

The Future of EHRs



If We Were Starting Now: What is Needed for the EHR of the Future?

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COLLEGE OF MEDICINE PHOENIX

In Partnership with Arizona State University



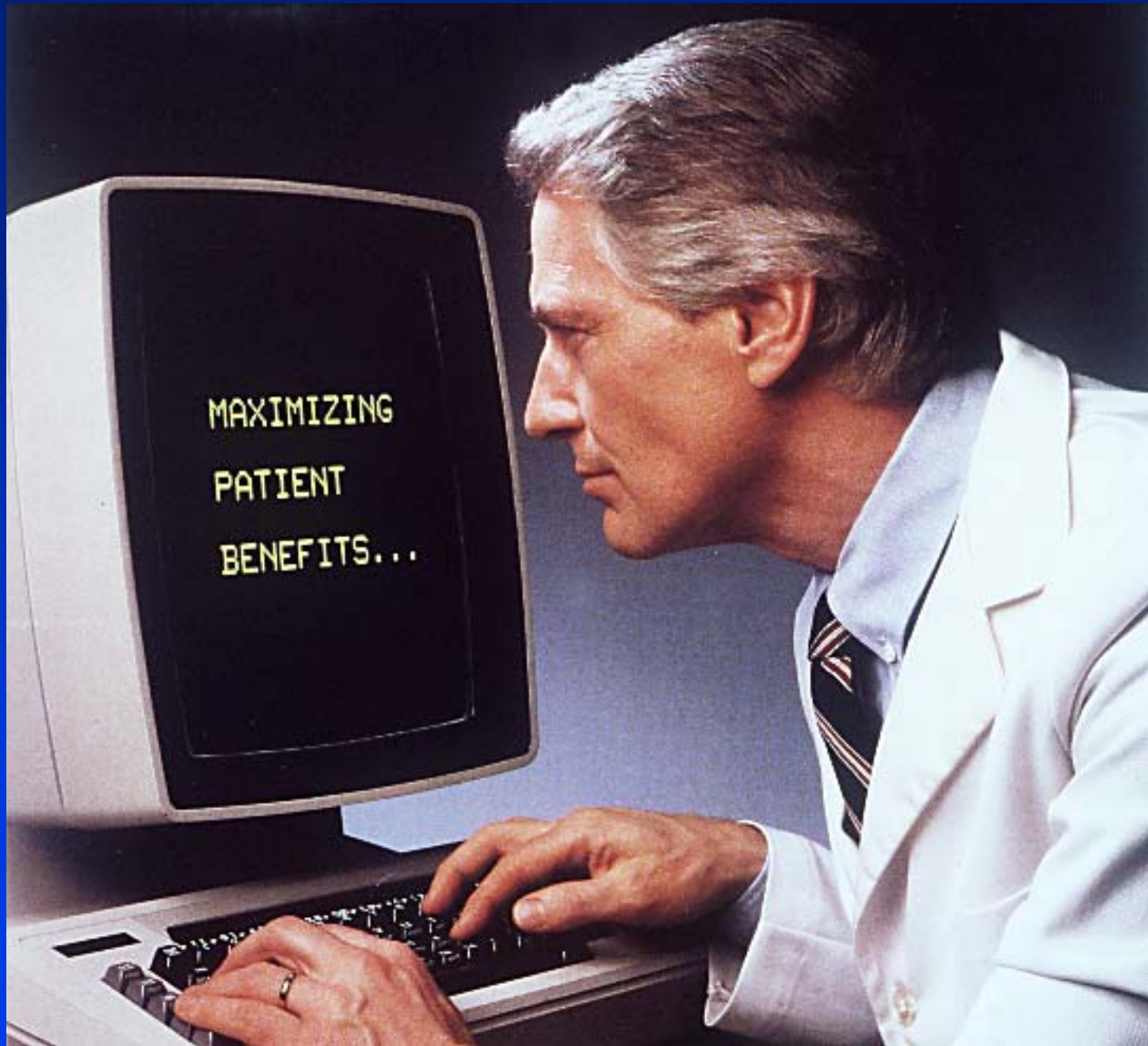
Friends of the NLM Symposium on
Personal Electronic Health Records



Natcher Conference Center
National Institutes of Health

May 21, 2009





Two Major Topics (among many)

- **Structure of the health care system that the EHR is designed to support**
- **Reaching an understanding of the cognitive needs of physicians, nurses, patients, and the myriad other users of the EHR**

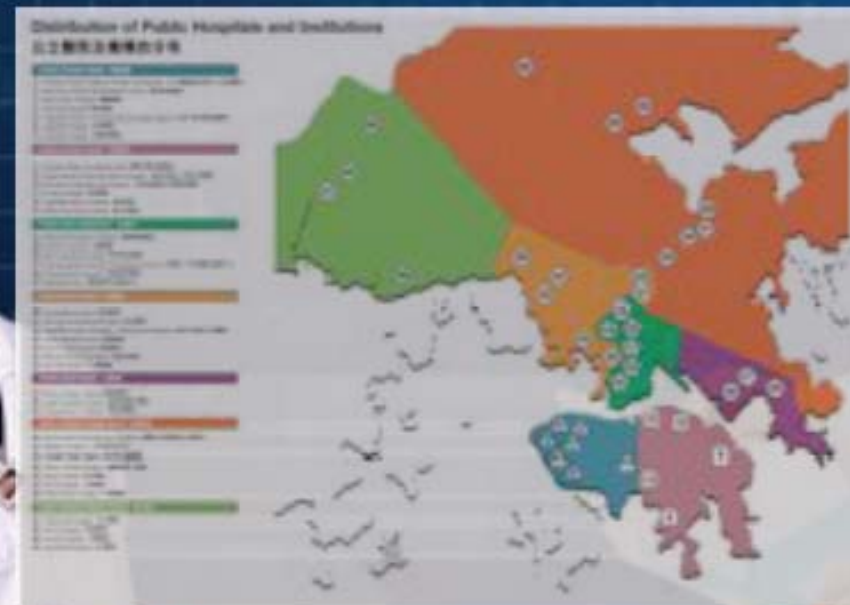
Case Report

- **The health system in the Hong Kong Special Administrative Region**
- **The role of the Hong Kong Hospital Authority in creating a unified clinical record throughout the Region**

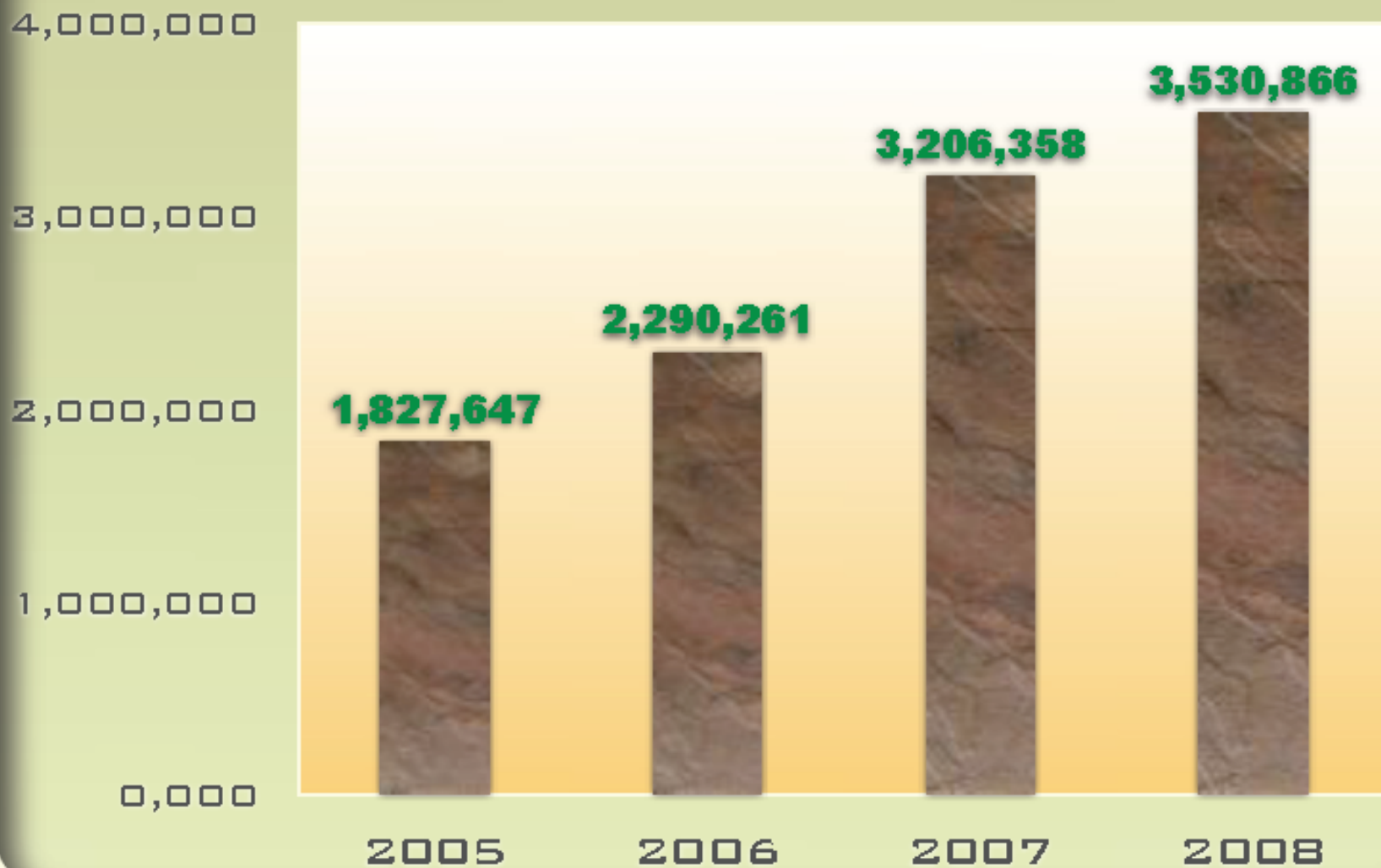
With thanks to NT Cheung

The Hospital Authority

- **40** Hospitals
- **45** Specialist Clinics
- **74** General Clinics
- **52,000** staff
- **9M** patient records
- **1M** annual admissions
- **13M** ambulatory visits



CMS - DAILY TRANSACTIONS



EPR - SCALE

- ▶ **8.9M** PATIENTS
- ▶ **223M** EPISODES OF CARE
- ▶ **890M** LABORATORY RESULTS
- ▶ **70M** RADIOLOGY STUDIES
- ▶ **388M** DRUG ITEMS
- ▶ **3.5M** UPDATES / DAY
- ▶ **700K** HITS / DAY
- ▶ **Sub-second** RESPONSE TIME
- ▶ 7x24 > **99.98%** UPTIME SINCE LIVE RUN



MDS Statistics (2008)

Drug Allergy Checking

Drug Allergy Alerts Raised	68,790
Alert Accepted	32,102 (47%)
Alert Overridden	36,688 (53%)

Drug Drug Interaction Checking

DDI Alerts Raised	10,975
Alert Accepted	3881 (35%)
Alert Overridden	7094 (65%)

INFECTIOUS DISEASE REPORTING

Clinical Management System [CMS] Last successful logon: 27-Apr-2009 21:21 (QMHHAE0)

File Clinical Investigation Enquiry Booking DT Report Doc. Print Other System Info Admin

Logoff Close PSP Dr.Px Disc Info Disc Sum Rc Reminder Letter/Doc Lab Result OP Book Bed Assigs ePR Next Pat

WDORS

病人 PATIENT. 589667 Details Alert

M 25y DOB: 03-Sep-1983 Z343653(6) PAE L1 Adm: 26-Feb-1998 HN98950017(7)

Report Date	Edit Print	Disease	Reported by	Last Updated	Pat. Spec	Hosp
02/10/2008 11:27		Cryptosporidiosis	WONG, TAI MAN	02/10/2008 11:27	PAE	QMH Log
02/10/2008 11:26		Chickenpox	WONG, TAI MAN	02/10/2008 11:26	PAE	QMH Log
02/10/2008 11:26		Tuberculosis	WONG, TAI MAN	02/10/2008 11:26	PAE	QMH Log

Scheduled Infectious Diseases		Infectious Diseases of Public Health Concerns		Potential Outbreak	
<i>Acute poliomyelitis</i>	CA-MRSA Infection	Hantavirus infection	Measles	Relapsing fever	Typhoid fever
Amoebic dysentery	Creutzfeldt-Jakob disease	<i>Influenza A(H2) / Influenza A(H5) / Influenza A(H7) / Influenza A(H9) / Swine Influenza</i>	<i>Meningococcal infection (invasive)</i>	Rubella / Congenital rubella syndrome	Typhus / Other rickettsial diseases
<i>Anthrax</i>	Dengue fever	Japanese encephalitis	Mumps	scarlet fever	Viral haemorrhagic fever
Bacillary dysentery	Diphtheria	Legionnaires' disease	Paratyphoid fever	SARS	Viral hepatitis
<i>Botulism</i>	E. coli O157:H7 infection.	Leprosy	<i>Plague</i>	<i>Smallpox</i>	West Nile Virus Infection
Chickenpox	<i>Enterovirus 71</i>	Leptospirosis	Psittacosis	<i>Streptococcus suis infection</i>	Whooping cough

DOCUMENTATION BECOMES KNOWLEDGE

Patient care and documentation



Clinical Data Analysis & Reporting (CDARS)

Audit & Research reports

Some Observations

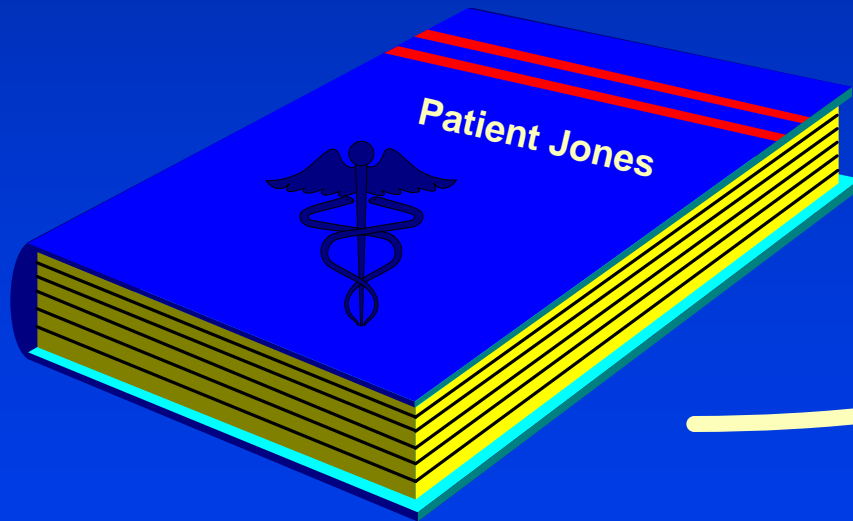
- **Large central system drives the planning and participation of physicians and patients who are not part of the government system**
- **Government sees the importance of providing connectivity to the central system as a public good**
- **Patients have embraced the system (including privacy assurances), as have most physicians**
- **Interoperability less of an issue when a single integrated system dominates (c.f., the VA system in the US)**
- **Entire effort driven by administrative, quality, and efficiency considerations, not by finance**

Lessons

- **Doing the EHR well means getting the health system right**
 - **EHR supports the system and does not define it**
 - **System governance, financing, and incentives drive the ability to get high performance from an EHR, to get broad acceptance, and to achieve quality goals**
- **“If we were starting over”, we would need to get our health system reformed appropriately in order to build effective and successful EHRs that meet our broad quality, efficiency, and public health objectives**

What Should the Electronic Health Record Be?

- Can it be more than an electronic reincarnation of the paper record we have used for decades?

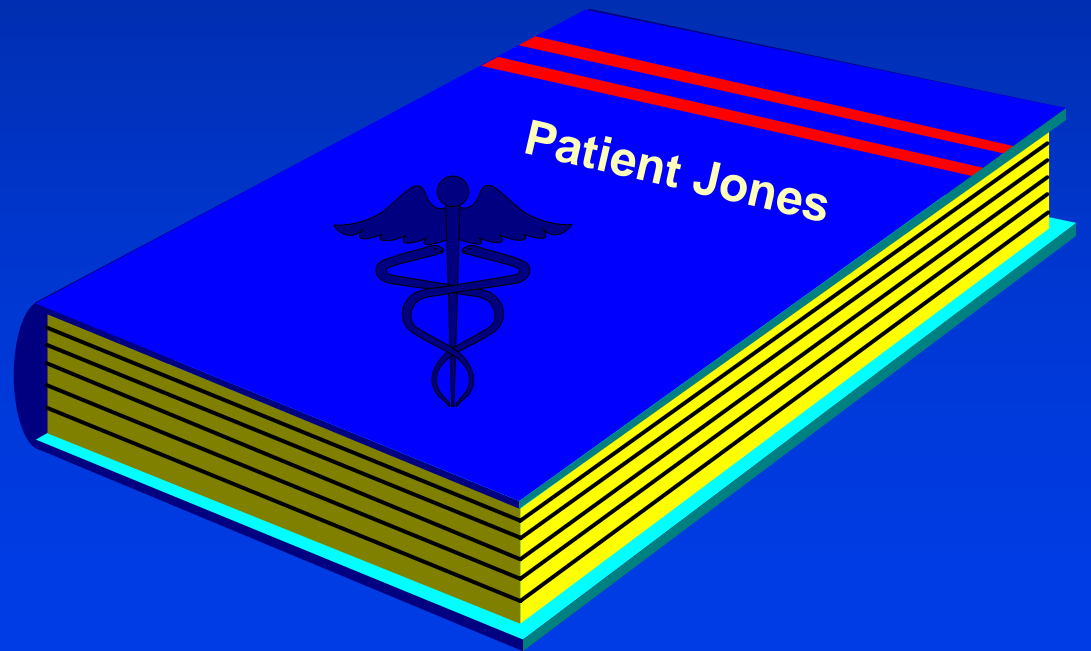


The Opportunity to Rethink Common Assumptions.....

- First instinct of developers is to create an electronic version of something from the physical world
- Major paradigm shifts occur when the computer allows us to move beyond the limitations of the physical object being modeled:
 - typewriter → word processor
 - tables on graph paper → spreadsheet
 - bank tellers → world-wide ATM network
 - hard-copy patient records → ???

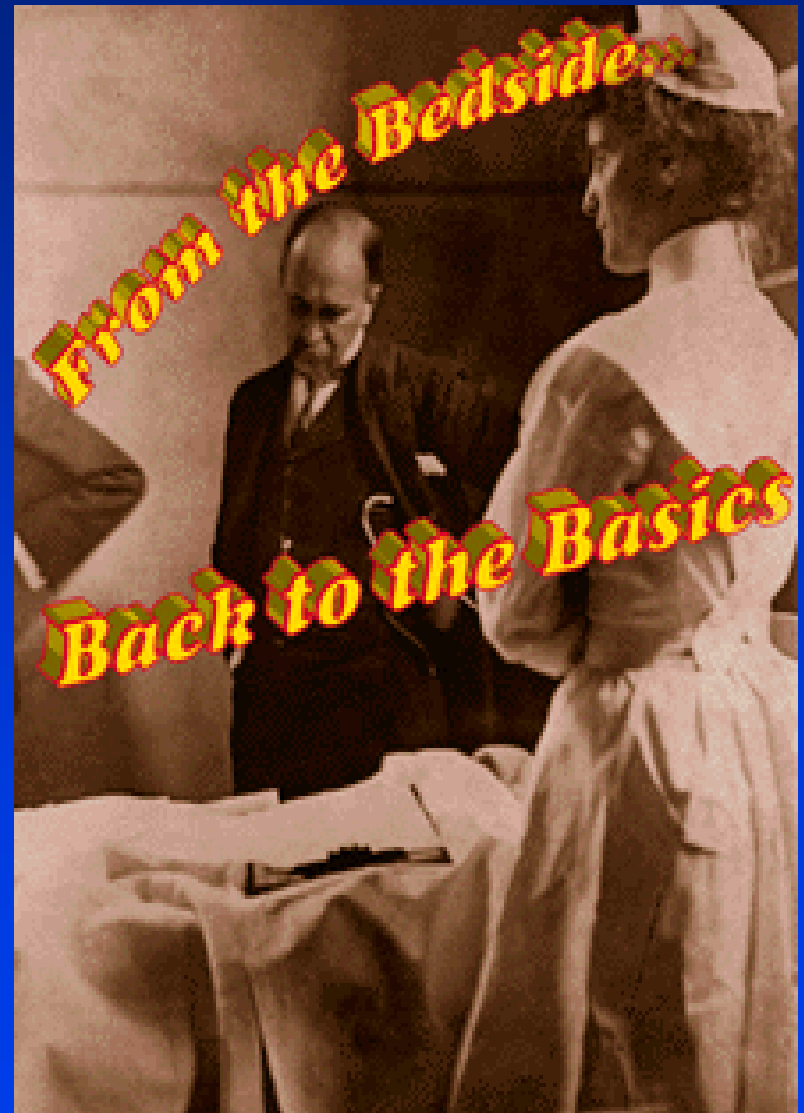
What is a Medical Record?

- We must rethink the nature of the “medical record”



The Medical Record as Lab Notebook

- Record began as a method for clinicians to record their observations
- Used as a mechanism for reminding oneself about the patient's previous visits
- Highly personalized and without major organizational or legal requirements



Use of the Paper Record

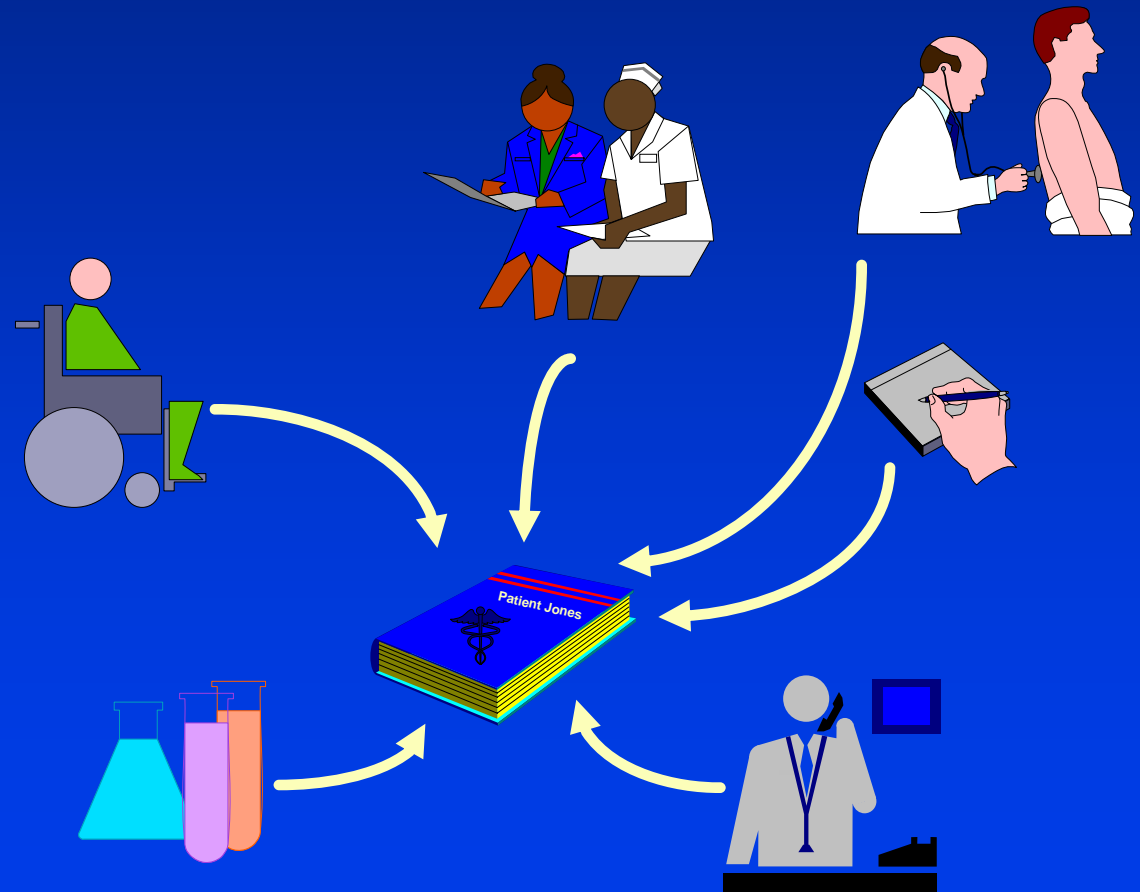
- The record is static and consistent
- Every user sees the same record
- The document tells a story, largely in chronological fashion, and is not indexed for random access to specific data
- Surgeons, internists, and other specialists all see and share the same chart



Great opportunities for leveraging electronic methods to provide custom-tailored, intuitive, and efficient interfaces to the same underlying database

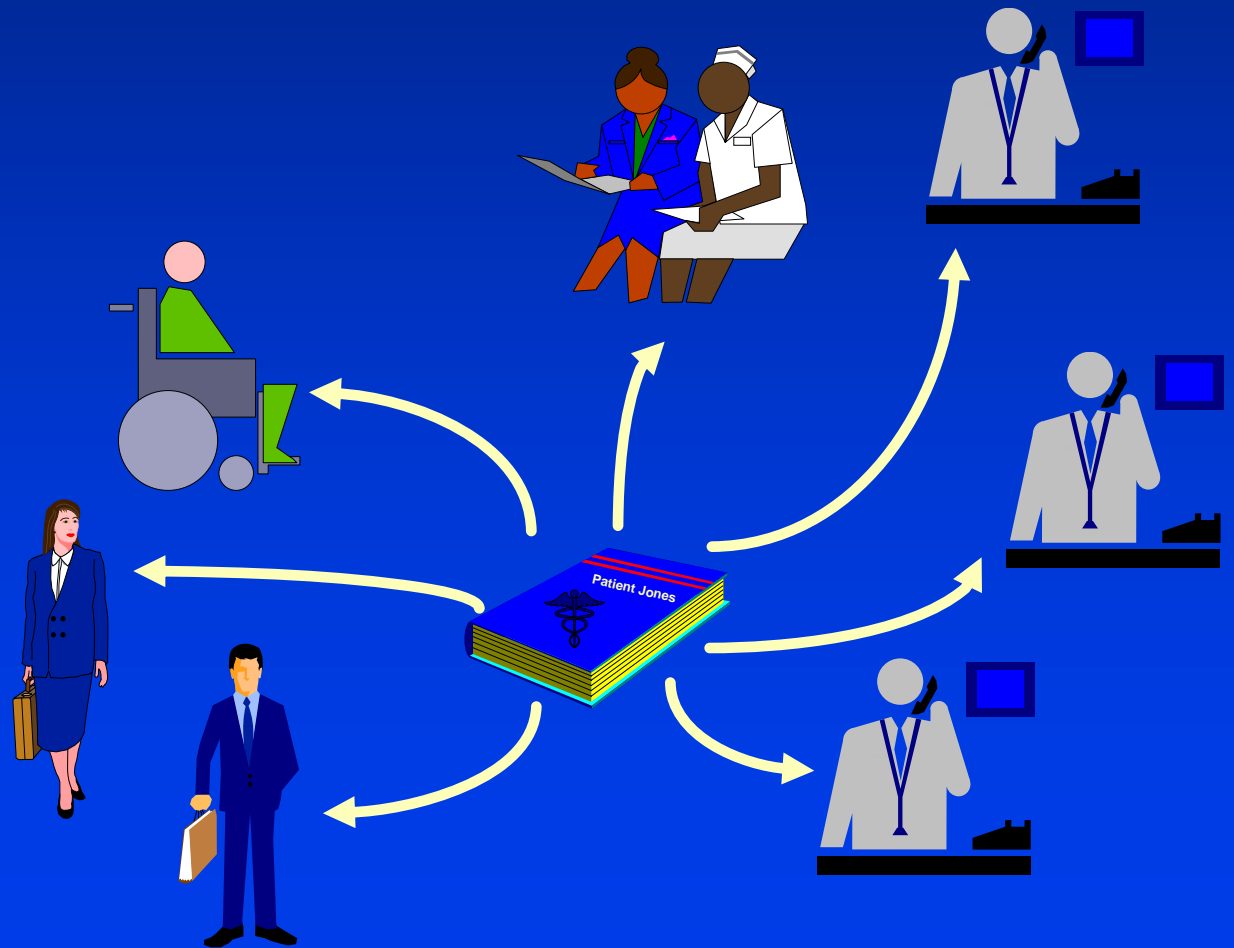
What is a Medical Record?

- The record is not an object but a *process*
 - data capture
 - merging



What is a Medical Record?

- The record is not an object but a *process*
 - data capture
 - merging
 - display
 - analysis
 - sharing

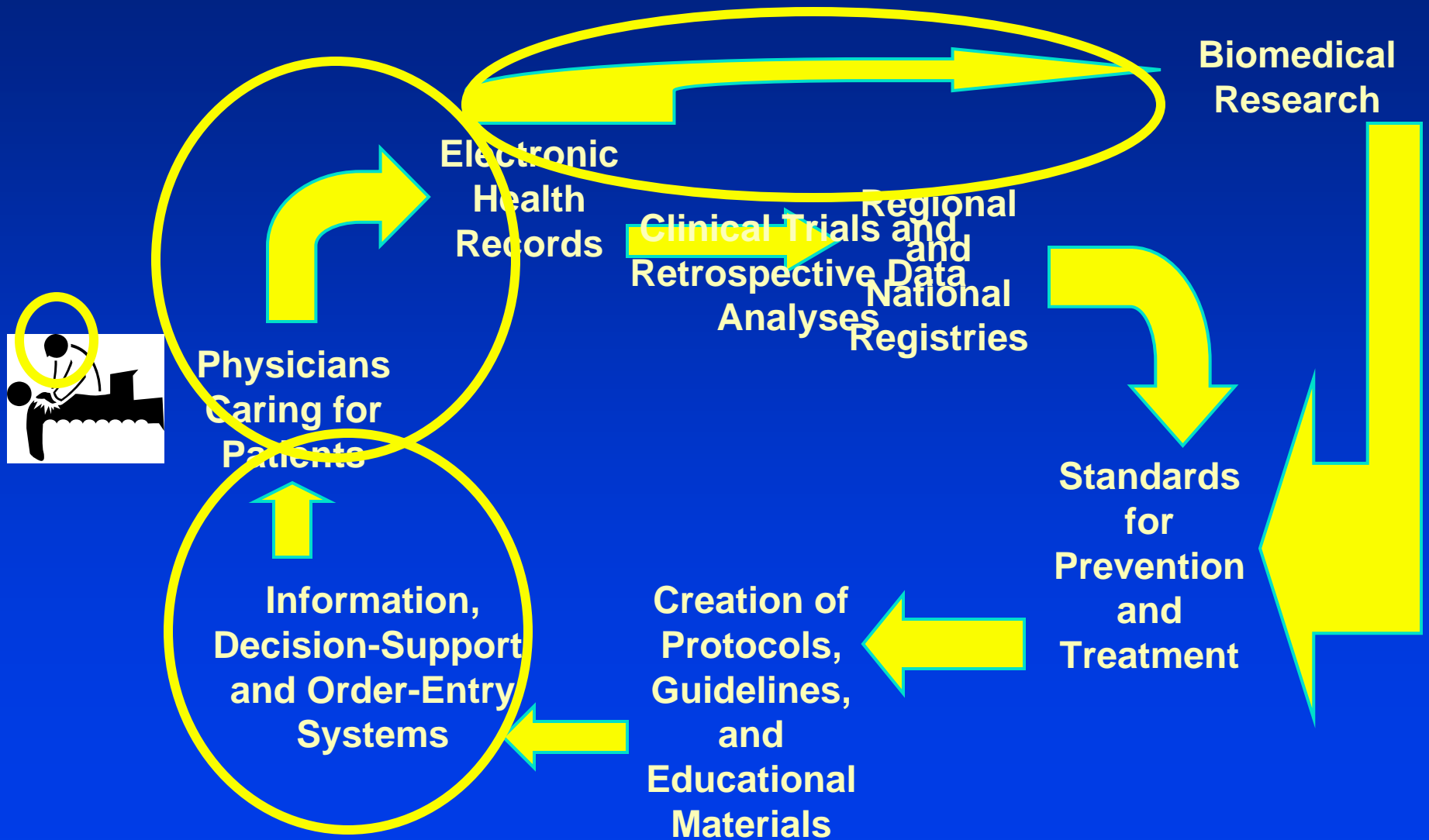


The Record as a Set of Processes

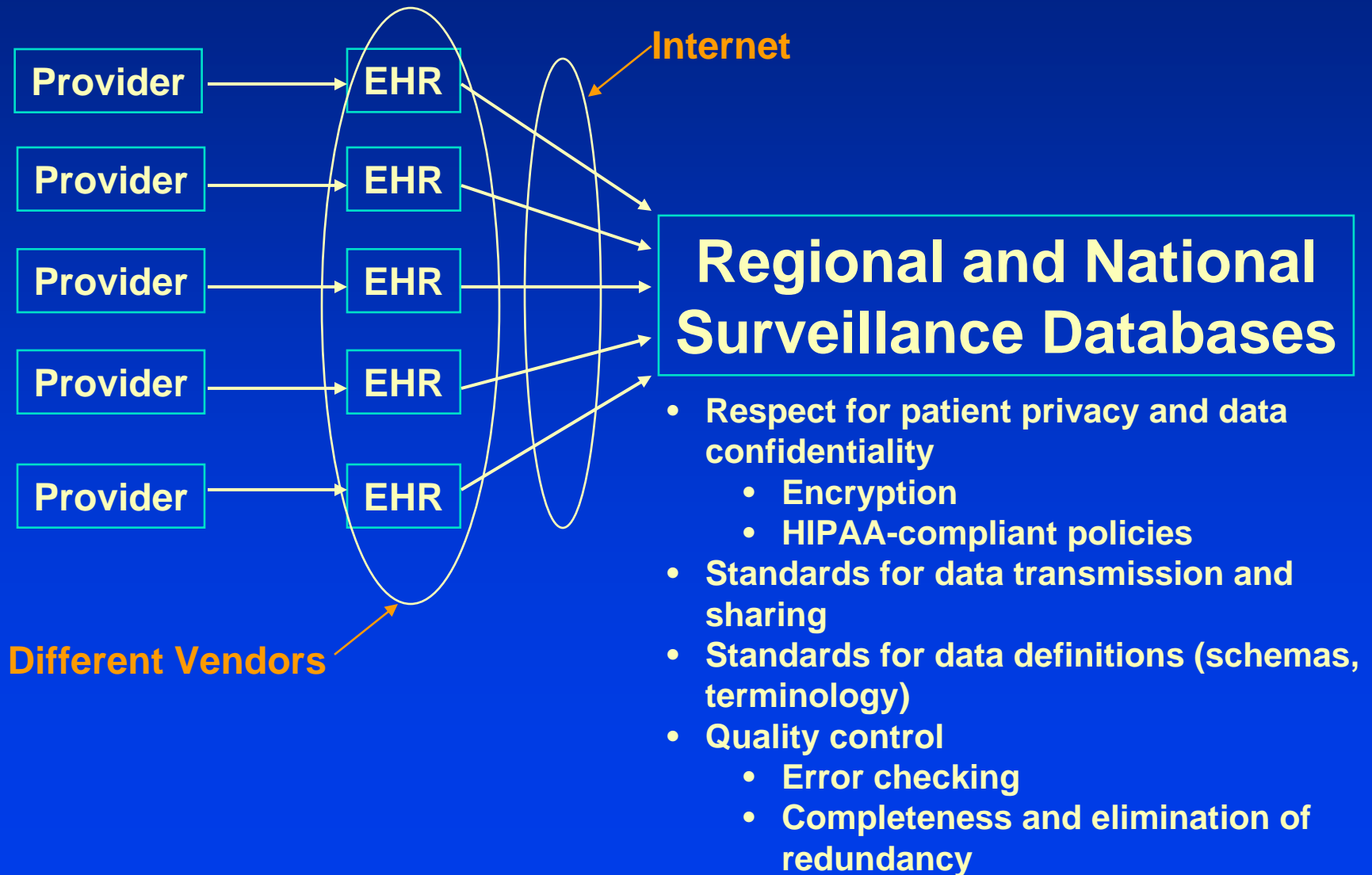
- The electronic health record is not an object, or a product, but a set of processes that an organization must put into place, supported by technology
- It is not possible to buy a medical record system as an “off-the-shelf” product



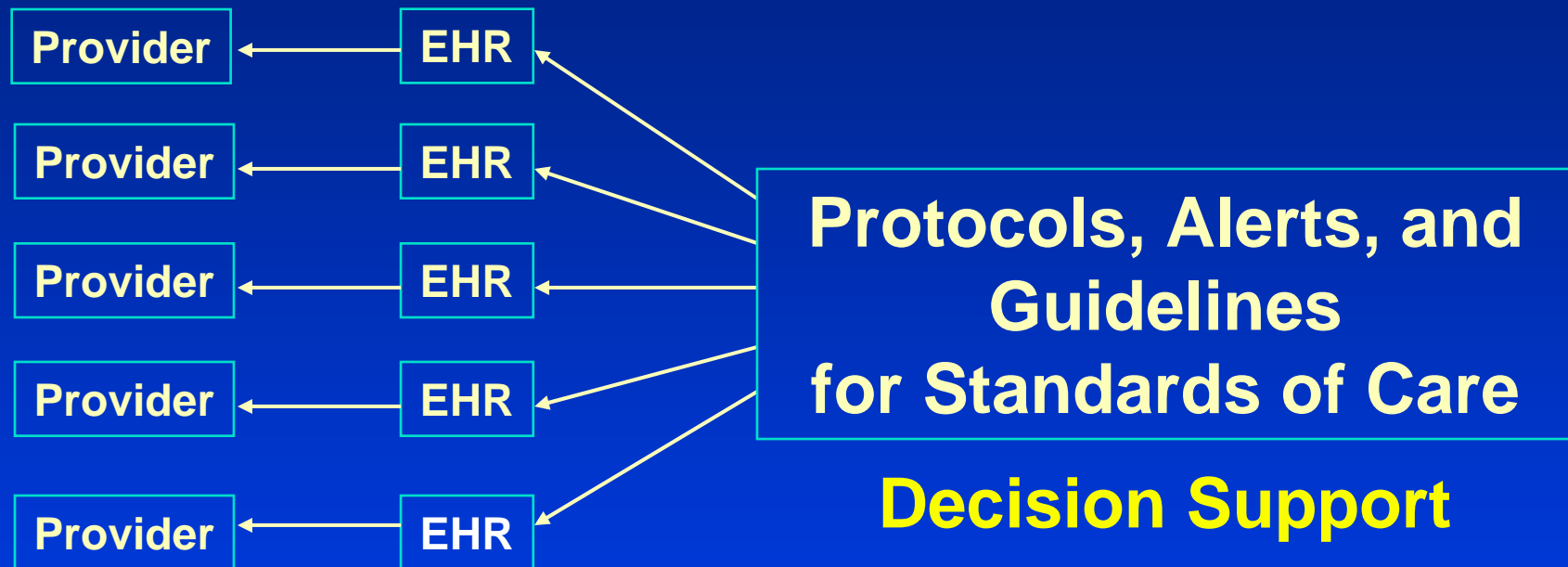
The Shared Vision



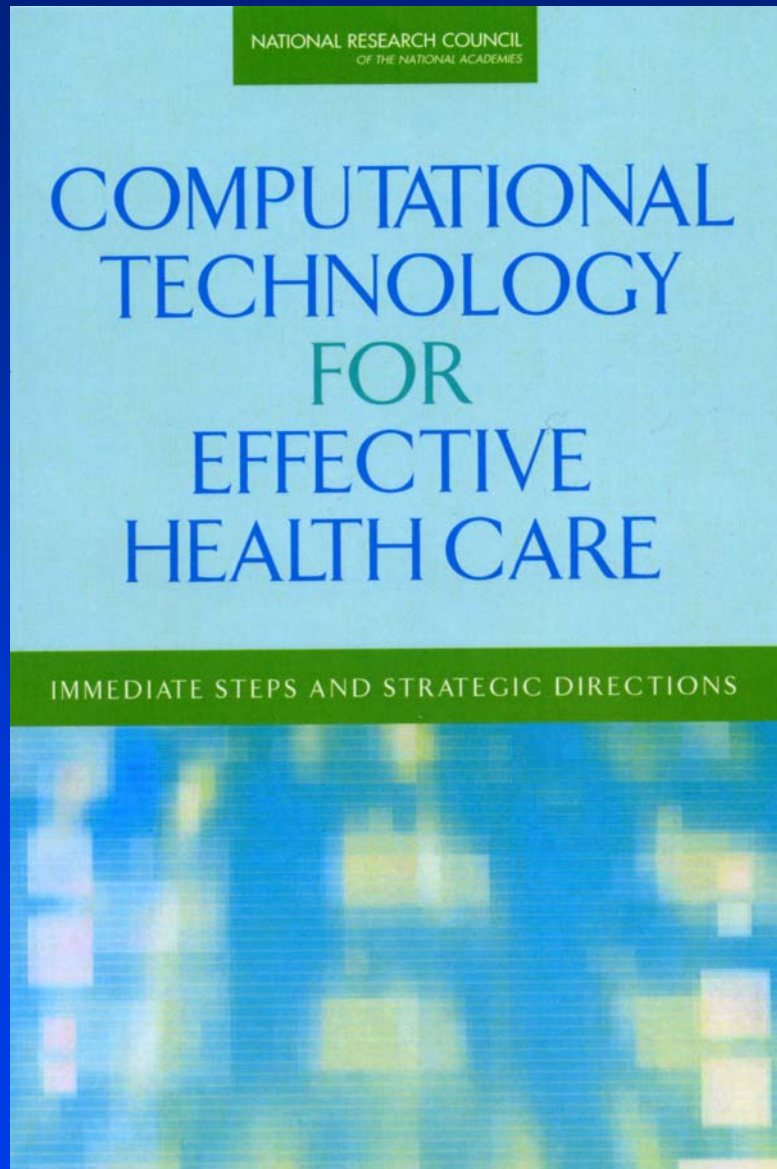
The Challenge in Leveraging EHRs in the Community



Decision Support Opportunities



- Prevention information
- Detection information
- Trends and patterns
- Delivery of guidelines
- Opportunities for distributed (community-based) clinical research



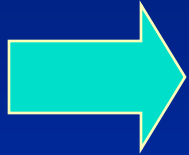
120 pages (March 2009)

The Computer Science Community

The computer science community can find deep, meaningful, and fundamental intellectual challenges in the health care problem domain. Accordingly, the committee believes that the computer science community should:

- **Engage as co-equal intellectual partners and collaborators** with health care practitioners and experts in biomedical informatics and other relevant disciplines, such as industrial and process engineering and design, in an ongoing relationship to understand and solve problems of importance to health care.
- **Develop institutional mechanisms** within academia for rewarding work at the health care/computer science interface.
- **Support educational and retraining efforts** for computer science researchers who want to explore research opportunities in health care and biomedical research.

Grand Challenges for Computer Science in Health Care Domain



- **An Overarching Research Grand Challenge:
Patient-Centered Cognitive Support**
- **Modeling**
- **Automation**
- **Data sharing and collaboration**
- **Data management at scale**
- **Automated full capture of physician-patient interactions**

Summary

- **Support health reform measures that will allow us to build EHR's that can meet our efficiency, quality, and public health objectives**
- **Design and implement systems with a much greater understanding of, and sensitivity to, the cognitive needs of various types of users**
 - **Decrease errors, even in use of electronic records**
 - **Improve workflow and decrease incremental time commitments**
 - **Better support patients as EHR users**

Thanks!

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