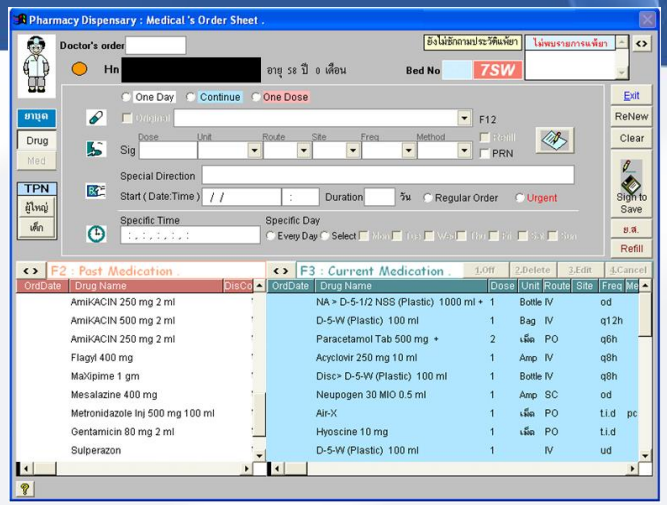
Information ← Value-Add

Technology ← Means

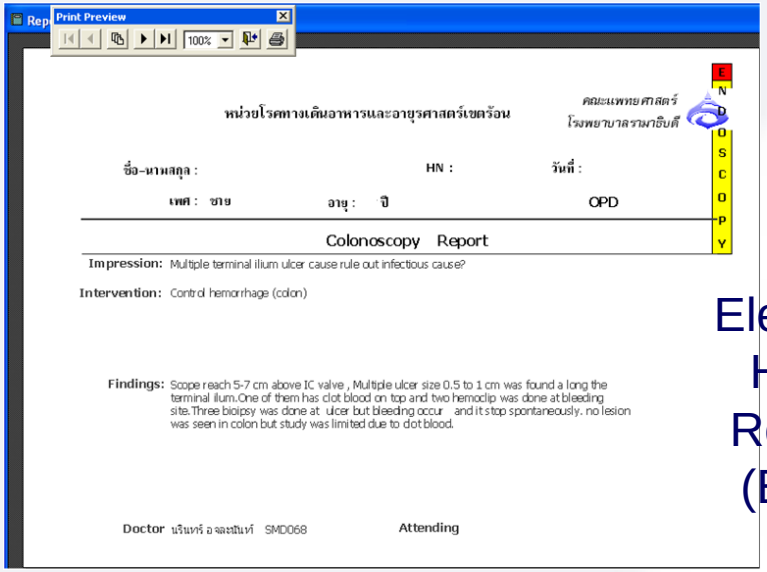
Various Forms of Health IT



Hospital Information System (HIS)



Computerized Provider Order Entry (CPOE)

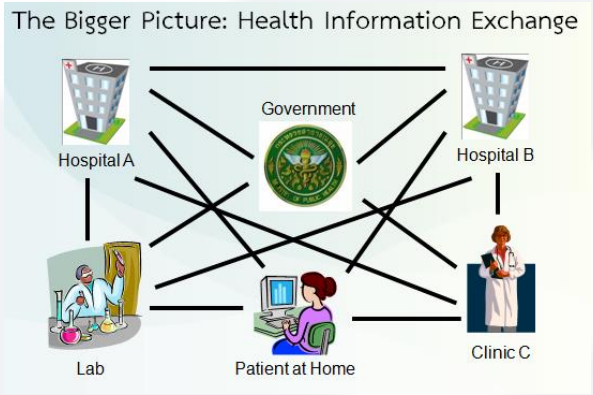


Electronic Health Records (EHRs)

Picture Archiving and Communication System (PACS)

Still Many Other Forms of Health IT

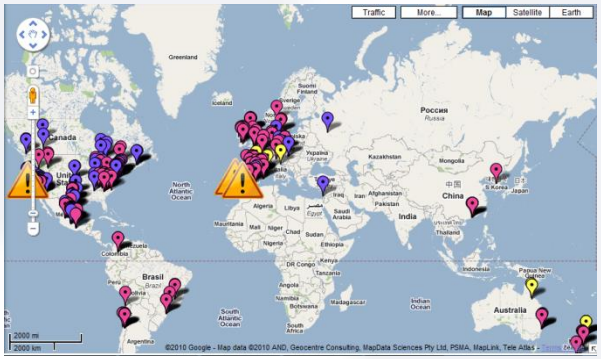
m-Health



Health Information Exchange (HIE)

Google health Microsoft HealthVault

Personal Health Records (PHRs)



Biosurveillance

PubMed.gov

Information Retrieval

Telemedicine & Telehealth

Images from Apple Inc., Geekzone.co.nz, Google, Microsoft, PubMed.gov, and American Telecare, Inc.

Back to something simple...

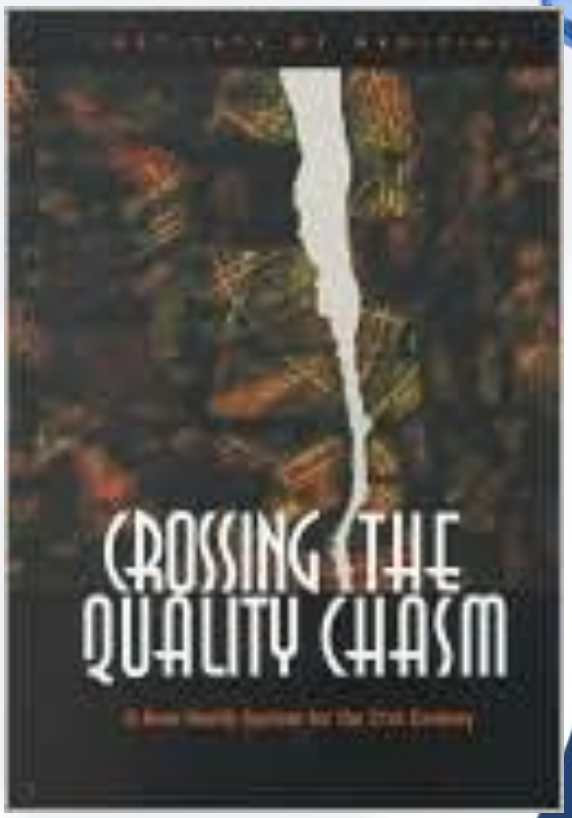
What Clinicians Want?

To treat & to care for their patients to their best abilities, given limited time & resources

Image Source: http://en.wikipedia.org/wiki/File:Newborn_Examination_1967.jpg (Nevit Dilmen)

High Quality Care

- Safe
- Timely
- Effective
- Patient-Centered
- Efficient
- Equitable



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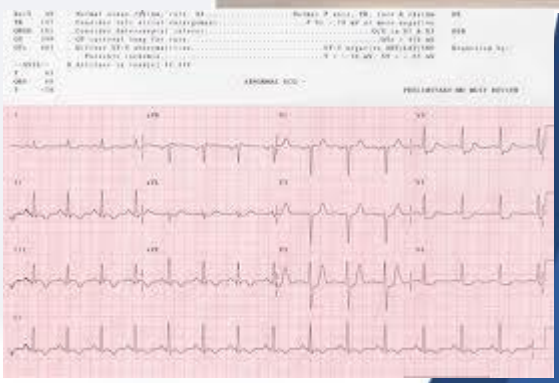
Information is Everywhere in Healthcare



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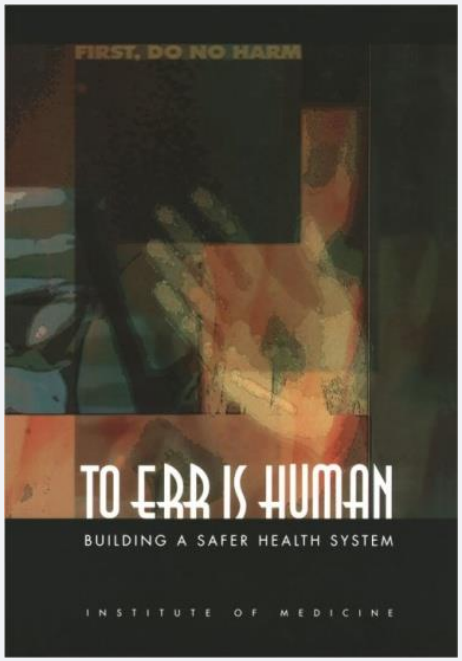
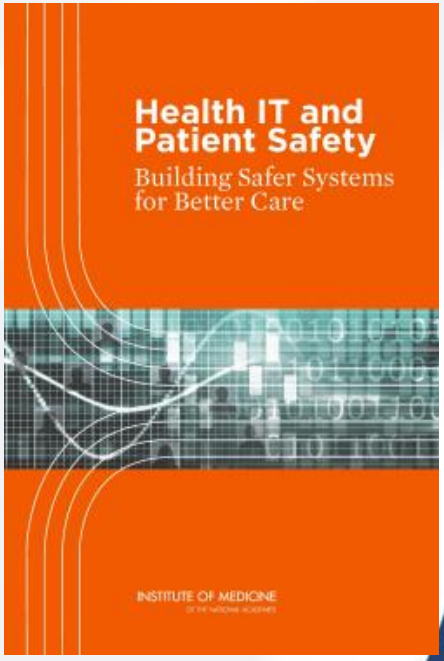
Landmark IOM Reports



(IOM, 2000)

(IOM, 2001)



(IOM, 2011)

Landmark IOM Reports: Summary

- Humans are not perfect and are bound to make errors
- High-light problems in the U.S. health care system that systematically contributes to medical errors and poor quality
- Recommends reform that would change how health care works and how technology innovations can help improve quality/safety

Why We Need Health IT

- Health care is very complex (and inefficient)
- Health care is information-rich
- Quality of care depends on timely availability & quality of information
- Clinical knowledge body is too large to be in any clinician's brain, and the short time during a visit makes it worse
- "To err is human"
- Practice guidelines are put "on-the-shelf"

To Err is Human 1: **Attention**

Image Source: (Left) http://docwhisperer.wordpress.com/2007/05/31/sleepy-heads/
(Right) http://graphics8.nytimes.com/images/2008/12/05/health/chen_600.jpg

To Err is Human 2: **Memory**

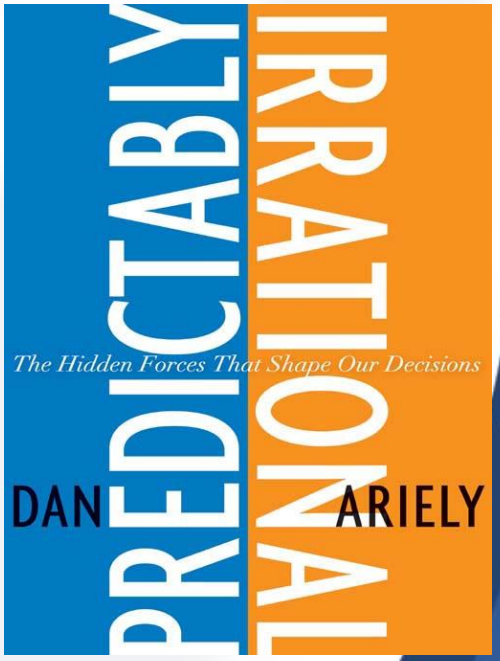
Image Source: Suthan Srisangkaew, Department of Pathology, Facutly of Medicine Ramathibodi Hospital, Mahidol University

To Err is Human 3: **Cognition**

- Cognitive Errors - Example: Decoy Pricing

The Economist Purchase Options		**# of People**
• Economist.com subscription	$59	**16**
• Print subscription	$125	**0**
• Print & web subscription	$125	**84**

The Economist Purchase Options		**# of People**
• Economist.com subscription	$59	**68**
• Print & web subscription	$125	**32**



Ariely (2008)

What If This Happens in Healthcare?

- It already happens....
  (Mamede et al., 2010; Croskerry, 2003; Klein, 2005)

- What if health IT can help?

Common Errors

- Medication Errors
  - Drug Allergies
  - Drug Interactions
- Ineffective or inappropriate treatment
- Redundant orders
- Failure to follow clinical practice guidelines

We need “Change”

“...we need to upgrade our medical records by switching from a paper to an electronic system of record keeping...”

President Barack Obama
June 15, 2009

The Anatomy of Health IT Revisited

Health ← Goal

Information ← Value-Add

Technology ← Means

Ultimate Goals of Health IT

- **Individual**'s Health
- **Population**'s Health
- **Organization's** Health

Dimensions of Quality Health Care

- Safety
- Timeliness
- Effectiveness
- Efficiency
- Equity
- Patient-centeredness

(IOM, 2001)

CLASS EXERCISE #2

For each of Institute of Medicine's 6 dimensions of quality health care, suggest ways health IT can help.

Safety	Timeliness	Effectiveness
Efficiency	Equity	Patient-centeredness

Safety?

Safety

- Legible handwriting
- Proper display of patient information (e.g. abnormal labs)
- Alerts
  - Drug-Allergy Checks
  - Drug-Drug Interaction Checks
  - Drug-Lab Interaction Checks
- Dose calculator
- Prevention of medication errors
- Timely information
  - Histories
  - Diagnoses/Problem List
  - Labs
  - Medication List

Timeliness?

Timeliness

- Timely information for emergencies, transfers, normal visits
  - Histories
  - Diagnoses/Problem List
  - Labs
  - Medication List
- Effective communications between providers
- Effective triage & patient monitoring

Effectiveness?

Effectiveness

- Reminders/advice for
  - Guideline adherence
  - Preventive care
  - Specialist consults
- Templates/forms
  - Order sets
  - Care planning, nursing assessments & interventions, nursing documentation
- Availability of patient information
- Continuity of care (even in referrals)
- Effective display of information (e.g. graphs, user-friendly screens)
- Assistance in decision-making (e.g. differential diagnosis)
- Access to evidence/references at the point of care

Efficiency?

Efficiency

- Fast/lean/efficient processes of care
  - Automation -> faster care, fewer workers
  - Process redesigns/reengineering (e.g. parallel processes/access)
  - Changes in role assignments -> productivity gains or more time for patient
- Predictable patterns/"Just-in-time" (staffing, resource allocation, inventory, bed management)
- Flexibility "Organizational slacks" (buffers)
- Drug-formulary checks & policy enforcement
- Reduction of redundant tests
- Efficient management of bed occupancy/hospital capacity
- Cost-savings & time-savings from preventable errors
- Space-savings (e.g. medical records, PACS)
- Effective communications

Equity?

Equity

- Reduction of barriers to care, improved access to care
  - Physical barriers (telemedicine, tele-consultation)
  - Structural barriers (information exchange among hospitals)
  - Functional barriers (information access by patients, networks of patients)
  - Cultural barriers (tailored information for different patients)

Patient-Centeredness?

Patient-Centeredness

- Patient's access to
  - Own clinical information
  - General health information
  - Tailored health information
- Patient engagement/compliance
- Patient empowerment
  - Patients' networking & knowledge sharing
- Patient satisfaction with quality & efficient care
- Patient's control of information (privacy)

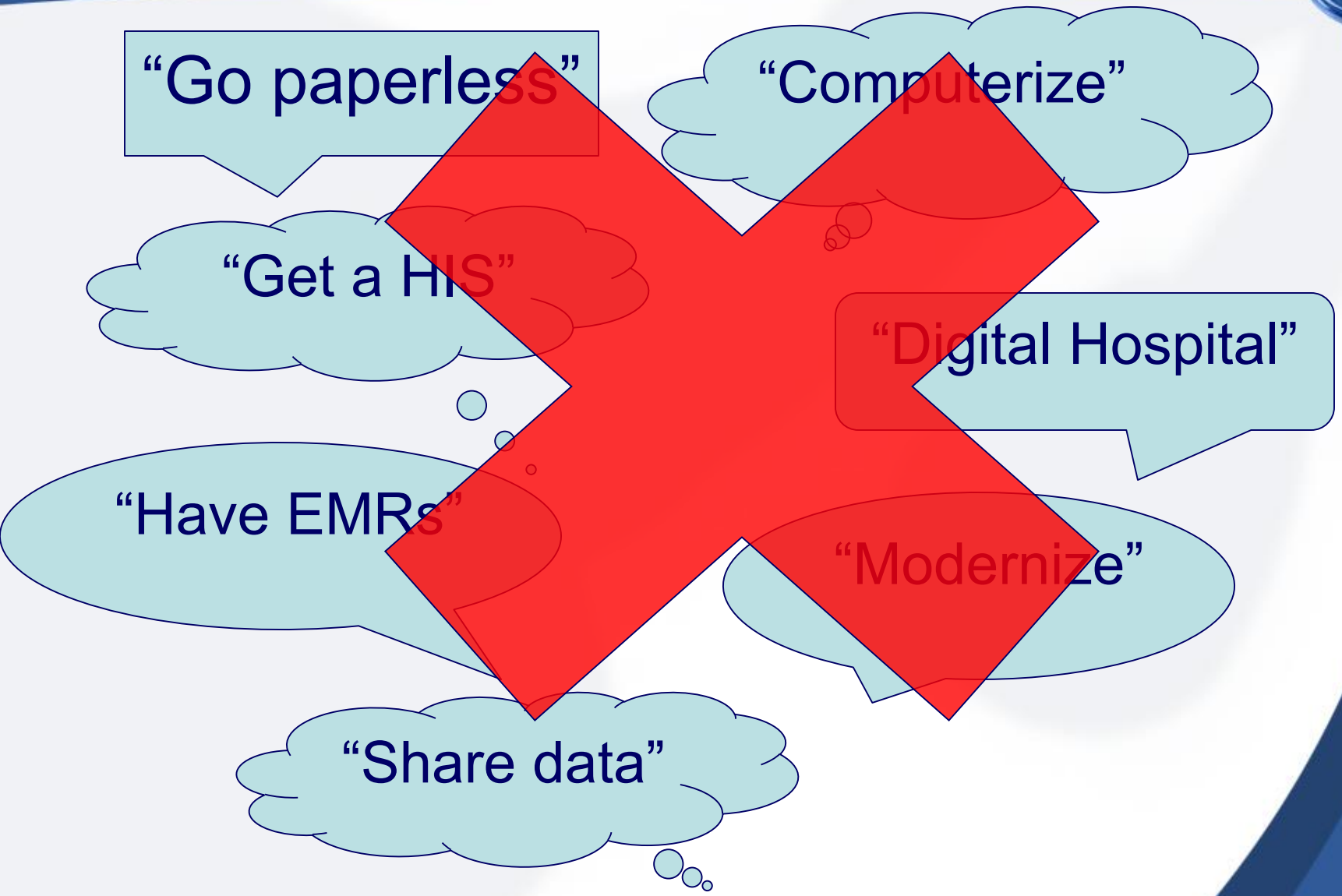
Documented Benefits of Health IT

- Literature suggests improvement through
  - Guideline adherence (Shiffman et al, 1999;Chaudhry et al, 2006)
  - Better documentation (Shiffman et al, 1999)
  - Practitioner decision making or process of care (Balas et al, 1996;Kaushal et al, 2003;Garg et al, 2005)
  - Medication safety (Kaushal et al, 2003;Chaudhry et al, 2006;van Rosse et al, 2009)
  - Patient surveillance & monitoring (Chaudhry et al, 2006)
  - Patient education/reminder (Balas et al, 1996)
  - Cost savings and better financial performance (Parente & Dunbar, 2001;Chaudhry et al, 2006;Amarasingham et al, 2009; Borzekowski, 2009)

But…

- “Don’t implement technology just for technology’s sake.”
- “Don’t make use of excellent technology. Make excellent use of technology.”
  (Tangwongsan, Supachai. Personal communication, 2005.)
- “Health care IT is not a panacea for all that ails medicine.” (Hersh, 2004)
- “We worry, however, that [electronic records] are being touted as a panacea for nearly all the ills of modern medicine.”
  (Hartzband & Groopman, 2008)

Common “Goals” for Adopting HIT

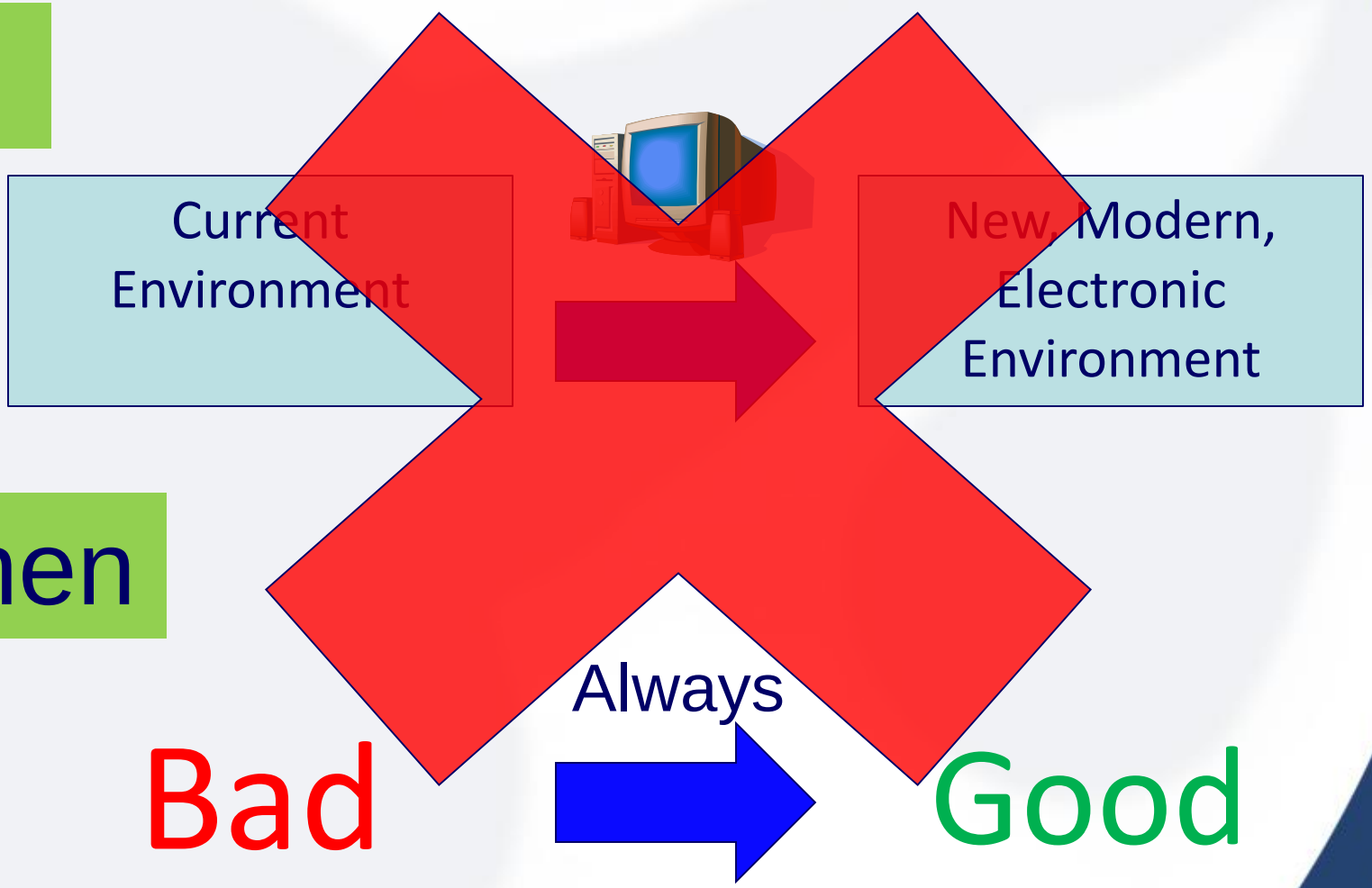


The Common Denominator

- **Health** Information Technology
- Electronic **Health** Records
- **Health** Information Exchange

Some Misconceptions about HIT

If



Then

Fundamental Theorem of Informatics

- Health IT as a replacement or supplement of clinicians?
  - The demise of the "Greek Oracle" model (Miller & Masarie, 1990)

The "Greek Oracle" Model

Wrong Assumption

The "Fundamental Theorem" Model

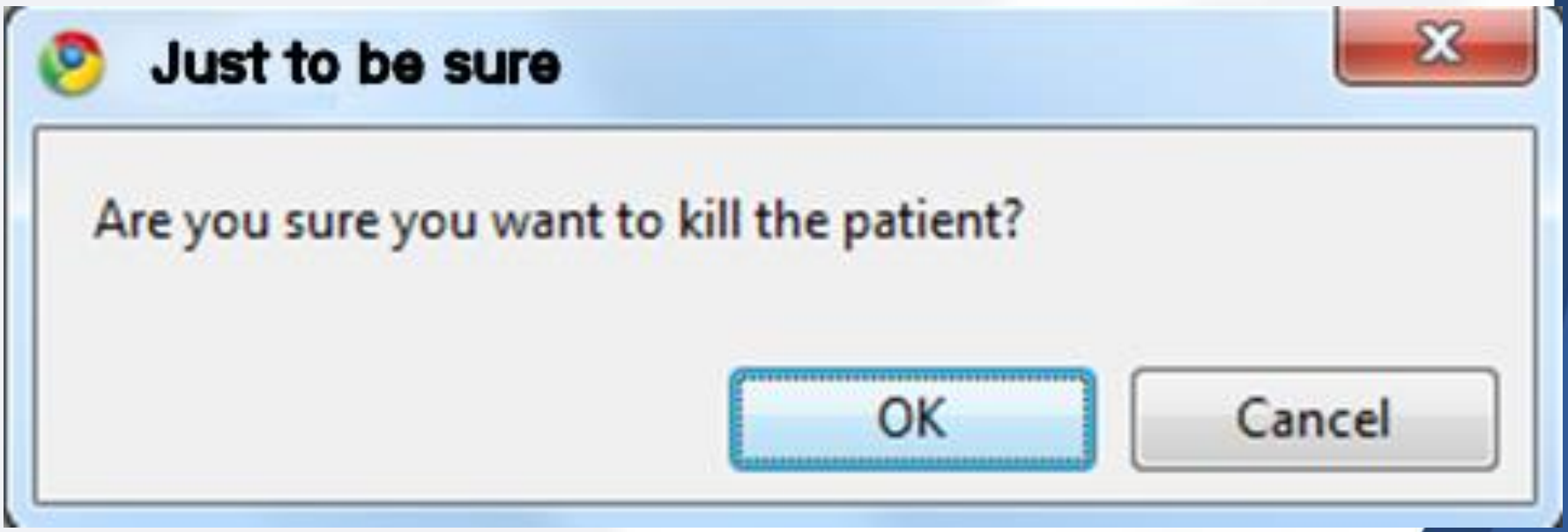
Correct Assumption

Friedman (2009)

Unintended Consequences of Health IT

Some risks

- Alert fatigue



Workarounds

Take-Home Messages

- Health IT has documented benefits to quality & efficiency of care
- Implementing health IT will not automatically fix all problems
- Health IT is not without risks
- Find the ways health IT can help
- Focus on the ultimate goals
- Benefits of health IT may vary by context

NEXT

Health IT in Clinical Settings

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