5. Case Studies: Healthcare & Medical Informatics

DE + IA (INFO 243) - 6 February 2008

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Plan for Today's Class

HIT and MIS

Electronic Health Records

Cracks in the Pharmaceutical Supply Chain

Health Care Needs an Internet Revolution

Wall Street Journal (5 October 2007) by Bill Gates

"98,000 Americans die every year as a result of preventable medical errors. That makes the healthcare system itself the fifth-leading cause of death in this country"

"Few industries are as information-dependent and as data-rich as health care. Every visit to a doctor, every test, measurement and procedure generates more information"
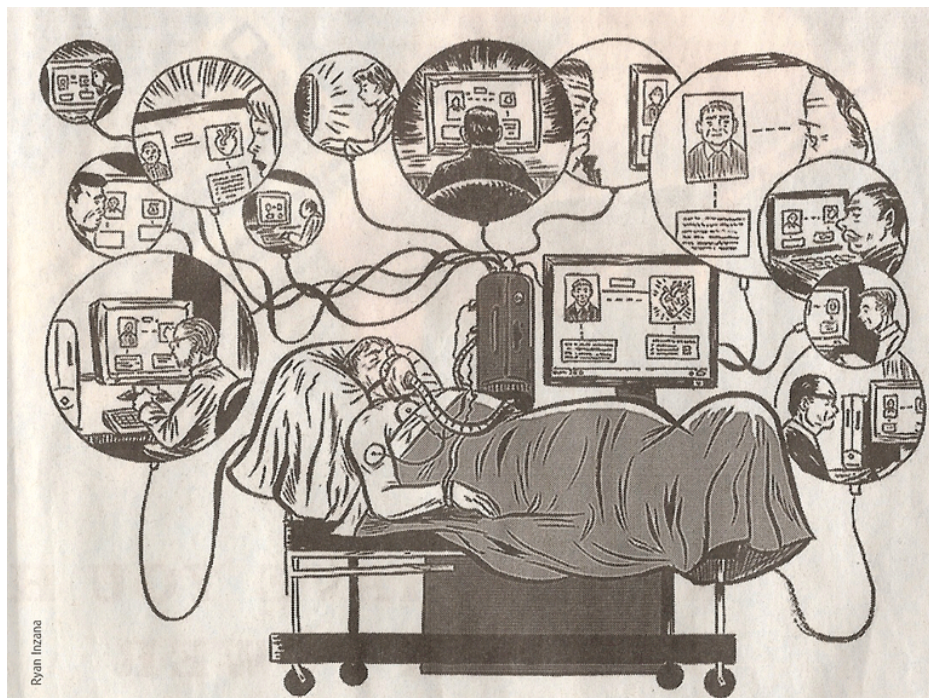
"Isolated, disconnected systems make it impossible for your doctor to assemble a complete picture of your health and make fully informed treatment decisions"

"We envision a comprehensive, Internet-based system that enables health care providers to automatically deliver personal health data to each patient in a form they can understand and use"

The Wired Patient

The Wireless Hospital

InnerWireless and IBM to Install Advanced Wireless Infrastructure at Vassar Brothers Medical Center to Improve Productivity, Patient Care

IBM Selects InnerWireless' Medical-grade Wireless UtilityT As In-building Solution for Hospital Transformation

RICHARDSON, Texas – Jan. 31, 2006 – InnerWireless announced today that they have completed their first joint installation with IBM of the InnerWireless Medical-grade Wireless UtilityT in Vassar Brothers Medical Center, a 365-bed hospital in the Health Quest network that serves a local population of approximately 585,000 patients. The wireless, in-building platform allows Vassar Brothers to expand and support a broad range of wireless devices and applications to improve hospital operations and patient care. The hospital is enhancing employee productivity with wireless communication tools, increasing patient safety through a wireless medication bar-coding solution, and enabling point-of-care registration to emergency room admissions with wireless devices.

Opportunities for "HIT and MIS"

Business process automation, within and between offices and other parts of the ecosystem (insurers, labs, pharmacies)

Electronic health records / personal health records

Decision support applications (for patients, clinicians, and researchers)

Telemedicine and home care; outsourcing and offshoring

EHR Architectures

Bill Gates argues for a patient-centered or Personal Health Record that collects information from healthcare providers

However, most EHRs are designed not as a "single physical entity" but as a "functional view assembled when needed" from data stored in multiple repositories

What are the rationales and implications of each of these architectures?

EHR Constituents and Perspectives
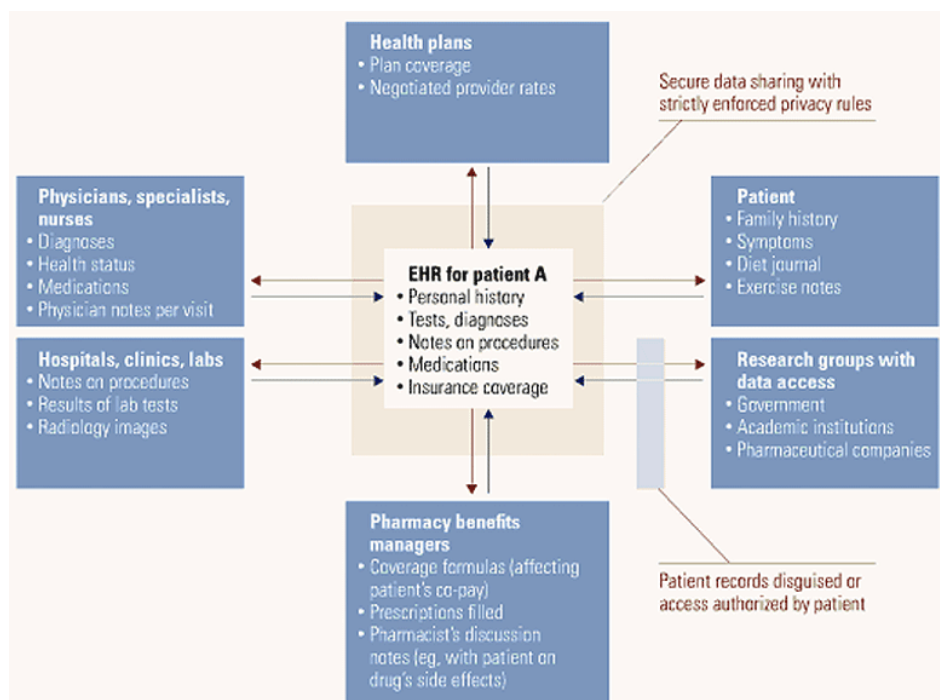
EHR Models and Formats

Some EHRs have richly-structured multimedia information models

Others are much simpler -- word processing documents or text "notepad" formats

And others -- like the scanned PDFs in the Army system we read about last week -- are barely "electronic"

What are the rationales and implications of each of these models and formats?

Potential Benefits of EHRs

For doctors and other medical service providers...

For patients

For medical research and for "society"

Challenges on the way to EHRs

The healthcare ecosystem is extremely complex and fragmented

Large short-term investment required, and cost reductions are uncertain and longer-term

Mismatch of benefits and incentives - who pays, and who benefits?

Insufficient standardization, interoperability problems

Electronic Health Records: Just Around the Corner? Or over the Cliff?

A case study of the adoption of an electronic health record system by a small (4 physicians) medical office

What were the primary motivations for installing the system?

Did they do a good job selecting the system and ensuring that it was appropriate to their requirements?

Were their expectations about installation, training, and operation reasonable?

Of the problems they encountered, which were preventable, and which ones weren't?

Applying The D-O-C-U-M-E-N-T Checklist to the EHR Case(s) [1]

D -- data types and document types (paying special attention to the former when they are used across the latter as the "glue" to connect processes)

O -- organizational transactions and processes (the "business processes", described coarsely like "drop shipment" or precisely like "PIP 3A4")

C -- context (types of products or services, industry, geography, regulatory considerations -- the ebXML "context dimensions" described in section 8.2 of Document Engineering)

U -- user types and special user requirements (these are "people" user types)

Applying The D-O-C-U-M-E-N-T Checklist to the EHR Case(s) [2]

M -- models, patterns, or standards that apply or that are needed

E -- enterprises and eco systems (e.g., trading communities, standards bodies, other frameworks that help scope the case study)

N -- the needs (business case) driving the enterprise(s)

T -- technology constraints and opportunities (legacy or interoperability concerns from existing technologies or implementations; new or improved processes or outcomes enabled by technology)

Cracks in the Pharmaceutical Supply Chain

The pharmaceutical industry supply chain is complex and opaque

"Gray market" drugs hurt profits, but counterfeit drugs can kill you

Barcode and RFID tracking can help, but aren't perfect solutions

Italy has strong laws about traceability of prescription drugs, but "such an intrusion of privacy by the government would probably not be permitted in the United States"

Legitimate Drug Suppliers?

FDA Mandates Electronic Drug "Pedigree"

FDA forces the issue on drug tracking

12/11/06
By Mary Mosquera,

Agency orders use of electronic system to fight counterfeit prescriptions

After nearly 20 years of gently prodding the pharmaceutical industry to adopt electronic track-and-trace technology, the Food and Drug Administration has decided to push.

As drug counterfeiting becomes more sophisticated and prevalent, FDA officials are requiring once and for all that distributors ensure the prescription drugs they sell are tracked throughout the supply chain, using documentation that could include radio frequency identification tags.

Electronic or paper documentation establishes a pedigree to protect consumers and industry against prescription drug counterfeiting.

"Industry needs to pick up the speed in implementing electronic pedigrees and the track-and-trace technologies to facilitate them," said FDA acting commissioner Andrew von Eschenbach at a recent RFID in Health Care Industry Adoption Summit in Washington. "This would allow tracking drugs from the assembly line to the dispenser by being able to replace the paper pedigree with an electronic version that cannot be easily forged or tampered with."

The Vassar Medication Bar Coding Project

Industry-wide error rates for experienced nurses administering medications to patients in the hospital is 20%; fortunately, rate for serious errors is only 1.4%

But Vassar administers around 2 million doses per year, so a 1.4% error rate means 28,000 serious errors per year

The wireless-based Medication Bar Coding Administration solution requires that a nurse perform three scans before giving medications to a patient

- first ...

- then...

- finally...

Only if all three scans are correct and the computer flashes a green sign will the nurse administer the medications

US Healthcare Payment System

The US Healthcare payment system is plagued by operational and policy inefficiencies

(If the patient has healthcare insurance) when he sees a doctor, neither the patient nor the providers can present a bill for services when they are provided

All the billing mechanisms and interactions between the provider and payer are invisible to the patient

The consumer might receive one or more bills, but usually weeks later

This system is plagued by 10s of billions of dollars annually in inefficiency, high overhead, and bad debts when consumers don't pay medical bills not (fully) covered by insurance
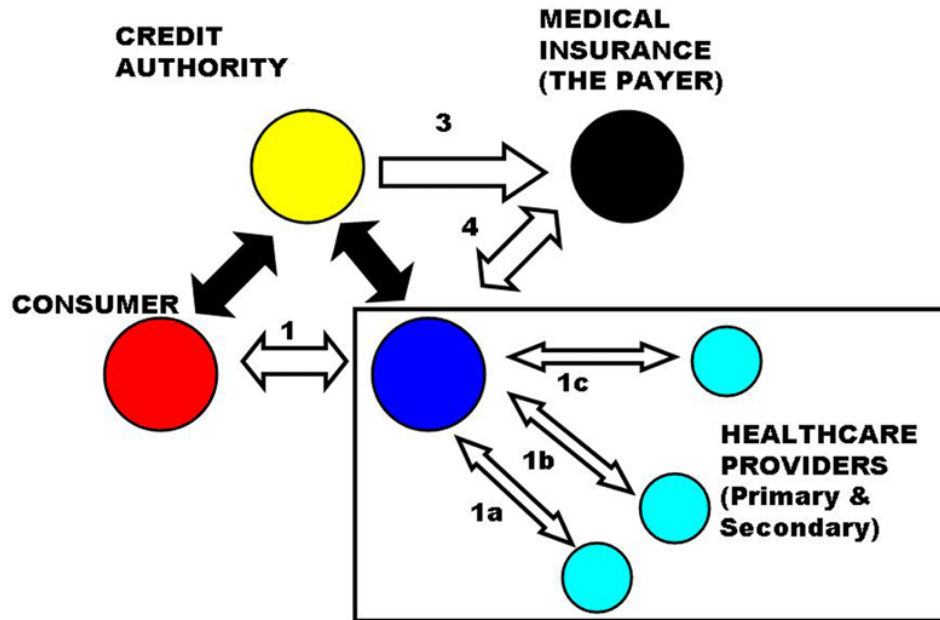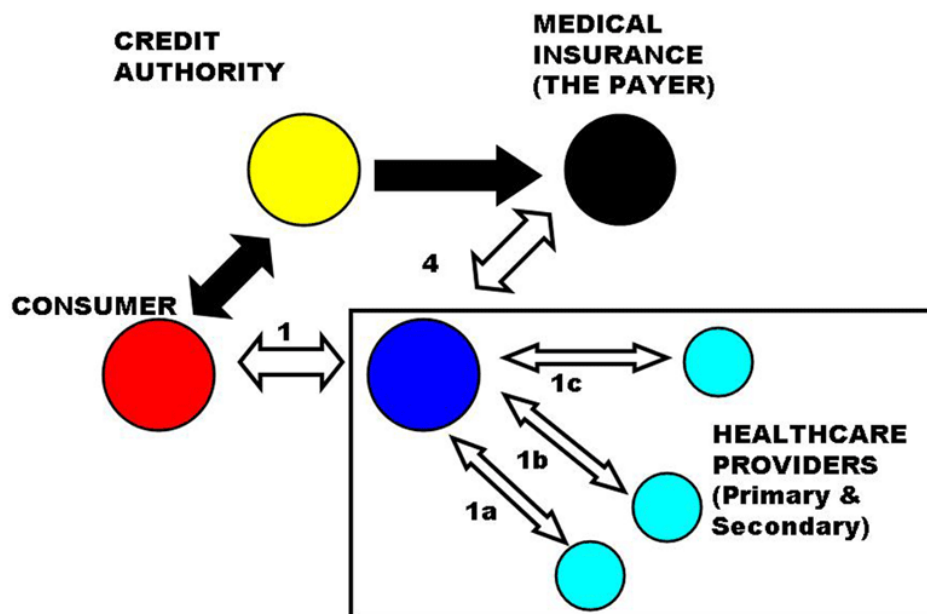
As-Is Information Flows
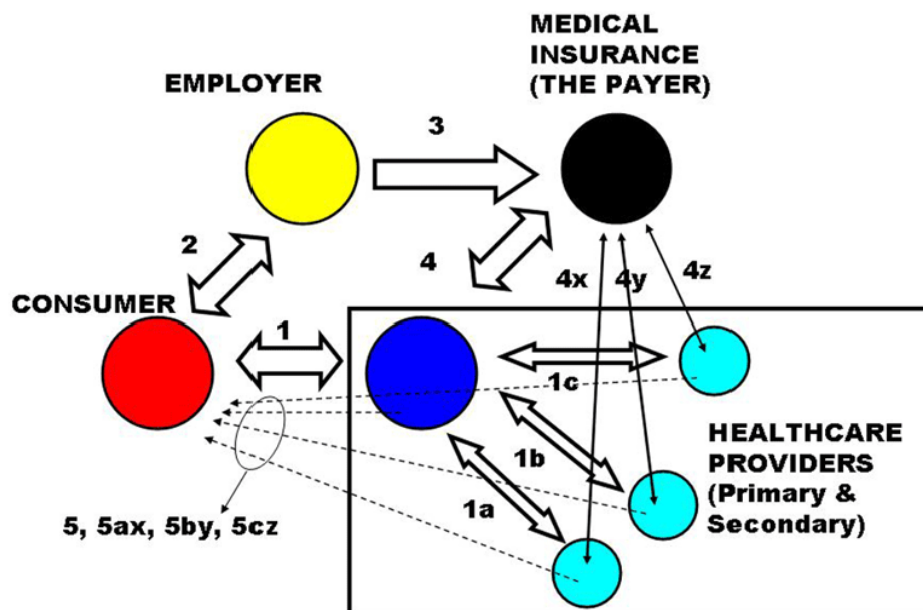
Provider-Centered "Fix"

Payer-Centered "Fix"

Reading for 11 February

Chapter 7 of Document Engineering book