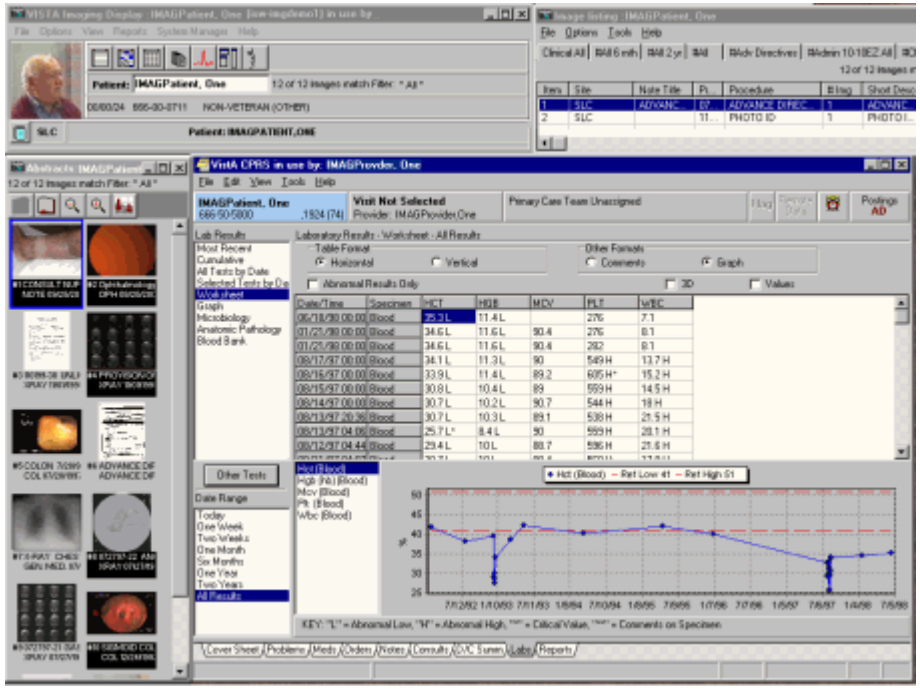
A Socio-technical Model for Safe and Effective HIT Implementation & Use

DEAN F. SITTIG, PHD

PROFESSOR, BIOMEDICAL INFORMATICS

UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER AT HOUSTON, TX

An EHR is not an ATM



≠

SHARP-c Clinical Summarization

- Started with a grand plan

John Q. Smith – 375 Plantation Rd. Luling, TX W: 713-985-4215 Insurance: BC/BS TX

67yr white male 5'-9" 195 lbs (↓4 lbs in 12 mo.) **BMI-28.8**

Patient photo

View graph of weight

Link to pt insurance info

Diabetes Risk Management Summary

View graph of HbA1c's

Glycemic Control: Type 2 DM (dx: 10/1/09): **HbA1c-7.0%** (10/01/10) (↓3.0% in 12 mo.) on metformin (1000 mg BID).

Glycemic control is acceptable according to ADA guidelines.

View graph of lipid panels

Lipid Control: Hyperlipidemia (dx: 10/01/09): **Total cholesterol-250 mg/dL, HDL 40 mg/dL, LDL 175 mg/dL** (10/1/10) (↑from 180/60/125 4 mo. ago) on simvastatin (20 mg QD)

ATP III 10 yr risk of MI or death - 23% Pat Ed: Cardiac Risk Factors

Print patient ed sheet

ATP III guidelines recommend adjusting dosage.

Link to medication list

View graph of BP's

Blood Pressure Control: Hypertension (dx: 10/01/09): **BP-135/90** (today) (↓from 150/105 in 12 mo.) on Hydrochlorothiazide (25 mg QD)

JNC VII guidelines recommend adding a medication.

Link to medication list

Visit History: Clinic – Urgent Follow-up (6/15/10); ED – Hospital – chest pain (6/1/10); Clinic – Well Visit (2/1/09); Clinic – Physical (10/1/09)

Link to related note

SHARP-c Clinical Summarization

- Started with a grand plan
- Quickly realized that there were many obstacles in our path…
  - Data availability and interpretability issues
  - Gaps in computer-readable knowledge bases
  - Limitations of current EHR interfaces
  - No clear agreement on what summarization even meant!
- Didn't even have the tools – theories or frameworks – to address these sorts of complex, socio-technical problems

Modern healthcare system is a complex adaptive system

- Non-linear and dynamic: does not reach a steady state
- Composed of independent agents whose behavior based on physical, psychological or social rules
- Independent agents are not the same

Modern healthcare system is a complex adaptive system

- Non-linear and dynamic: does not reach a steady state
- Composed of independent agents whose behavior based on physical, psychological or social rules
- Independent agents are not the same
- Agents are intelligent
- Adaption and change leads to self-organizing behaviors
- Result in systems which are unpredictable and uncontrollable

HIT can improve safety and effectiveness of healthcare

- Many isolated examples of significant improvements
- Widespread improvement has been harder to document
- Certainly not guaranteed!

HIT can improve safety and effectiveness of healthcare

The NEW ENGLAND JOURNAL of MEDICINE

HOME | ARTICLES & MULTIMEDIA | ISSUES | SPECIALTIES & TOPICS | FOR AUTHORS | CME

SPECIAL ARTICLE

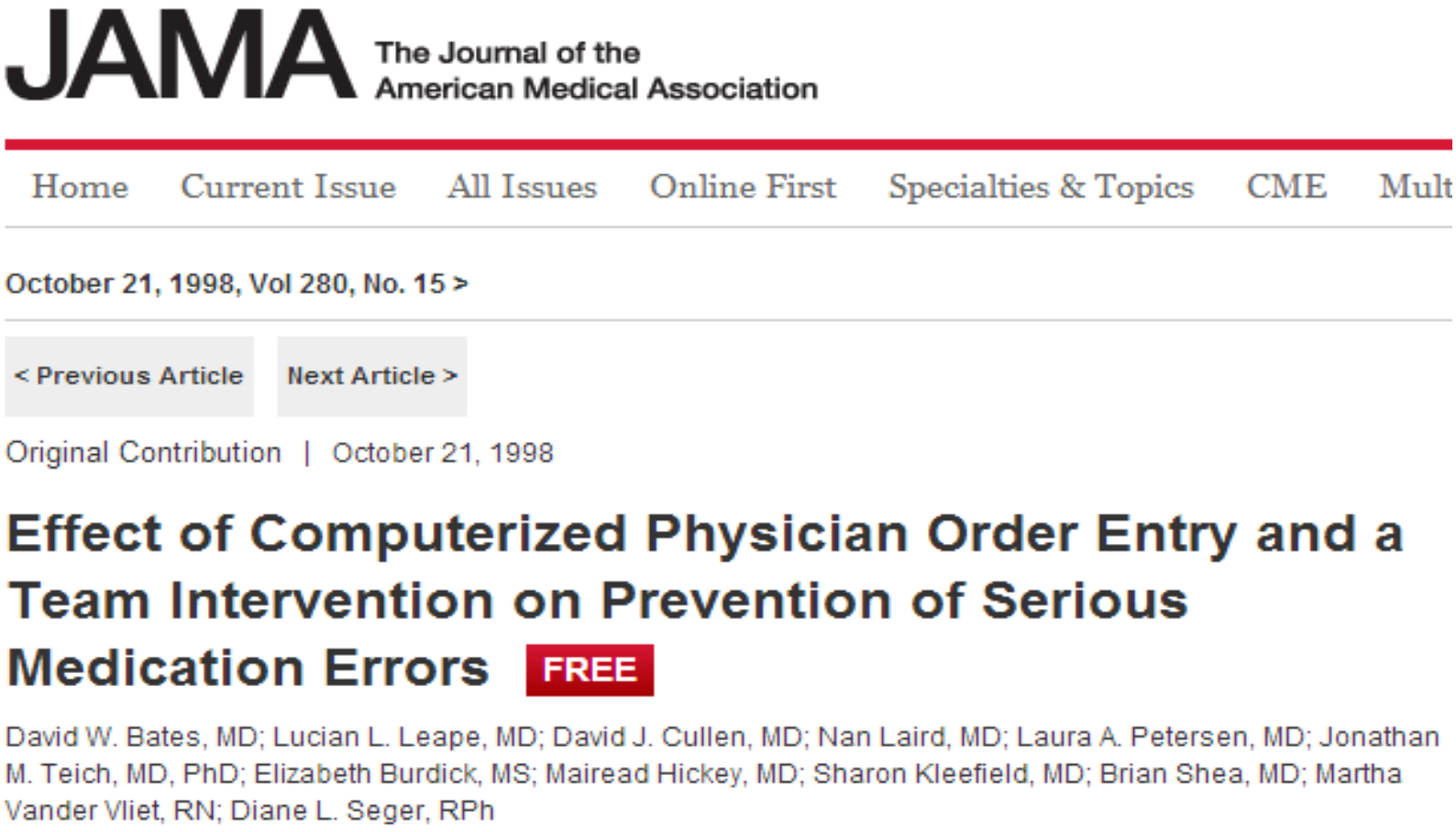
A Computer-Assisted Management Program for Antibiotics and Other Antiinfective Agents

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.

N Engl J Med 1998; 338:232-238 | January 22, 1998 | DOI: 10.1056/NEJM199801223380406

N Engl J Med. 1998 Jan 22;338(4):232-8

HIT can improve safety and effectiveness of healthcare



JAMA The Journal of the American Medical Association

Home Current Issue All Issues Online First Specialties & Topics CME Mult

October 21, 1998, Vol 280, No. 15 >

< Previous Article Next Article >

Original Contribution | October 21, 1998

Effect of Computerized Physician Order Entry and a Team Intervention on Prevention of Serious Medication Errors FREE

David W. Bates, MD; Lucian L. Leape, MD; David J. Cullen, MD; Nan Laird, MD; Laura A. Petersen, MD; Jonathan M. Teich, MD, PhD; Elizabeth Burdick, MS; Mairead Hickey, MD; Sharon Kleefield, MD; Brian Shea, MD; Martha Vander Vliet, RN; Diane L. Seger, RPh

JAMA 1998;280:1311-1316

HIT can improve safety and effectiveness of healthcare

Randomized clinical trial of pressure-controlled inverse ratio ventilation and extracorporeal CO2 removal for adult respiratory distress syndrome.

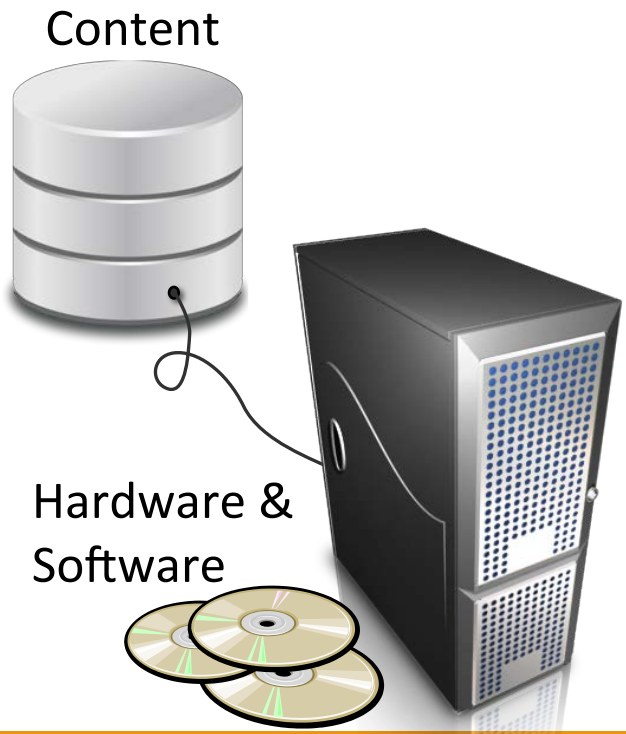
A H Morris, C J Wallace, R L Menlove, T P Clemmer, J F Orme,Jr, L K Weaver, N C Dean, F Thomas, T D East, N L Pace, M R Suchyta, E Beck, M Bombino, D F Sittig, S Böhm, B Hoffmann, H Becks, S Butler, J Pearl, and B Rasmusson

Morris, et al. Am J Resp Care. 10.1164/ajrccm.149.2.8306022

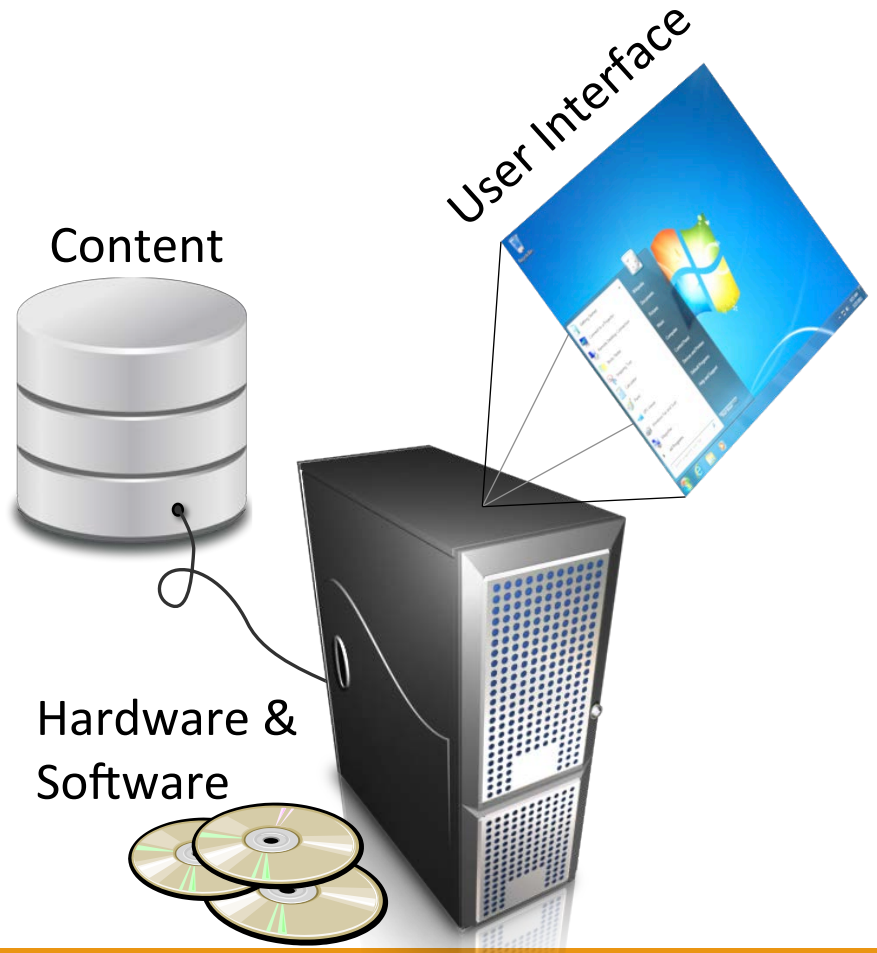
8-dimension Socio-Technical Model of Safe & Effective EHR Use

8-dimension Socio-Technical Model of Safe & Effective EHR Use

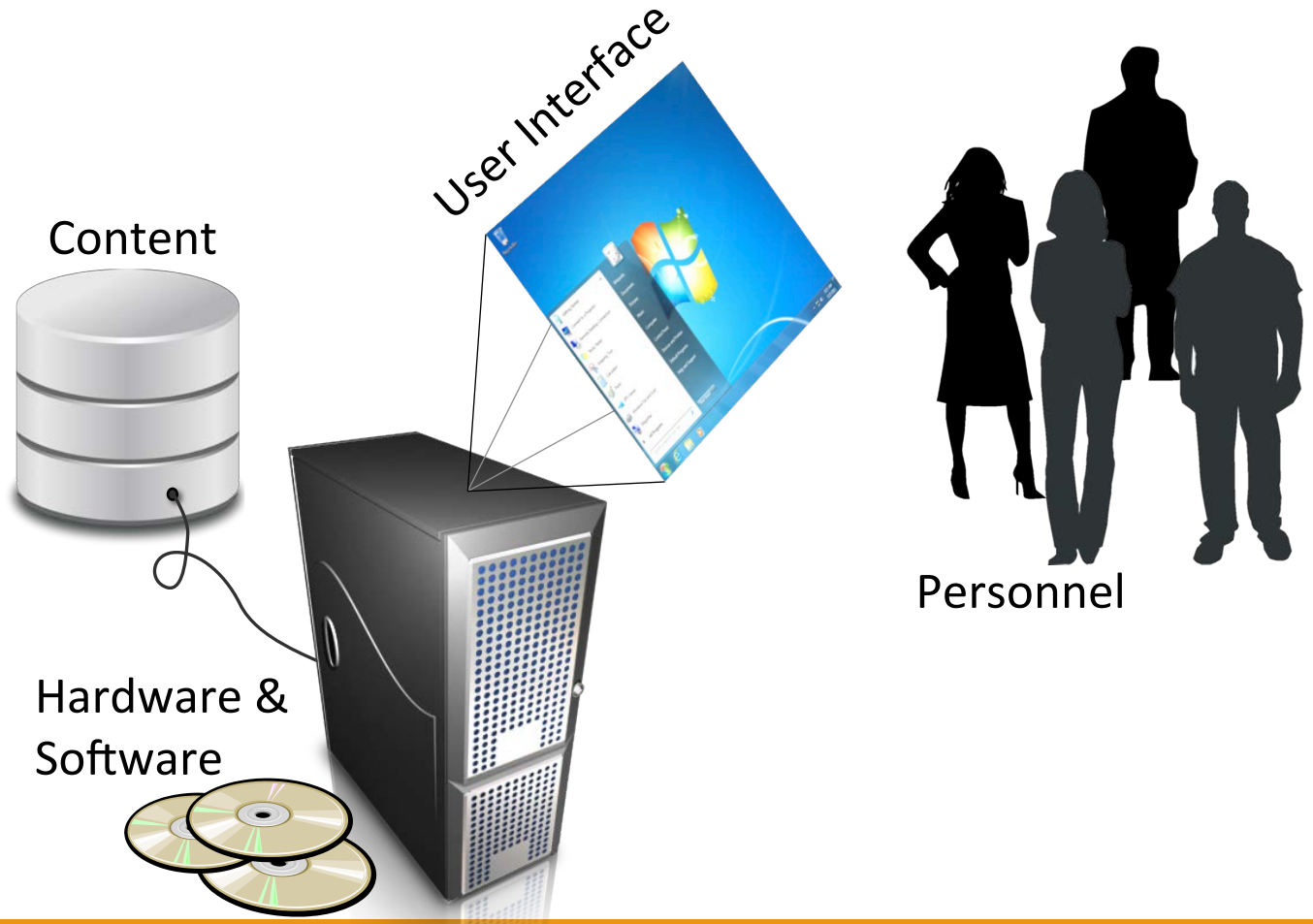
8-dimension Socio-Technical Model of Safe & Effective EHR Use



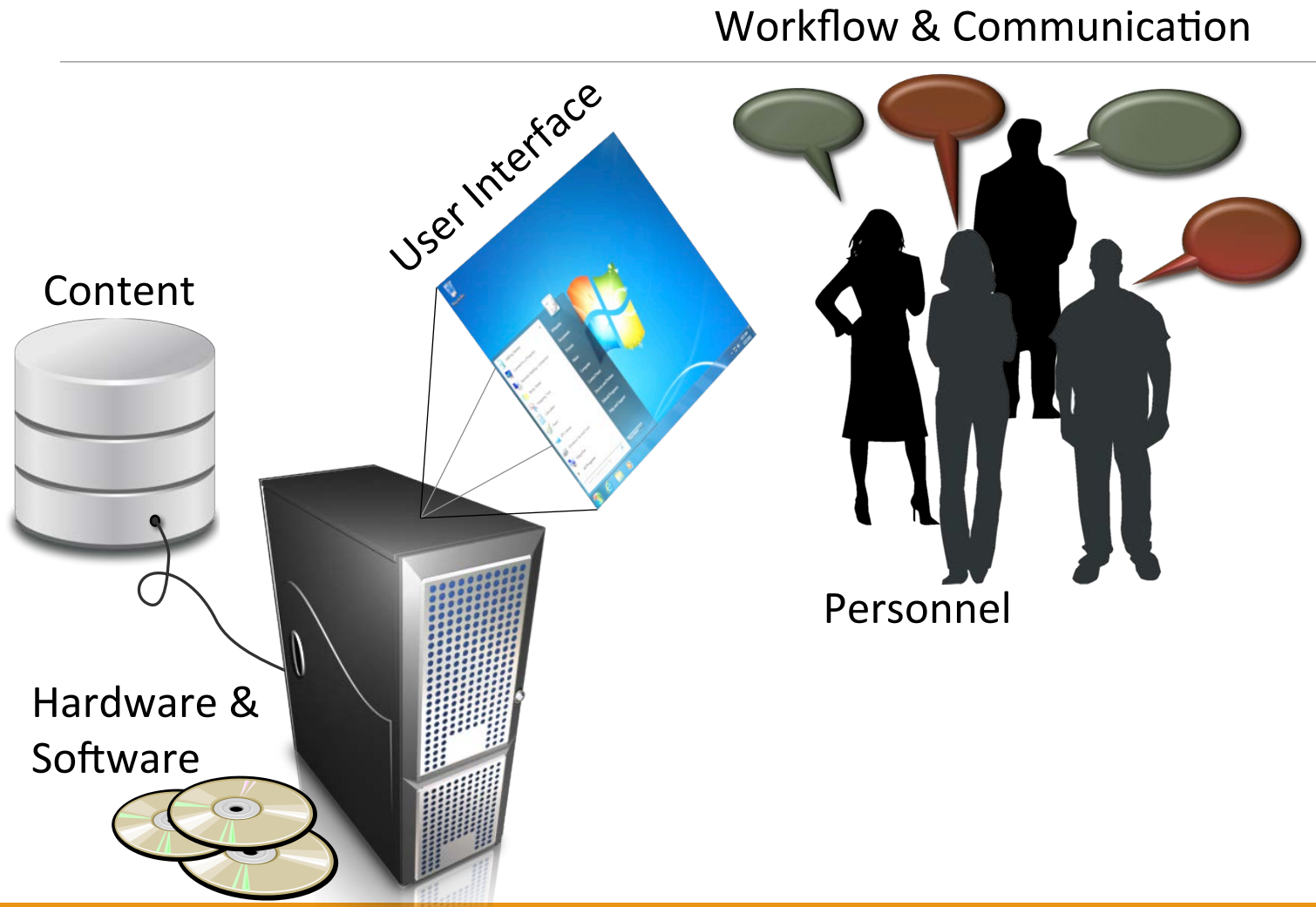
8-dimension Socio-Technical Model of Safe & Effective EHR Use



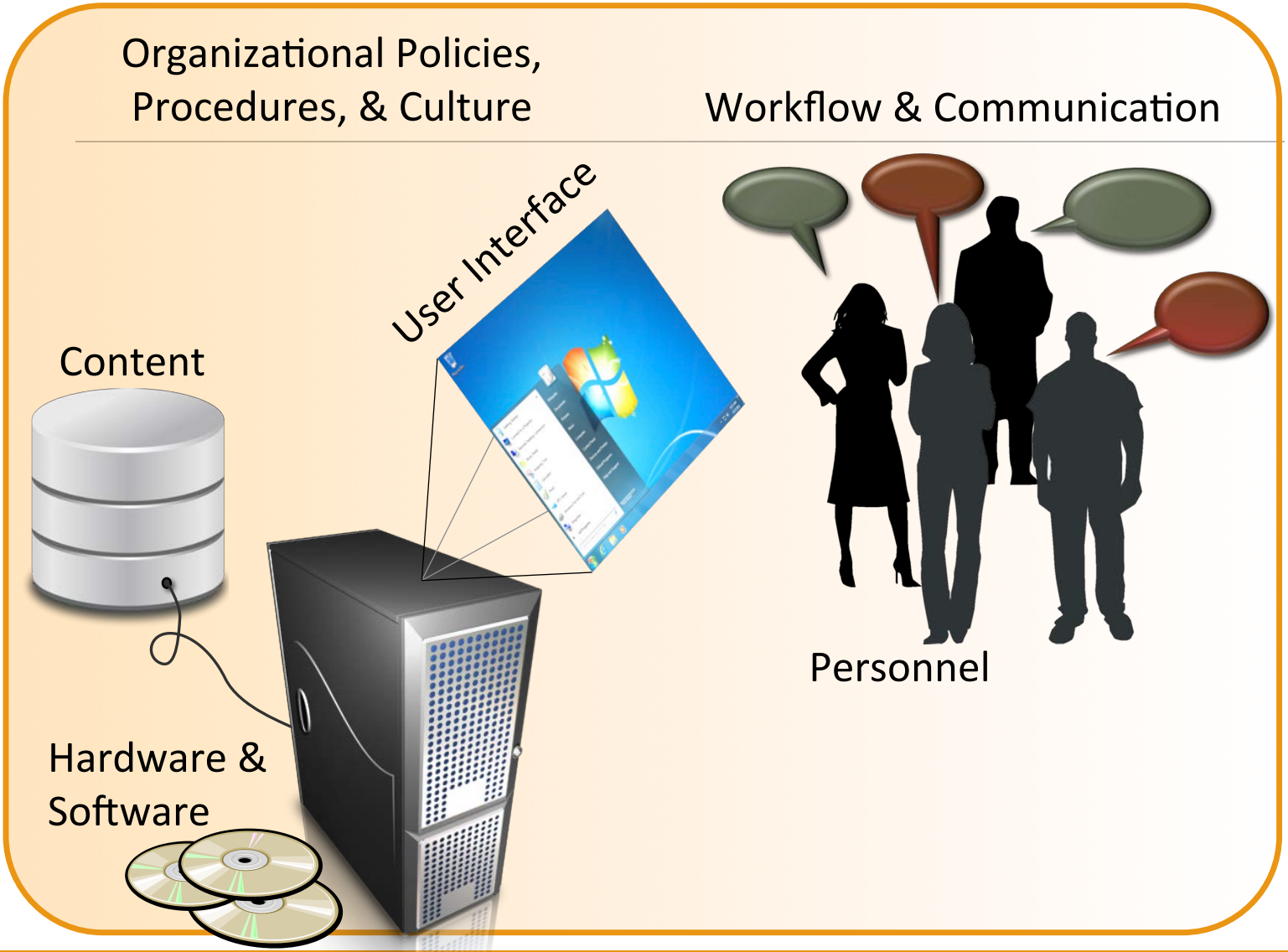
8-dimension Socio-Technical Model of Safe & Effective EHR Use



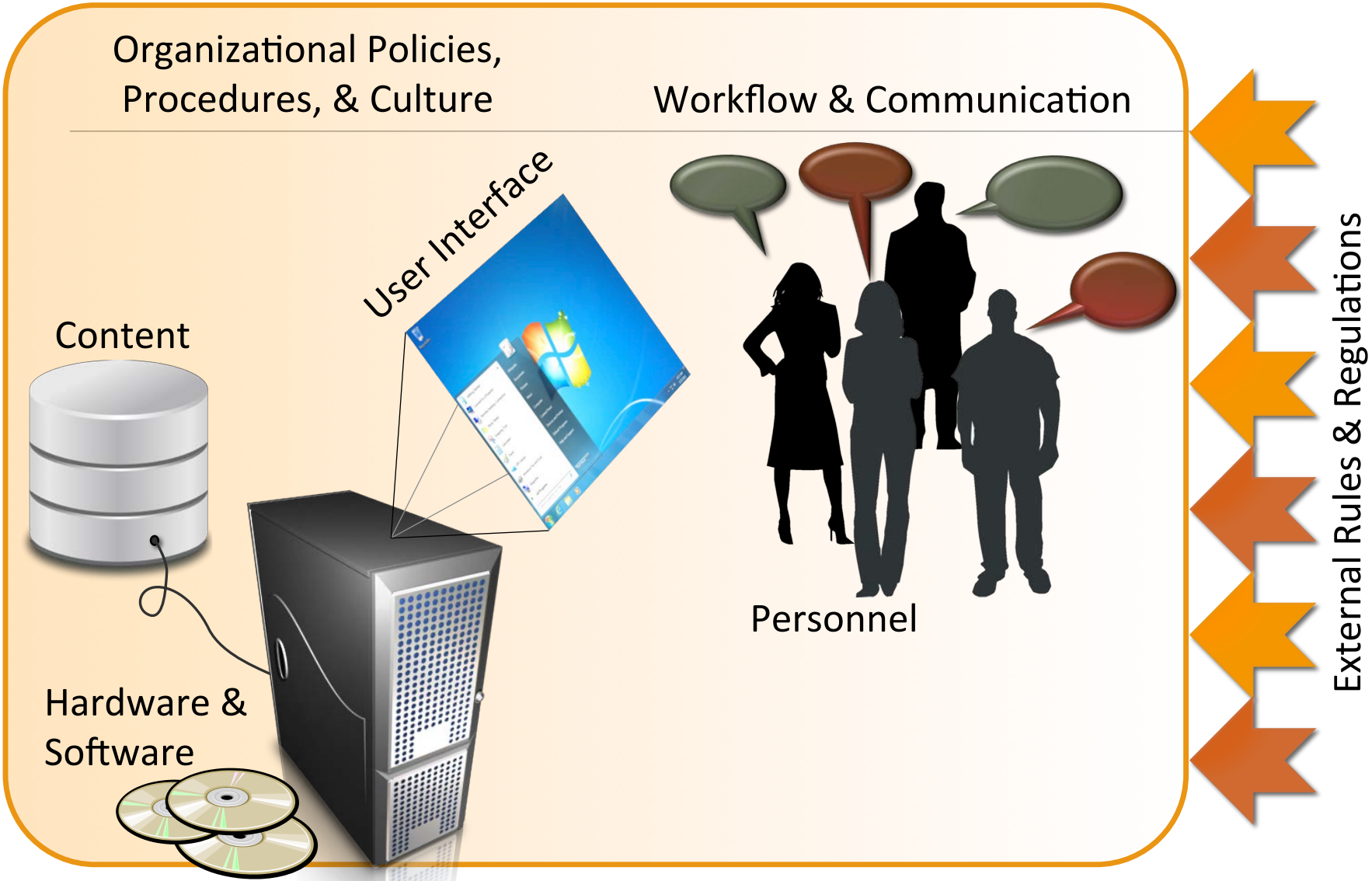
8-dimension Socio-Technical Model of Safe & Effective EHR Use



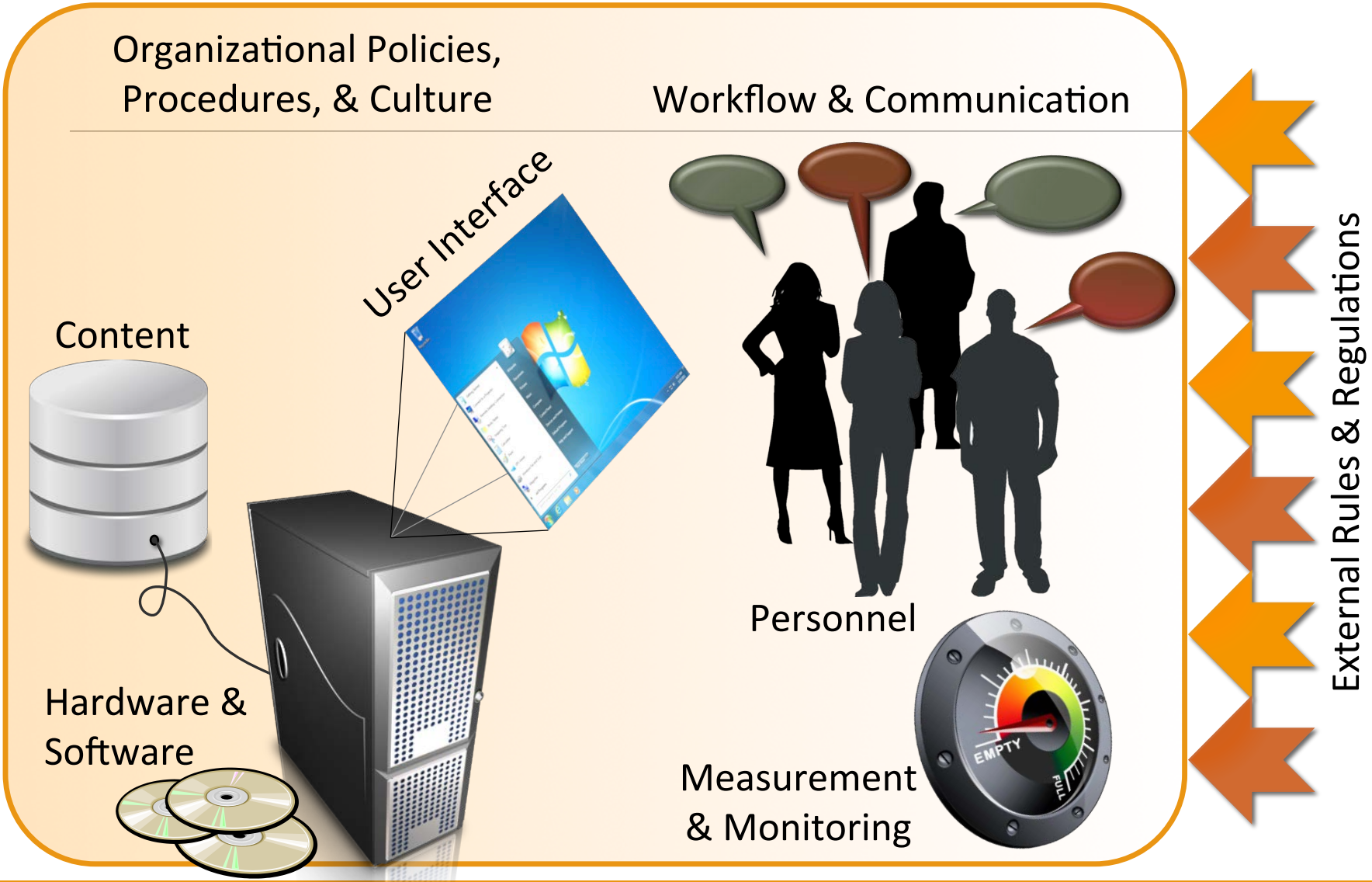
8-dimension Socio-Technical Model of Safe & Effective EHR Use



8-dimension Socio-Technical Model of Safe & Effective EHR Use



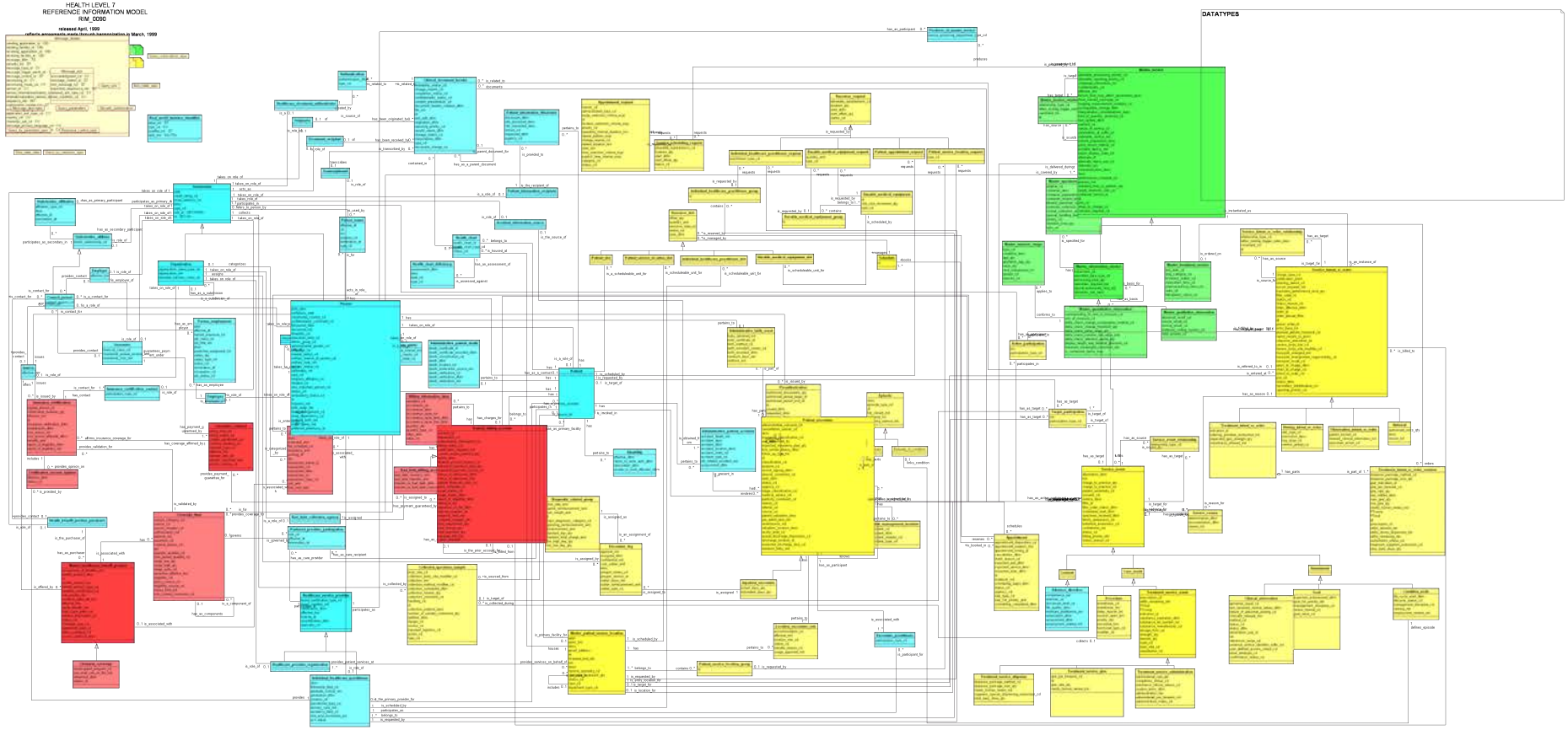
8-dimension Socio-Technical Model of Safe & Effective EHR Use



Clinical Summarization

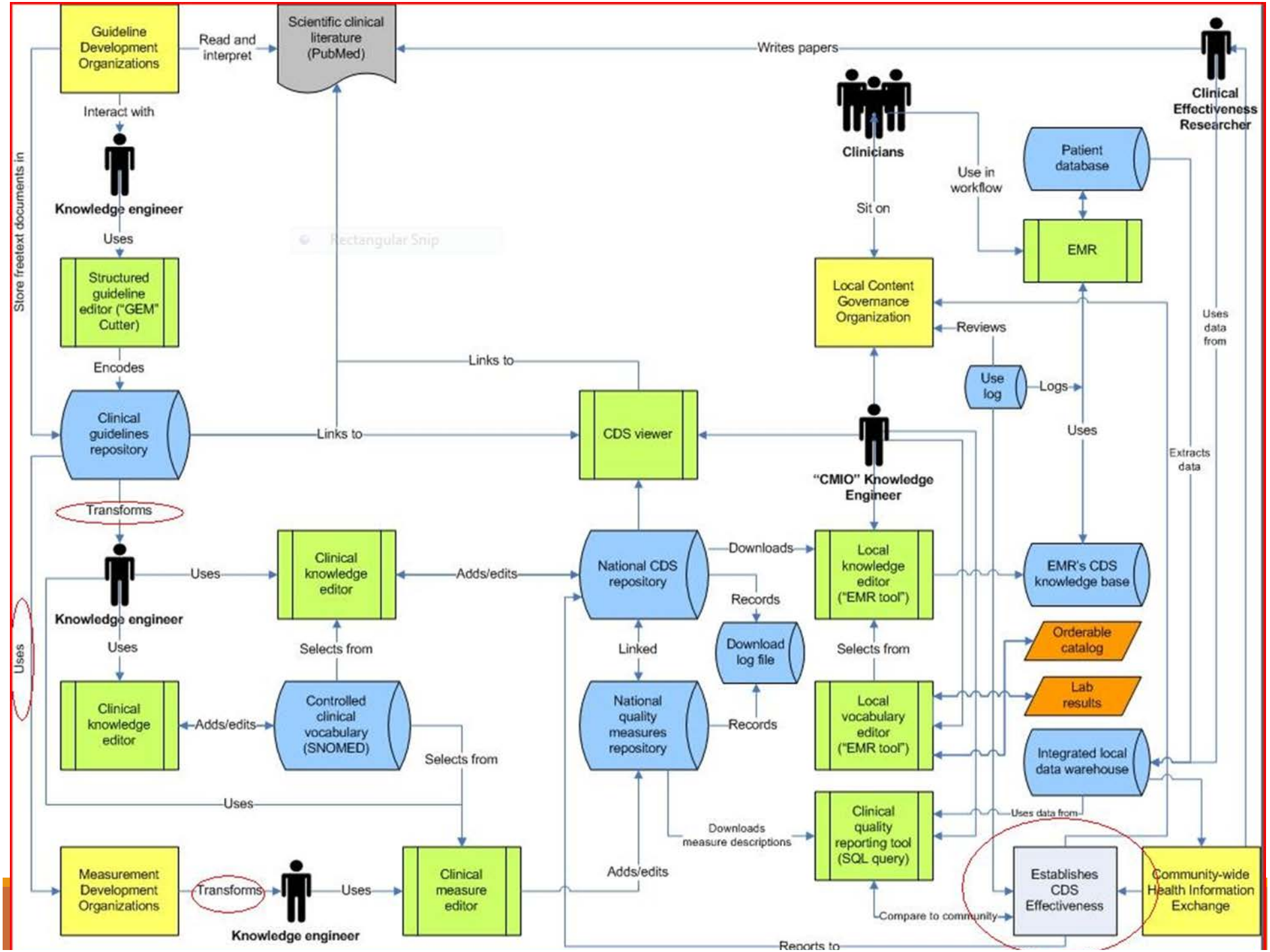
- A key unaddressed Grand Challenge in clinical informatics
- Requires multiple steps, each with major socio-technical obstacles:
  - ***Aggregate*** – data interchange standards / HIPAA / organizational resistance

HL-7 Reference Information Model



Clinical Summarization

- A key unaddressed Grand Challenge in clinical informatics
- Requires multiple steps, each with major socio-technical obstacles:
  - ***Aggregate*** – data interchange standards / HIPAA / organizational resistance
  - ***Organize*** – problem – medication knowledge bases / user interfaces
  - ***Reduce / Transform*** – clinical knowledge of key concepts
  - ***Interpret*** – clinical knowledge / FDA regulations?
  - ***Synthesize*** – knowledge re: combining data / FDA regulations? / clinician resistance


Guideline Development Organizations
Read and interpret
Scientific clinical literature (PubMed)
Writes papers
Clinical Effectiveness Researcher
Interact with
Knowledge engineer
Clinicians
Use in workflow
Patient database
Sit on
EMR
Uses
Structured guideline editor ("GEM" Cutter)
Local Content Governance Organization
Reviews
Uses data from
Encodes
Links to
Use log
Logs
Clinical guidelines repository
Links to
CDS viewer
"CMIO" Knowledge Engineer
Uses
Extracts data
Transforms
Clinical knowledge editor
Adds/edits
National CDS repository
Downloads
Local knowledge editor ("EMR tool")
EMR's CDS knowledge base
Knowledge engineer
Uses
Selects from
Records
Download log file
Linked
Selects from
Orderable catalog
Lab results
Clinical knowledge editor
Adds/edits
Controlled clinical vocabulary (SNOMED)
Selects from
National quality measures repository
Records
Local vocabulary editor ("EMR tool")
Integrated local data warehouse
Uses
Uses data from
Downloads measure descriptions
Clinical quality reporting tool (SQL query)
Measurement Development Organizations
Transforms
Knowledge engineer
Uses
Clinical measure editor
Adds/edits
Compare to community
Establishes CDS Effectiveness
Community-wide Health Information Exchange
Reports to
Store freetext documents in
Uses

Clinical Summarization

- A key unaddressed Grand Challenge in clinical informatics
- Requires multiple steps, each with major socio-technical obstacles:
  - ***Aggregate*** – data interchange standards / HIPAA / organizational resistance
  - ***Organize*** – problem – medication knowledge bases / user interfaces
  - ***Reduce / Transform*** – clinical knowledge of key concepts
  - ***Interpret*** – clinical knowledge / FDA regulations?
  - ***Synthesize*** – knowledge re: combining data / FDA regulations? / clinician resistance
- Failure to address this challenge is NOT an option
- Require long-term commitment using a socio-technical approach

The SAFER Guides for Safe and Effective EHR Implementation and Use

DEAN F. SITTIG, PHD

UTHealth | School of Biomedical Informatics
The University of Texas Health Science Center at Houston

Evolution of safety (and risks) - Phases

Safe IT:

- events unique/specific to EHRs; more likely early in implementation

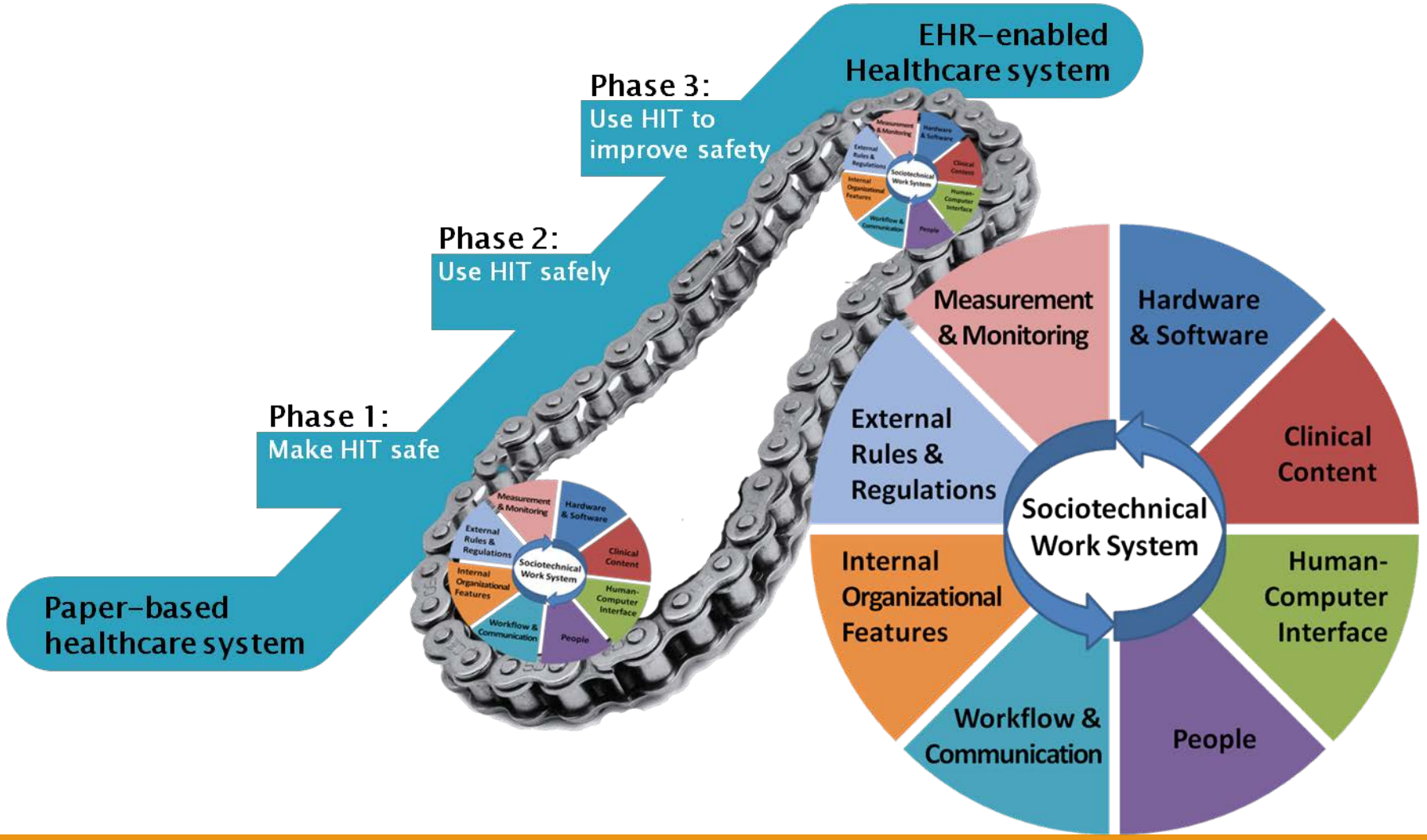
Using IT safely:

- unsafe or inappropriate use of technology
- unsafe changes in the workflows that emerge from technology use

Using IT to improve/monitor safety

- monitor health care processes and patient outcomes to identify potential safety concerns before harm

“SAFER” conceptual model



SAFER: Safety Assurance Factors for EHR Resilience

www.healthit.gov/safer/

Foundational Guides

- High Priority Practices
- Organizational Responsibilities

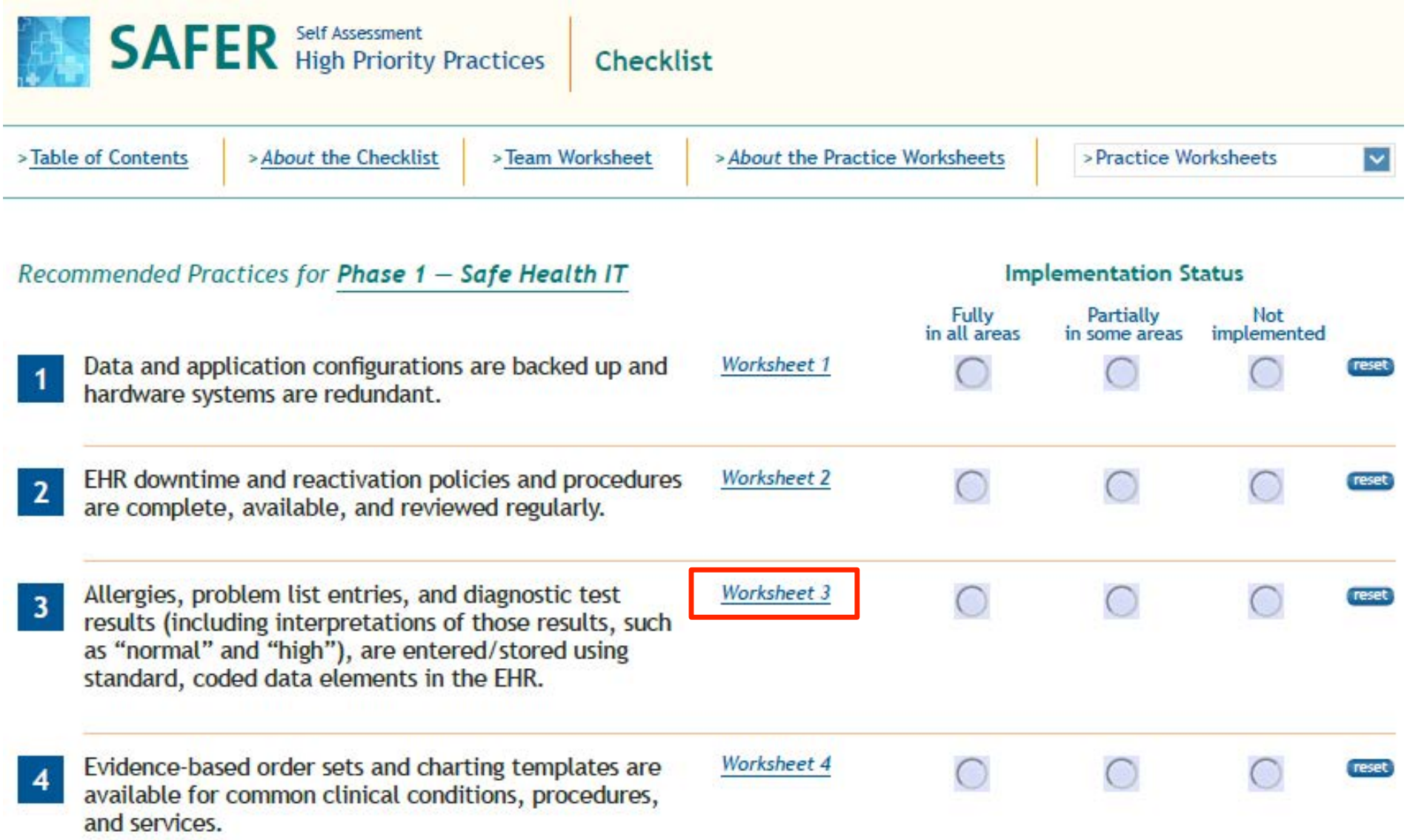
Infrastructure Guides

- System Configuration
- System Interfaces
- Contingency Planning

Clinical Process Guides

- Patient Identification
- Computerized Provider Order Entry with CDS
- Test Results Reporting and Follow-up
- Clinician Communication

SAFER checklists



Dean F. Sittig, PhD

Dean.F.Sittig@uth.tmc.edu

@DeanSittig

UTHealth | School of Biomedical Informatics
The University of Texas Health Science Center at Houston