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15.571 Generating Business Value from Information Technology
Spring 2009

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Two Significant Challenges in Health Care IT

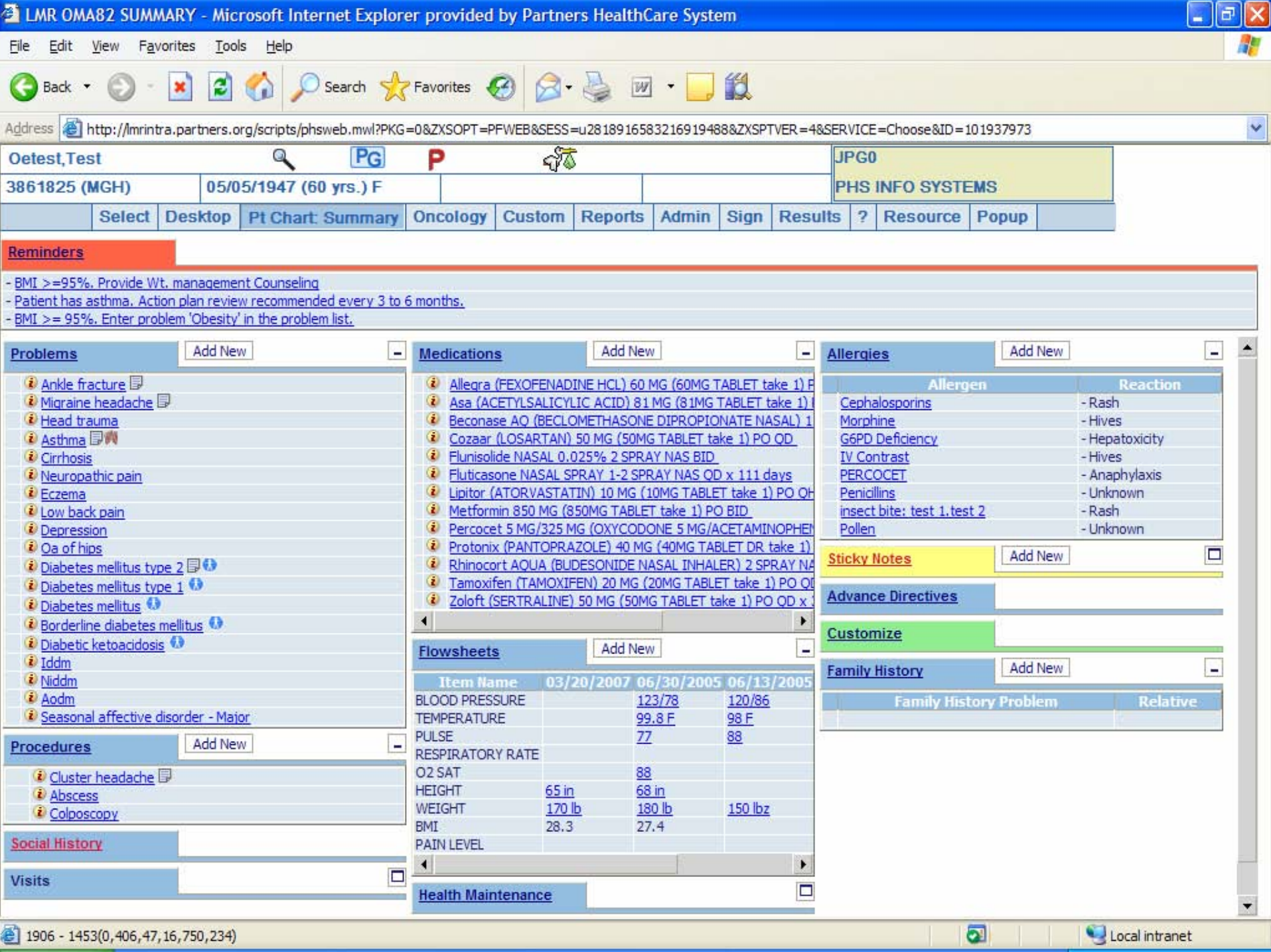
Electronic health records
Personalized medicine

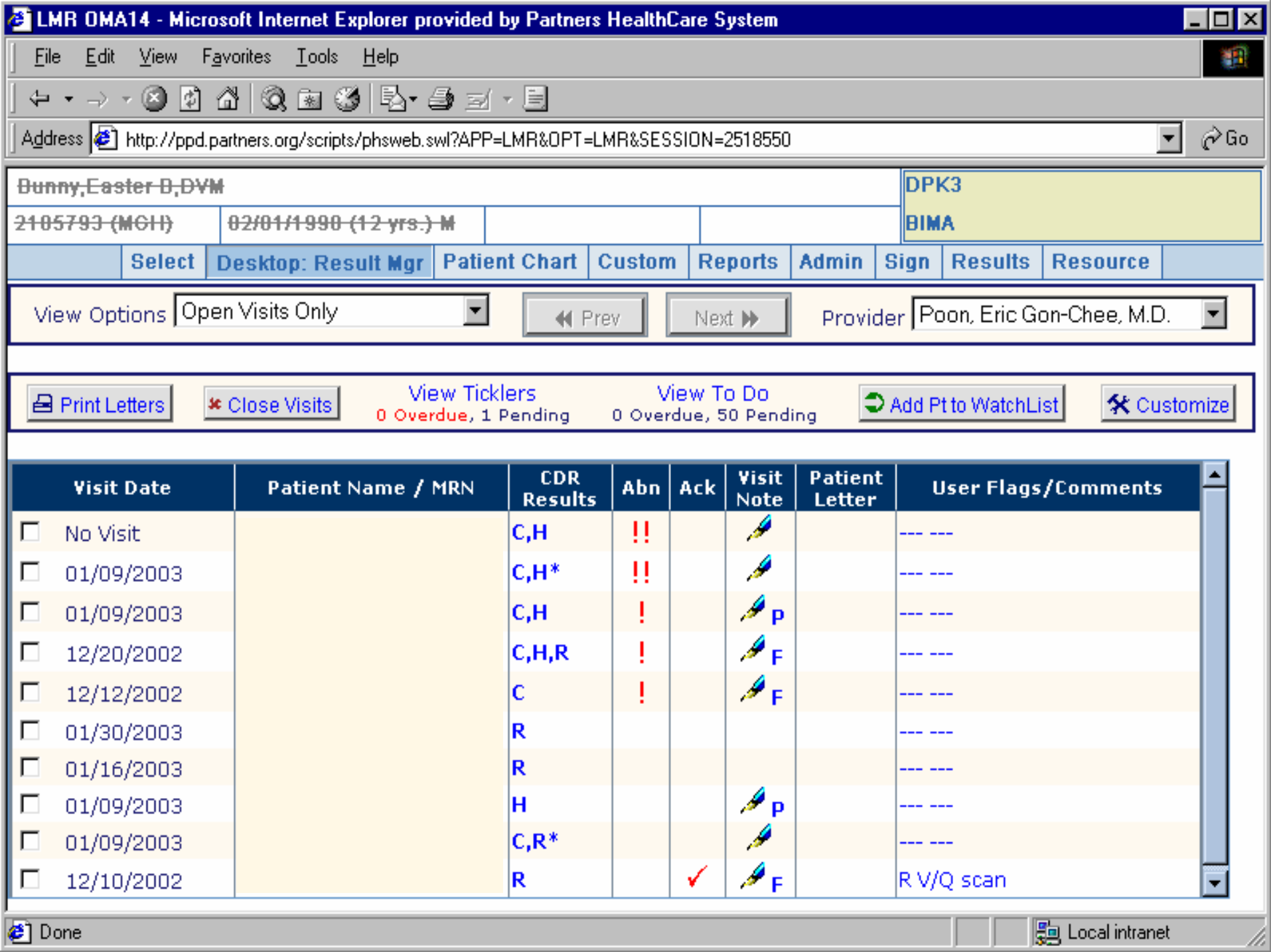
John Glaser, PhD
Vice President and CIO
Partners HealthCare

March 4, 2009

Scope of the Outpatient Care Problem

For Every:	There Appear to Be:
1000 patients coming in for outpatient care	14 patients with life-threatening or serious ADEs
1000 women with a marginally abnormal mammogram	360 who will not receive appropriate follow-up care
1000 patients who qualified for secondary prevention of high cholesterol	380 will not have a LDL-C, within 3 years, on record

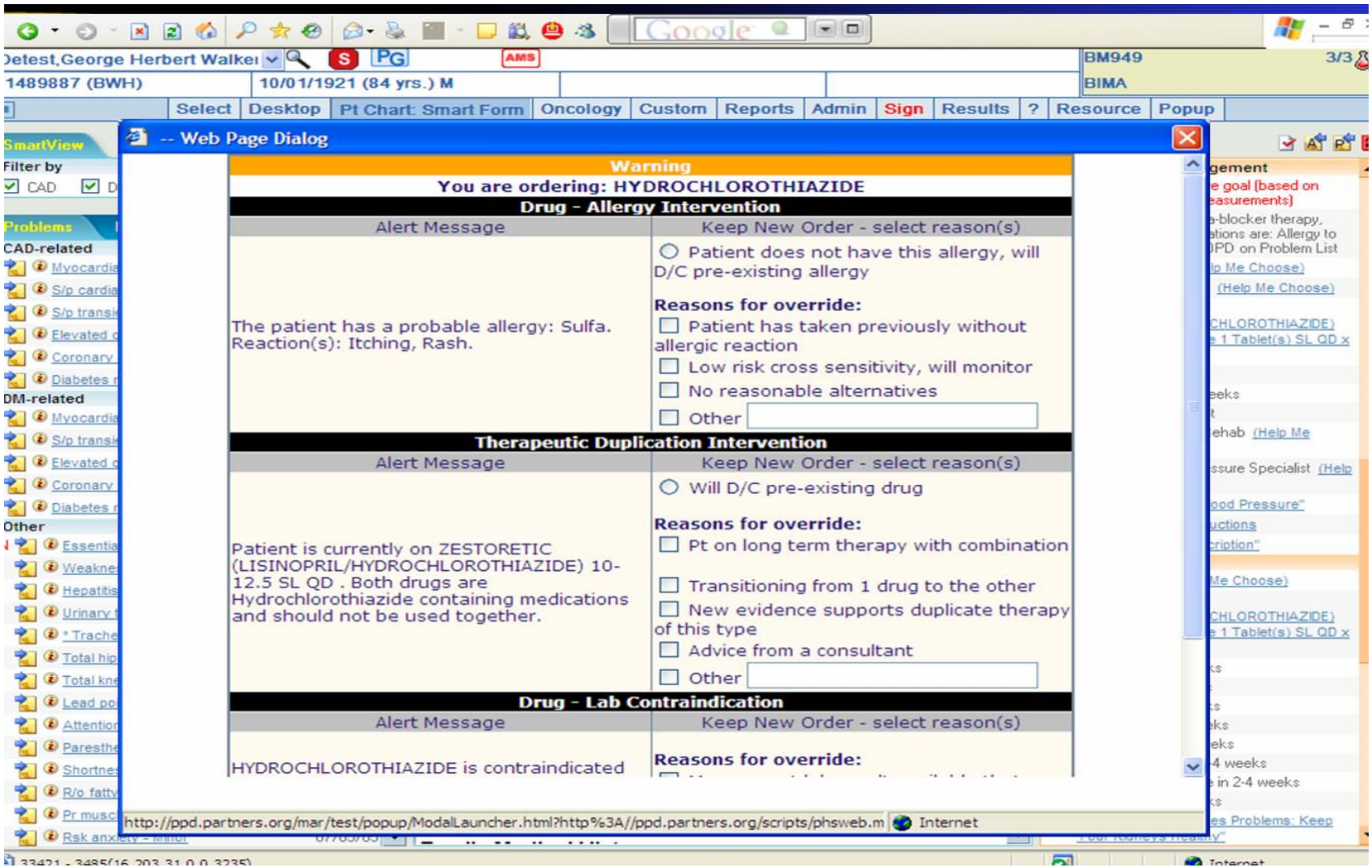

LMR OMA82 SUMMARY - Microsoft Internet Explorer provided by Partners HealthCare System
File Edit View Favorites Tools Help
Back Search Favorites
Address http://lmrintra.partners.org/scripts/phsweb.mwl?PKG=0&ZXSOPT=PFWEB&SESS=u2818916583216919488&ZXSPTVER=4&SERVICE=Choose&ID=101937973
Oetest,Test
3861825 (MGH)
05/05/1947 (60 yrs.) F
JPG0
PHS INFO SYSTEMS
Select Desktop Pt Chart: Summary Oncology Custom Reports Admin Sign Results ? Resource Popup
Reminders
- BMI >=95%. Provide Wt. management Counseling
- Patient has asthma. Action plan review recommended every 3 to 6 months.
- BMI >= 95%. Enter problem 'Obesity' in the problem list.
Problems
Add New
Ankle fracture
Migraine headache
Head trauma
Asthma
Cirrhosis
Neuropathic pain
Eczema
Low back pain
Depression
Oa of hips
Diabetes mellitus type 2
Diabetes mellitus type 1
Diabetes mellitus
Borderline diabetes mellitus
Diabetic ketoacidosis
Iddm
Niddm
Aodm
Seasonal affective disorder - Major
Procedures
Add New
Cluster headache
Abscess
Colposcopy
Social History
Visits
Medications
Add New
Allegra (FEXOFENADINE HCL) 60 MG (60MG TABLET take 1) P
Asa (ACETYLSALICYLIC ACID) 81 MG (81MG TABLET take 1)
Beconase AQ (BECLOMETHASONE DIPROPIONATE NASAL) 1
Cozaar (LOSARTAN) 50 MG (50MG TABLET take 1) PO QD
Flunisolide NASAL 0.025% 2 SPRAY NAS BID
Fluticasone NASAL SPRAY 1-2 SPRAY NAS QD x 111 days
Lipitor (ATORVASTATIN) 10 MG (10MG TABLET take 1) PO QH
Metformin 850 MG (850MG TABLET take 1) PO BID
Percocet 5 MG/325 MG (OXYCODONE 5 MG/ACETAMINOPHEN
Protonix (PANTOPRAZOLE) 40 MG (40MG TABLET DR take 1)
Rhinocort AQUA (BUDESONIDE NASAL INHALER) 2 SPRAY NA
Tamoxifen (TAMOXIFEN) 20 MG (20MG TABLET take 1) PO QD
Zoloft (SERTRALINE) 50 MG (50MG TABLET take 1) PO QD x
Flowsheets
Add New
Item Name 03/20/2007 06/30/2005 06/13/2005
BLOOD PRESSURE 123/78 120/86
TEMPERATURE 99.8 F 98 F
PULSE 77 88
RESPIRATORY RATE
O2 SAT 88
HEIGHT 65 in 68 in
WEIGHT 170 lb 180 lb 150 lbz
BMI 28.3 27.4
PAIN LEVEL
Health Maintenance
Allergies
Add New
Allergen Reaction
Cephalosporins - Rash
Morphine - Hives
G6PD Deficiency - Hepatoxicity
IV Contrast - Hives
PERCOCET - Anaphylaxis
Penicillins - Unknown
insect bite: test 1.test 2 - Rash
Pollen - Unknown
Sticky Notes
Add New
Advance Directives
Customize
Family History
Add New
Family History Problem Relative
1906 - 1453(0,406,47,16,750,234)
Local intranet


LMR OMA14 - Microsoft Internet Explorer provided by Partners HealthCare System
File Edit View Favorites Tools Help
Address http://ppd.partners.org/scripts/phsweb.swl?APP=LMR&OPT=LMR&SESSION=2518550
Go
Bunny,Easter B,DVM
DPK3
2105793 (MGH)
02/01/1990 (12 yrs.) M
BIMA
Select
Desktop: Result Mgr
Patient Chart
Custom
Reports
Admin
Sign
Results
Resource
View Options
Open Visits Only
Prev
Next
Provider
Poon, Eric Gon-Chee, M.D.
Print Letters
Close Visits
View Ticklers
0 Overdue, 1 Pending
View To Do
0 Overdue, 50 Pending
Add Pt to WatchList
Customize
Visit Date
Patient Name / MRN
CDR Results
Abn
Ack
Visit Note
Patient Letter
User Flags/Comments
No Visit C,H !! --- ---
01/09/2003 C,H* !! --- ---
01/09/2003 C,H ! P --- ---
12/20/2002 C,H,R ! F --- ---
12/12/2002 C ! F --- ---
01/30/2003 R --- ---
01/16/2003 R --- ---
01/09/2003 H P --- ---
01/09/2003 C,R* --- ---
12/10/2002 R ✓ F R V/Q scan
Done
Local intranet

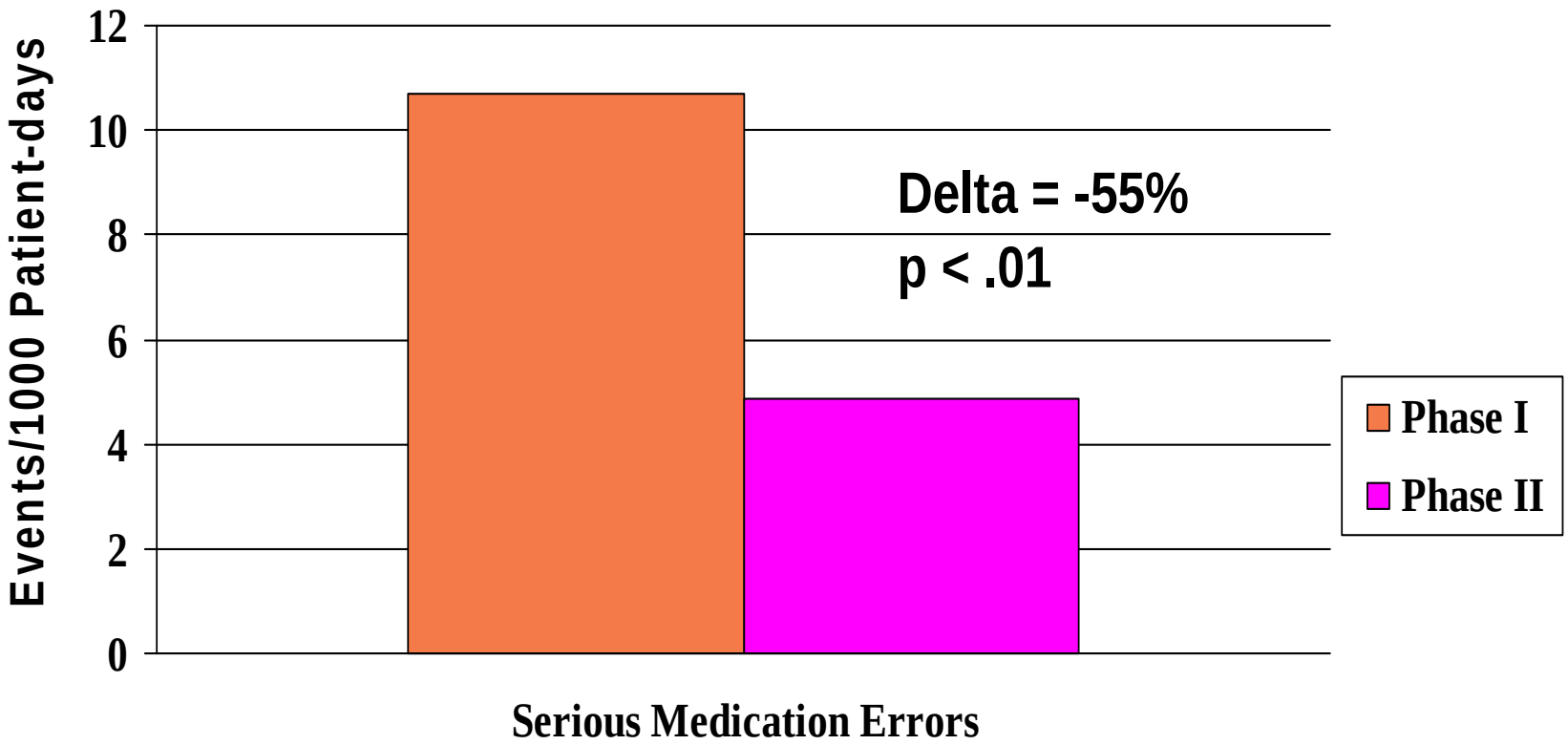
Impact of LMR Results Manager

Physician Users	**355**
Physician rating (1=Strongly agree, 5 = Strongly disagree) – care improvement	**1.8**
Physician rating – Reduce malpractice	**2.1**
Physician rating – Useful	**1.9**
Critically abnormal results highlighted per month	**120**
Sub-critical abnormal results highlighted per month	**600**

A Problematic Medication Order



Serious Medication Error Rates Before and After CPOE



Bates, Effect of Computerized Physician Order Entry and a Team Intervention on Prevention of Serious Medication Errors JAMA 1998.

The Impact of Clinical Data Exchanges Could be Significant

- **Nationwide implementation of standardized healthcare information exchange could:**
  - **Save $337B over ten years**
  - **Achieve breakeven during year five of implementation**
- **At steady state, net benefit is estimated to be:**

Providers	**$34B**	**Radiology Centers**	**$8B**
Payers	**$22B**	**Pharmacies**	**$1B**
Laboratories	**$13B**	**Public Health**	**$0.1B**

Source: Center for Information Technology Leadership, Partners HealthCare, 2004.

EHR Return on Investment

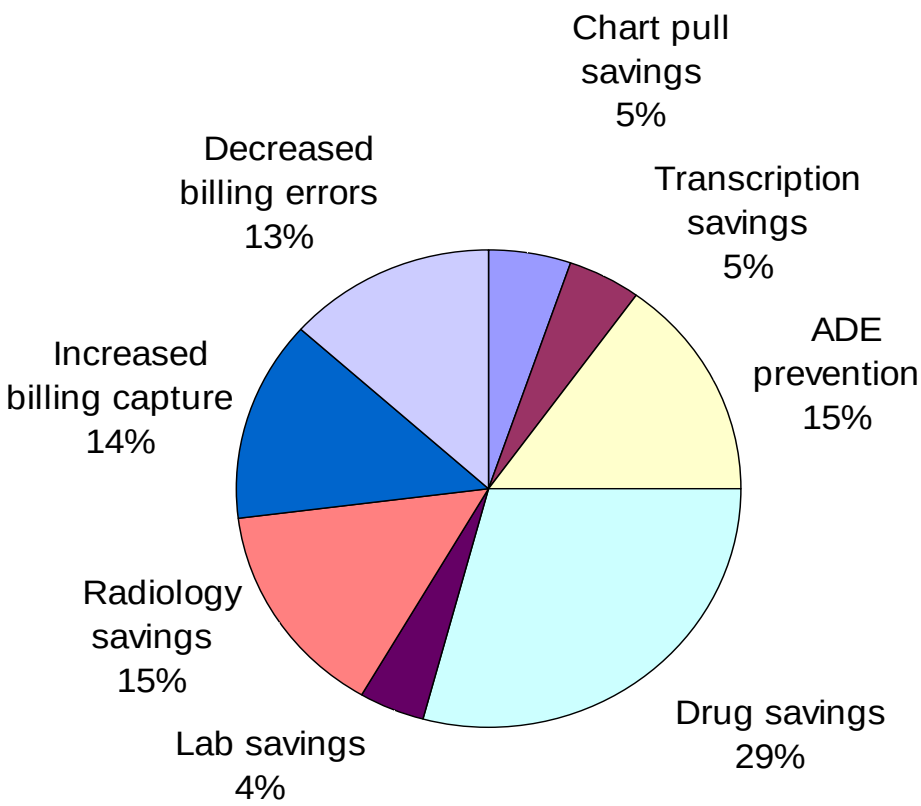
More Effective[1]	Year 1	Year 2	Year 3	Year 4	Year 5
EMR Investment	$40,700	$5,700	$5,700	$5,700	$5,700
Savings/Opportunities[2]	$11,498	$22,995	$22,995	$22,995	$22,995
Net	-$29,202	$17,295	$17,295	$17,295	$17,295
Cumulative Net	-$29,202	-$11,907	$5,388	$22,683	$39,978

Less Effective[1]	Year 1	Year 2	Year 3	Year 4	Year 5
EMR Investment	$40,700	$5,700	$5,700	$5,700	$5,700
Savings/Opportunities[2]	$6,325	$12,650	$12,650	$12,650	$12,650
Net	-$34,375	$6,950	$6,950	$6,950	$6,950
Cumulative Net	-$34,375	-$27,425	-$20,475	-$13,525	-$6,575

[1] More effective model uses top documented physician savings/opportunities; less effective model achieves least savings/opportunities

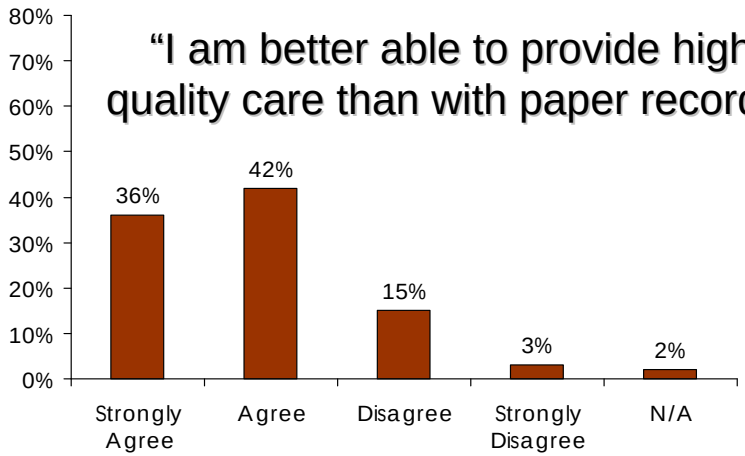
[2] Only half of benefits achieved in first year

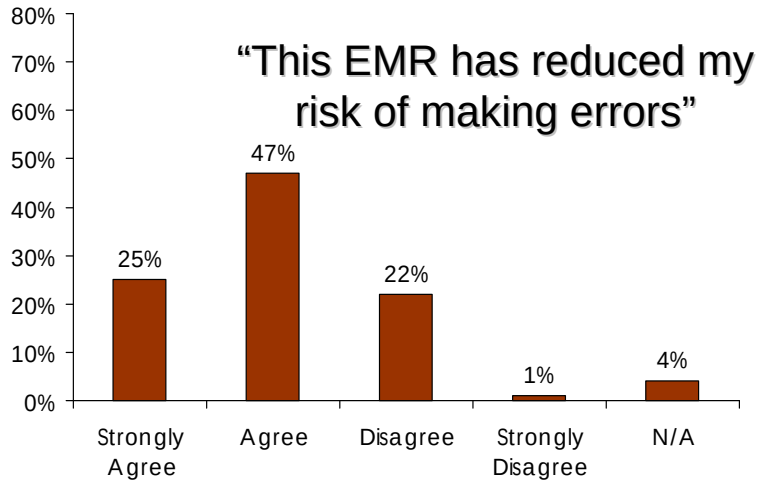
EHR Benefits

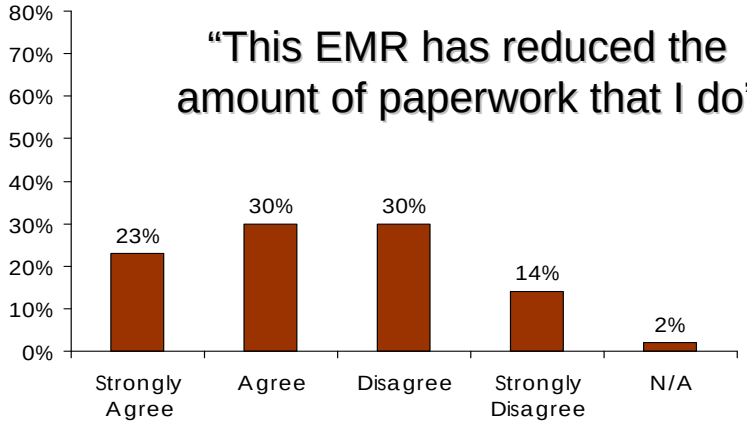


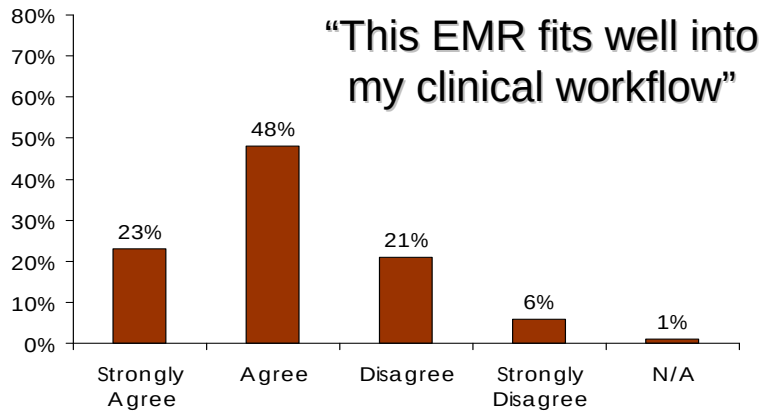
Wang, et. al. A Cost-Benefit Analysis for Ambulatory-Care Electronic Medical Records in Primary Care. American Journal of Medicine 2003

EHR Physician Satisfaction

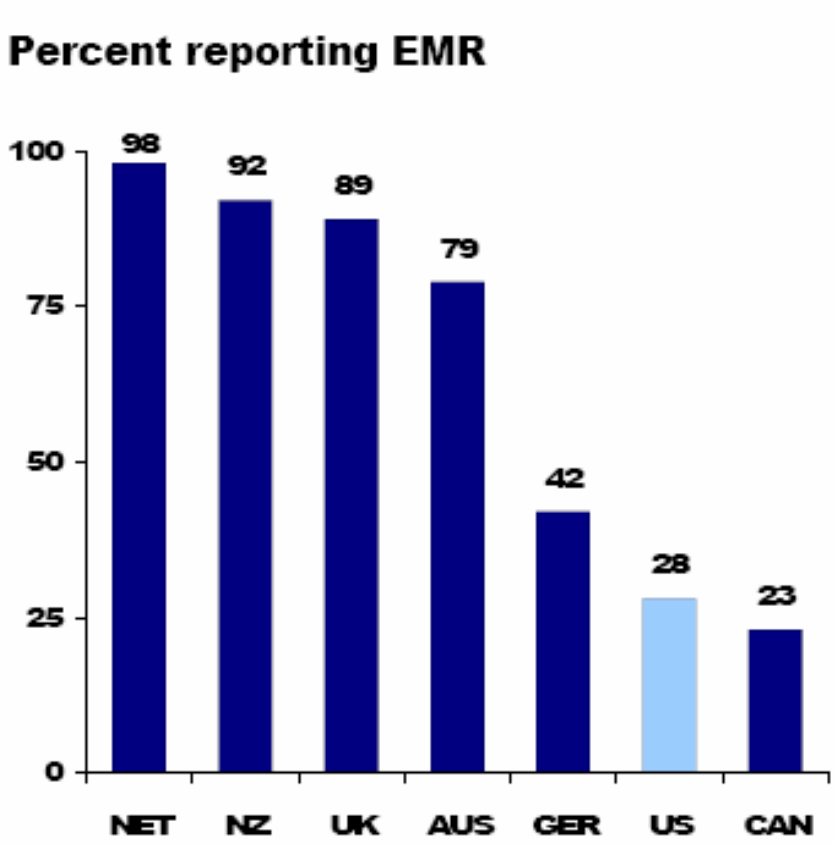


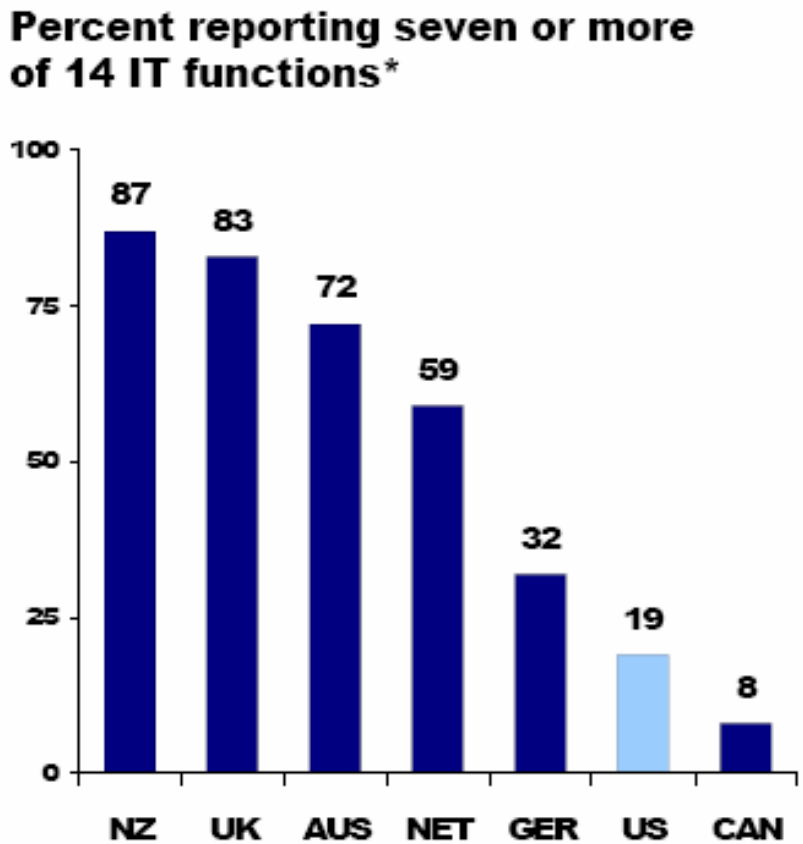






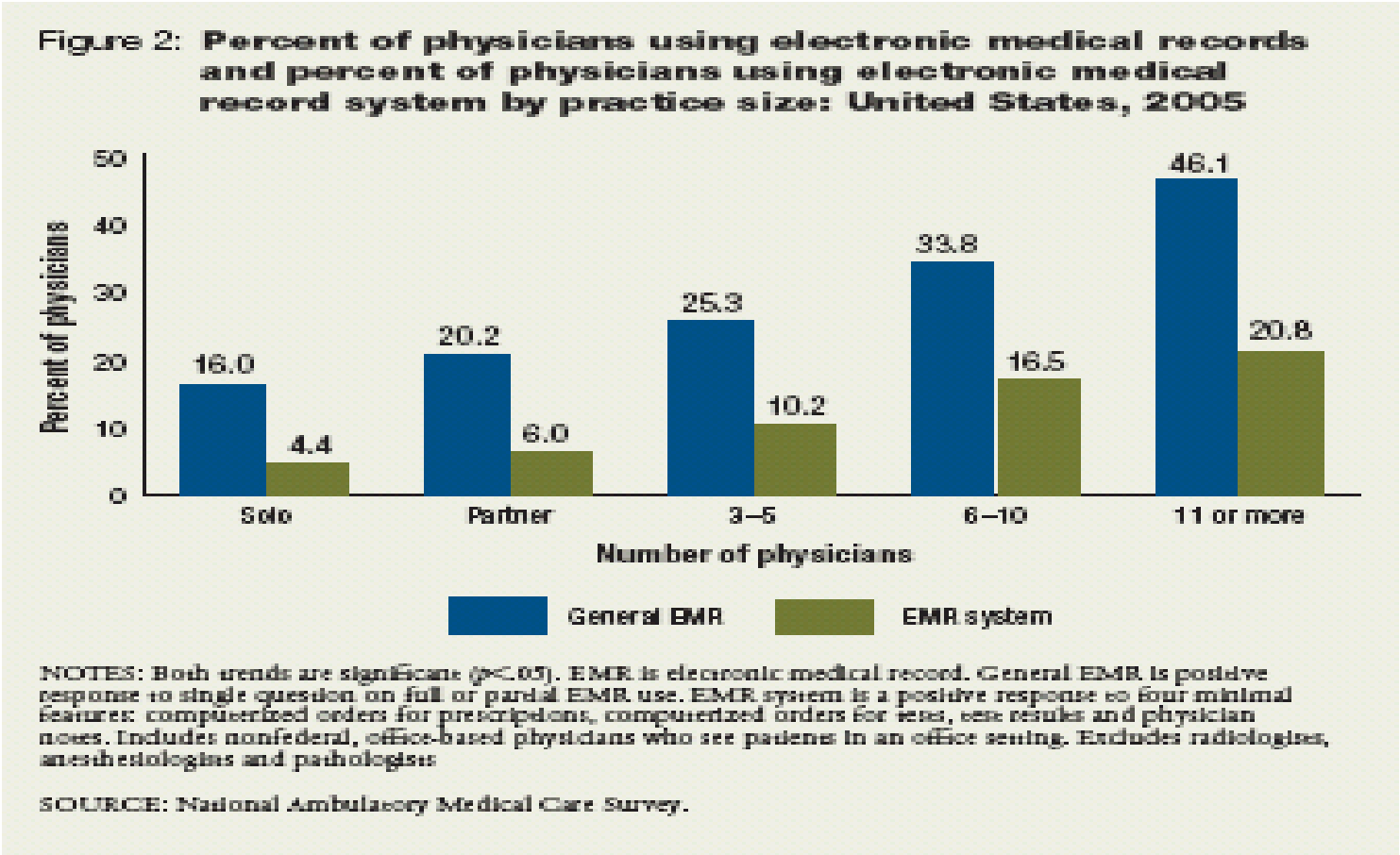
US EHR Adoption





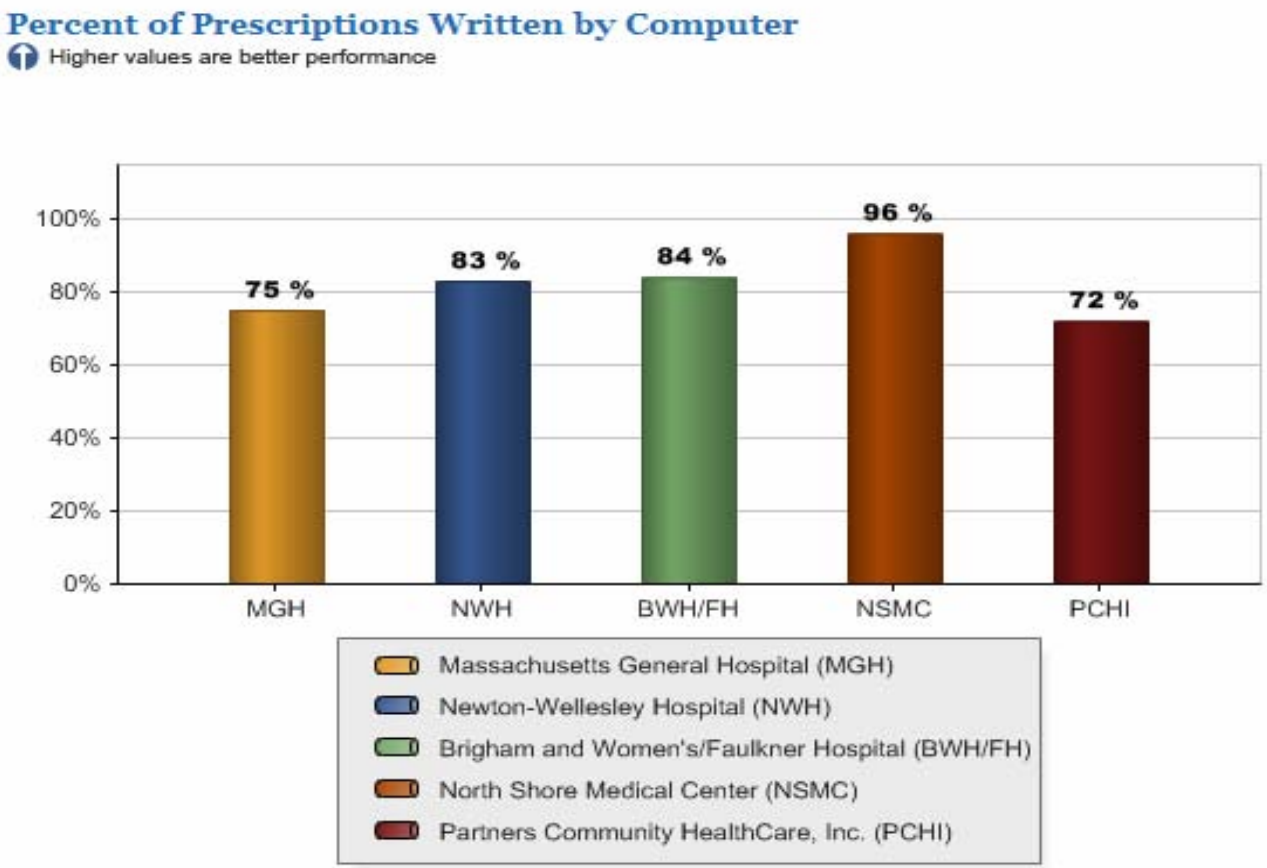
* The 14 functions are: EMR, EMR access other doctors, outside office, patient; routine use electronic ordering tests, prescriptions, access test results, access hospital records; computer for reminders, Rx alerts, prompt test results; easy to list diagnosis, medications, patients due for care.
Source: Commonwealth Fund 2006 International Health Policy Survey of Primary Care Physicians.

EHR Adoption is Uneven



Health Information Technology in the United States: The Information Base for Progress, Robert Wood Johnson Foundation, 2006

Effectiveness of Use of ePrescribing



Regional Interoperability Efforts are Struggling

The State Of Regional Health Information Organizations: Current Activities And Financing

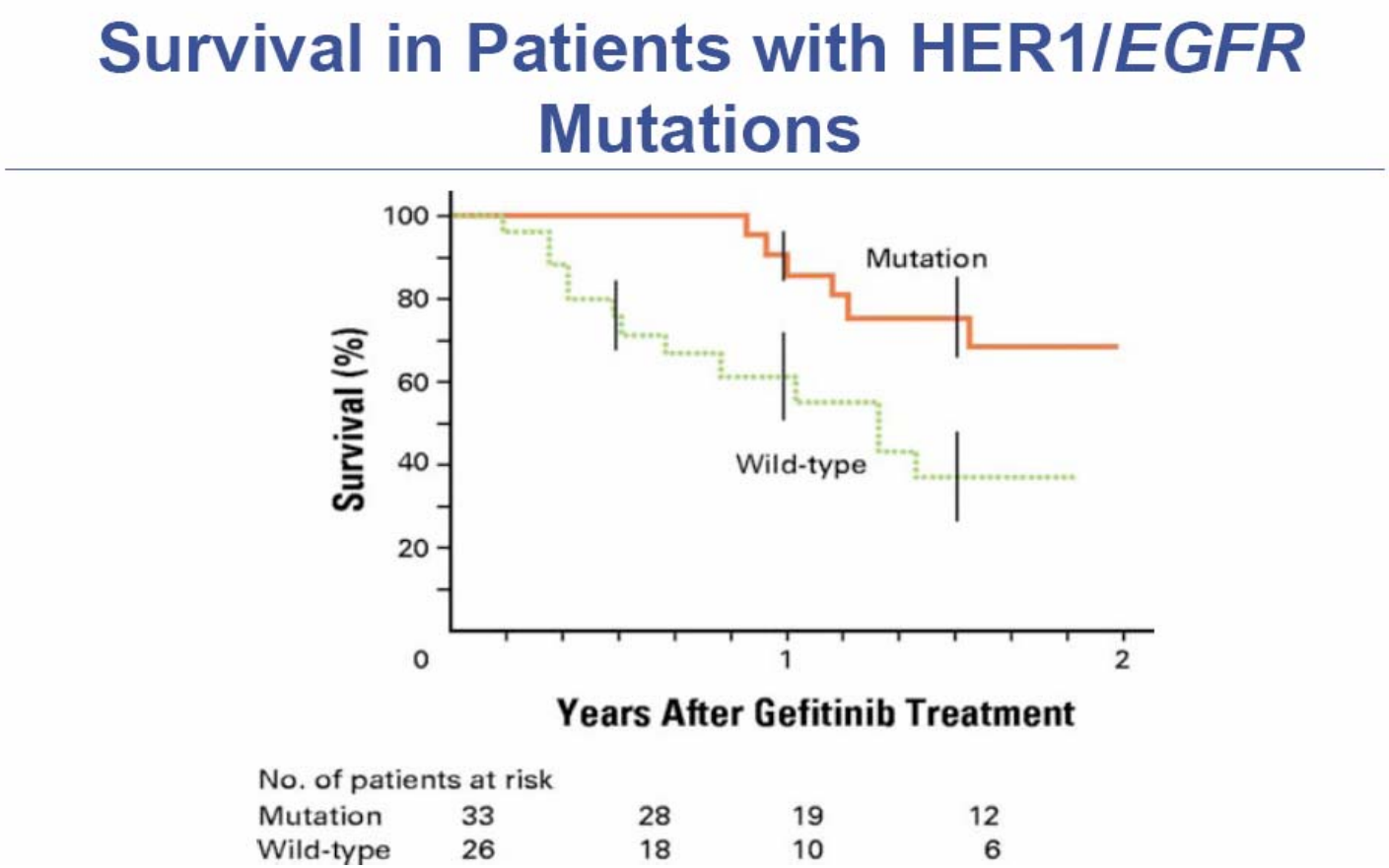
Julia Adler-Milstein, Andrew P. McAfee, David W. Bates and Ashish K. Jha

Electronic clinical data exchange promises substantial financial and societal benefits, but it is unclear whether and when it will become widespread. In early 2007 we surveyed 145 regional health information organizations (RHIOs), the U.S. entities working to establish data exchange. Nearly one in four was likely defunct. Only twenty efforts were of at least modest size and exchanging clinical data. Most early successes involved the exchange of test results. To support themselves, thirteen RHIOs received regular fees from participating organizations, and eight were heavily dependent on grants. Our findings raise concerns about the ability of the current approach to achieve widespread electronic clinical data exchange.

American Recovery and Reinvestment Act of 2009

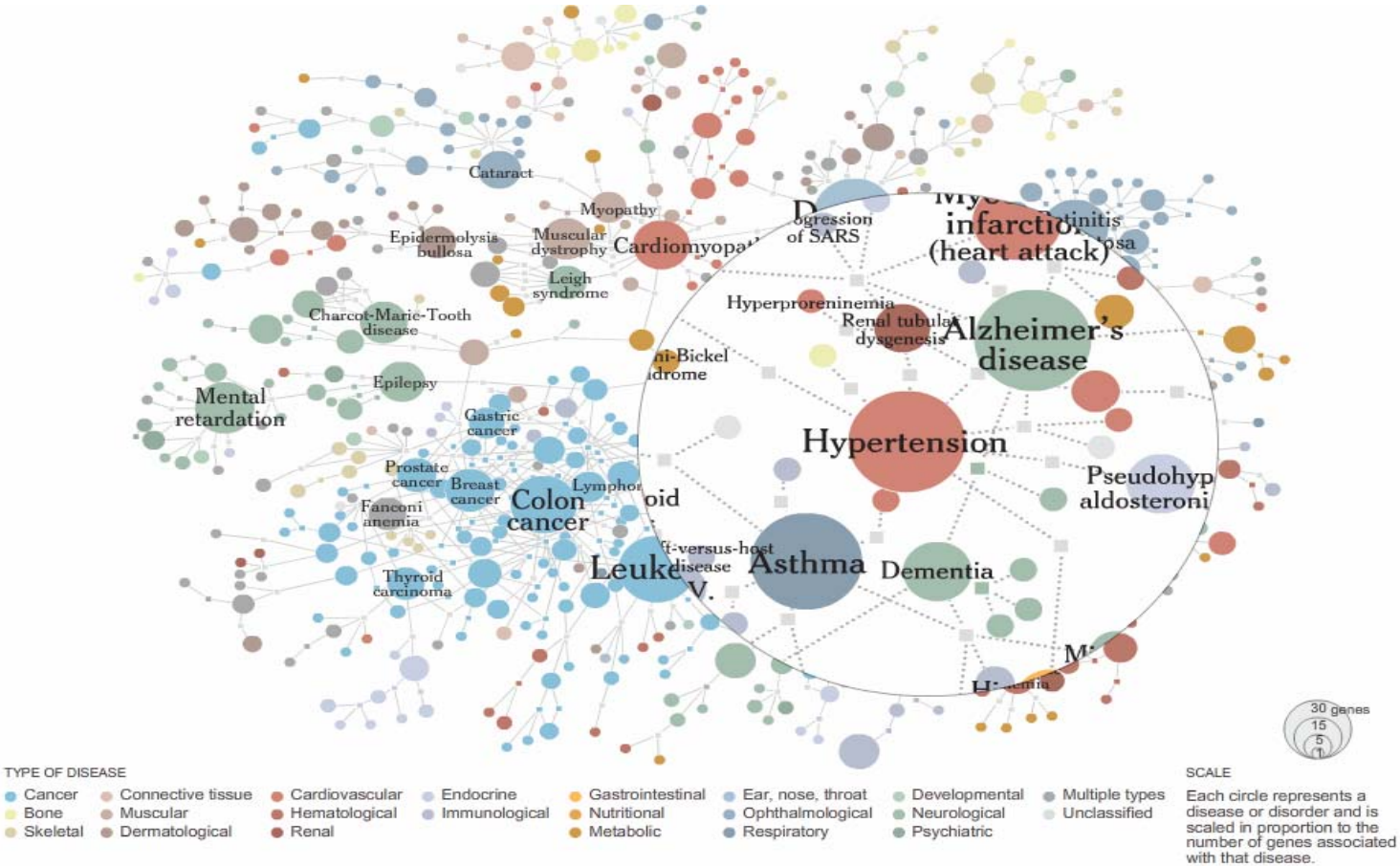
- **$31B in physician and hospital financial incentives for EHR adoption**
  - **$40K to $60K/physician**
  - **$2M-$11M/hospital**
- **Incentives require “meaningful use”**
  - **ePrescribing**
  - **Clinical data exchange**
  - **Quality measures reporting**
- **$300M for states to develop interoperability and adoption plans**
- **Loans/grants for physicians to cover EHR costs**
- **Health Information Extension Program to provide adoption assistance for small physician practices and hospitals**

Survival in Patients with HER1/EGFR Mutations



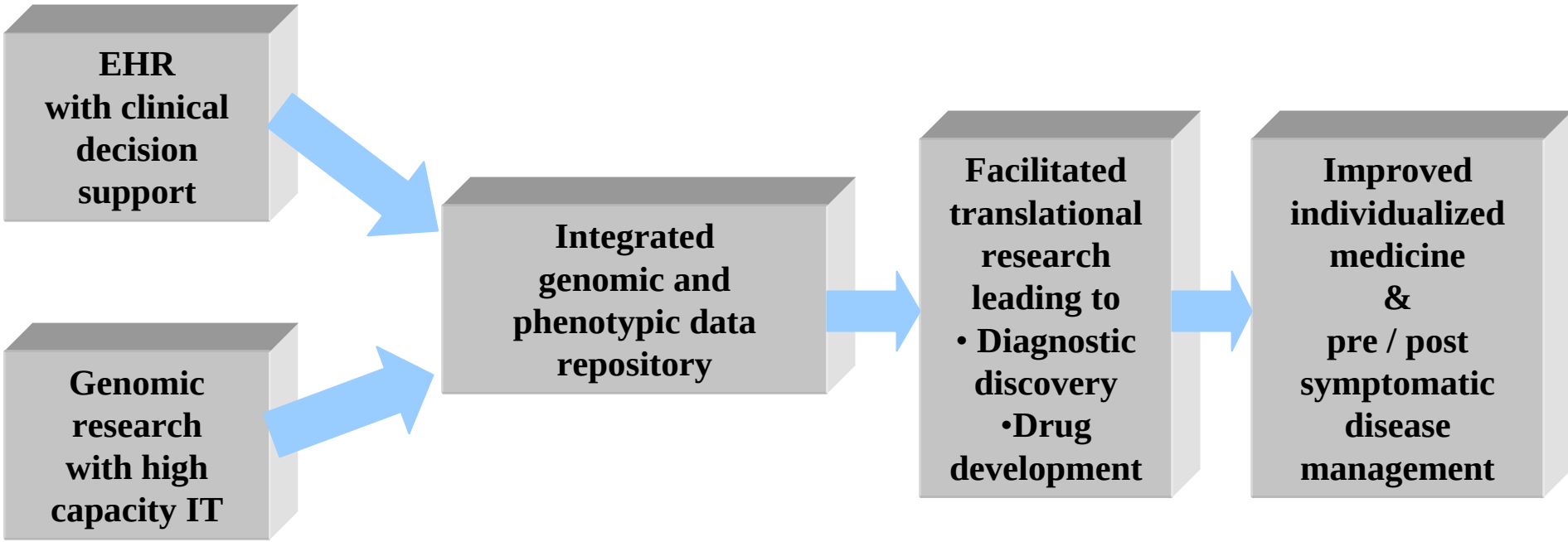
Bruce Johnson, Dan Farber Cancer Institute

The Human Diseasome

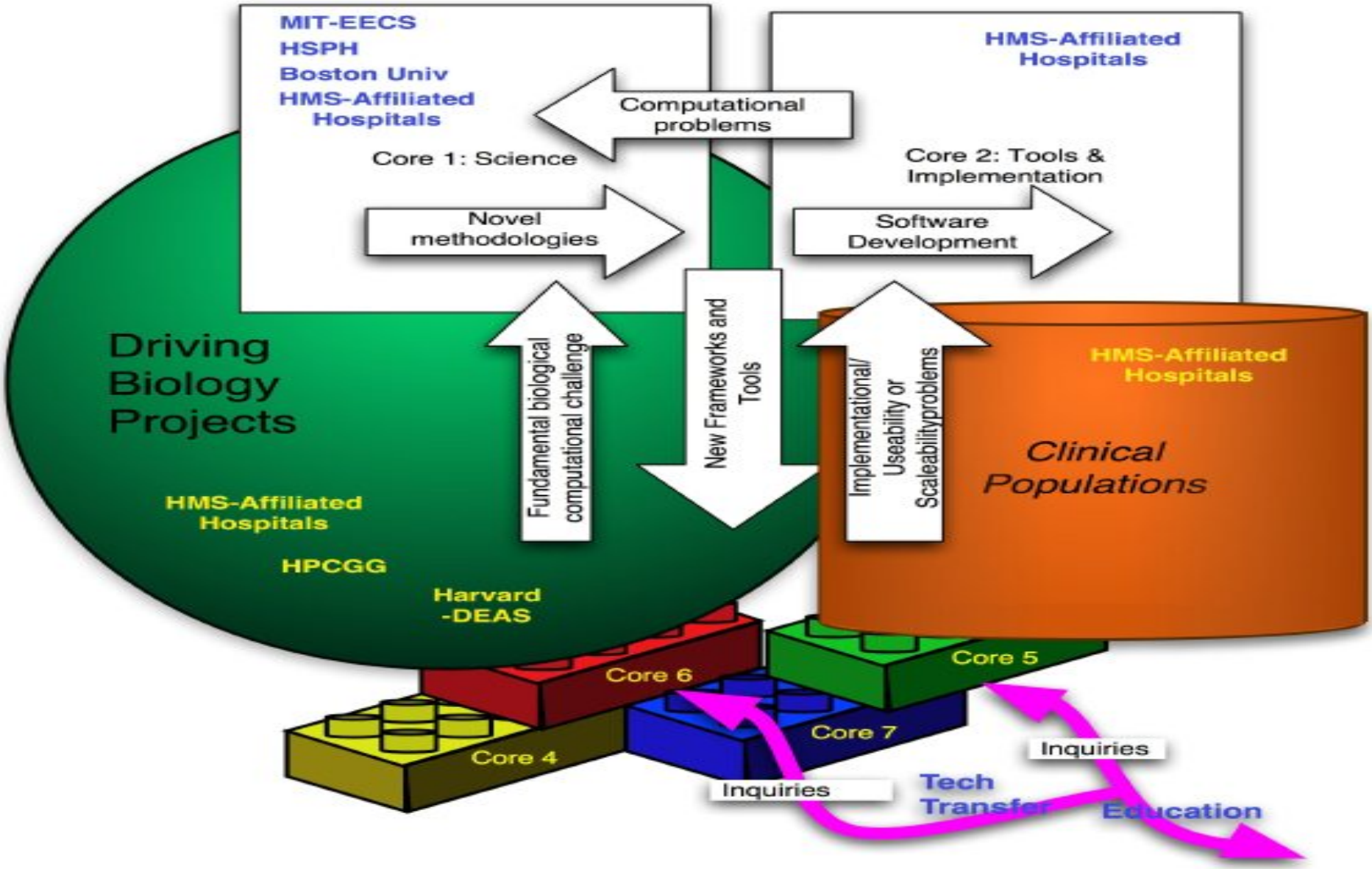


Sources: Marc Vidal; Albert-Laszlo Barabasi; Michael Cusick;
Proceedings of the National Academy of Sciences

A Vision for Personalized Medicine



Informatics for Integrating Biology and the Bedside (I2B2)

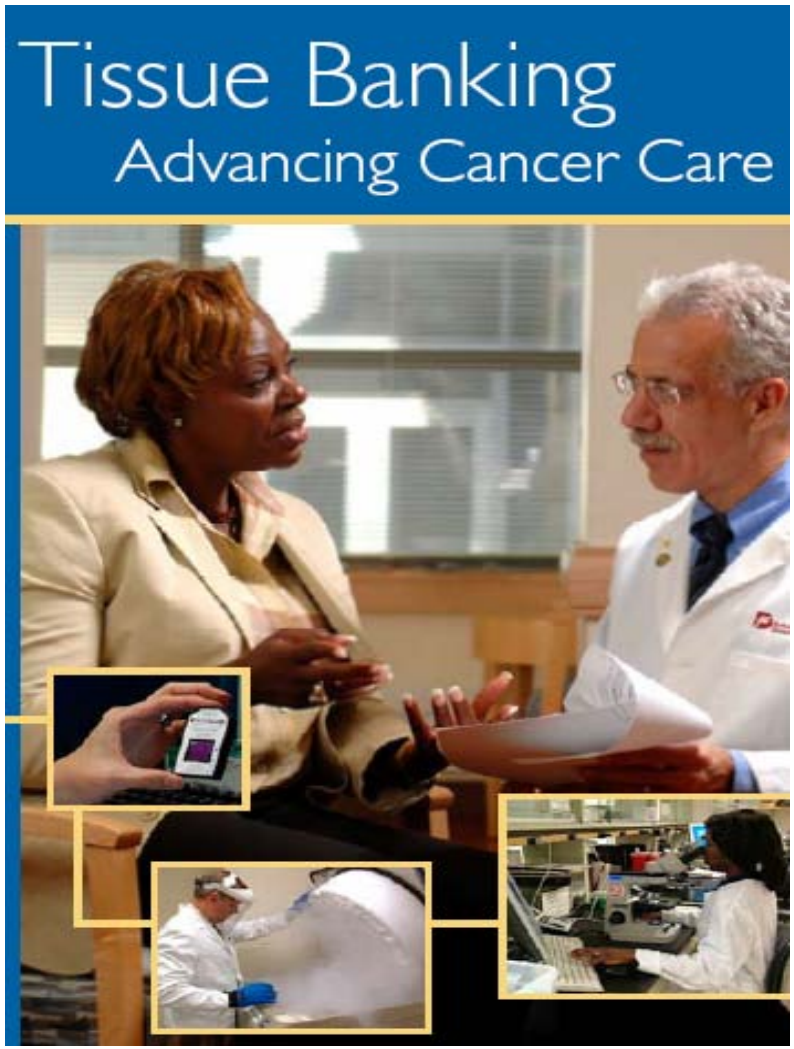


i2b2 Hive

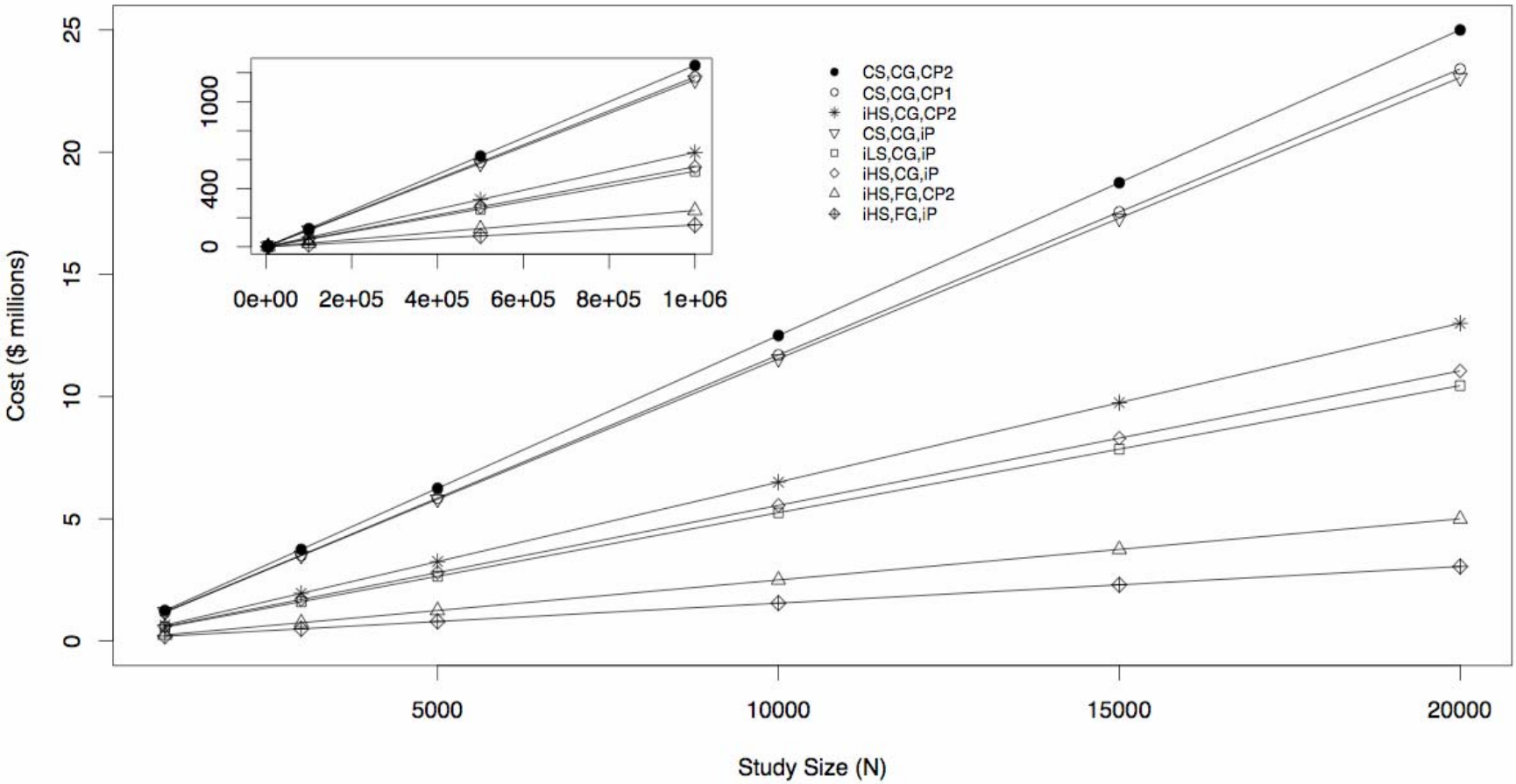
Project Management
File Repository
Natural Language Processing
De - Identification of Data
Annotating Genomic Data #2
Ontology Management
Identity Management
PFT Processing
Data Repository (CRC)
Workflow Framework
Annotating Genomic Data #1
Correlation Analysis
Annotating Imaging Data

Extraction of Structure from Notes

Tissue Sample Collection



Costs of “High Throughput” Clinical Research



Post Market Medication Surveillance

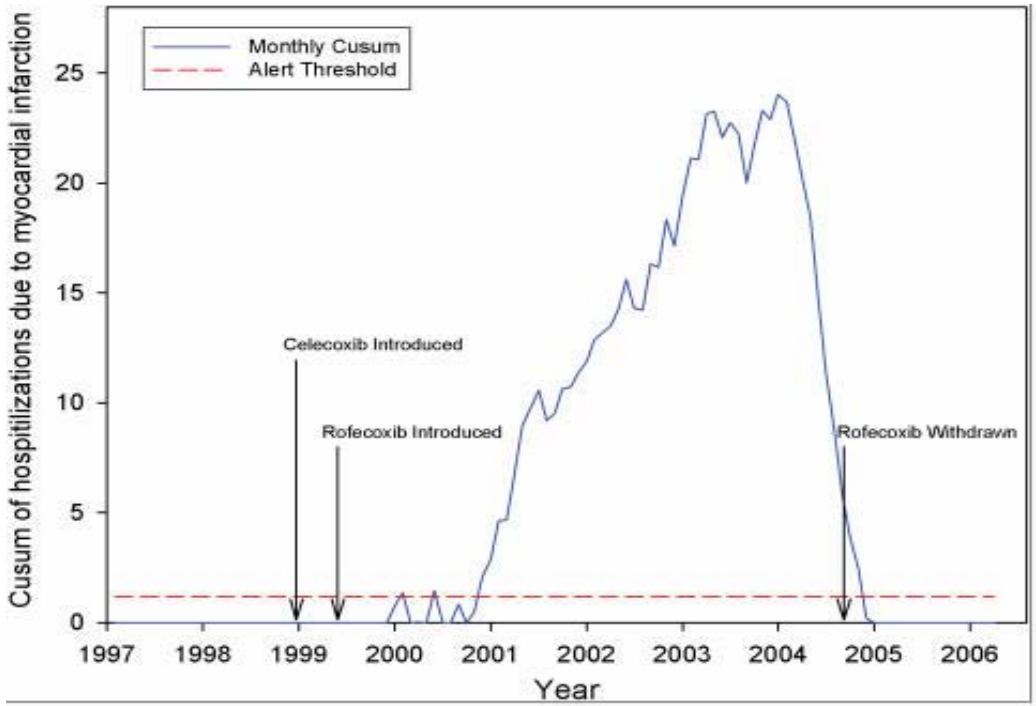
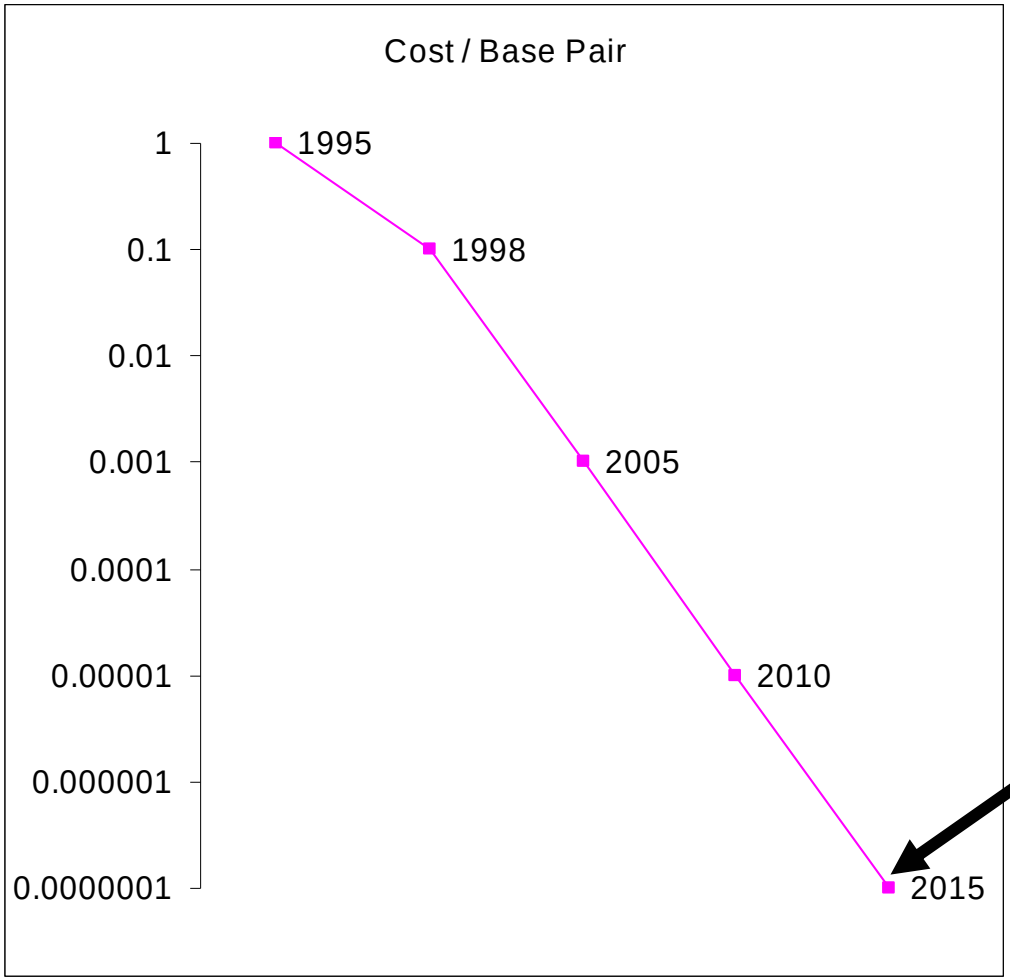


Figure 1

Cumulative sum (CUSUM) chart of monthly incidence of hospitalizations due to myocardial infarction from January 1, 1997 to March 30, 2006.

Underlying Drivers Point to Accelerated Growth



Values in chart are approximately sourced from:

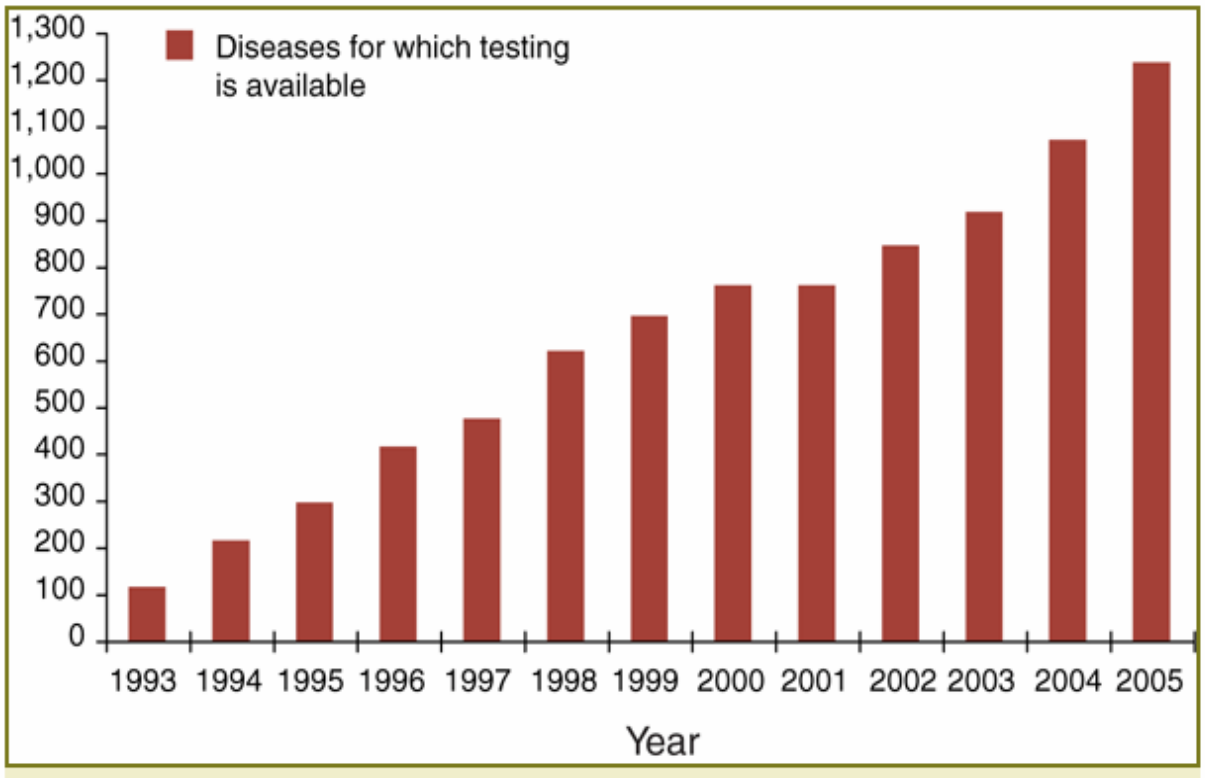
Mutation Research 573 (2005) 13–40

Review

Advances in sequencing technology

Eugene Y. Chan *

Significant Growth in Genetic Tests



Hudson, K., et al *Oversight of US Genetic Testing Laboratories*, Nature Biotechnology, 2006

Consumer Testing of Their Genome

23andMe genetics just got personal.

sign in | claim codes | blog | help

Search 23andMe

our service | genetics 101 | for the experts | store | about us

order now | try a demo

- gene journal
- ancestry
- family inheritance
- genome labs
- how it works
  - Take a Product Tour
  - The Genotyping Process

Variations

Speed Genes: Fact or Fiction?

Questions

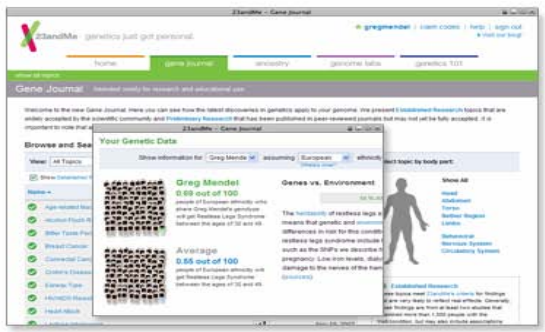
Key Words About Genetics

How do you decide what SNPs/traits are included in the Gene Journal?

gene journal

For decades scientists have been linking particular genetic signatures to various diseases, traits and characteristics. But only in the last few years has it been possible to find out what their discoveries may mean for you. 23andMe's Gene Journal does just that, by providing user-friendly descriptions of the traits we cover and the genes associated with them. The Established Research entries help you understand the relative importance of genetics in those traits compared to diet, personal habits, environment and other factors, so you can see how much—or little—of a difference your genes may make. Click here to see the list of Gene Journal articles included in our service.

Take a look at the odds.



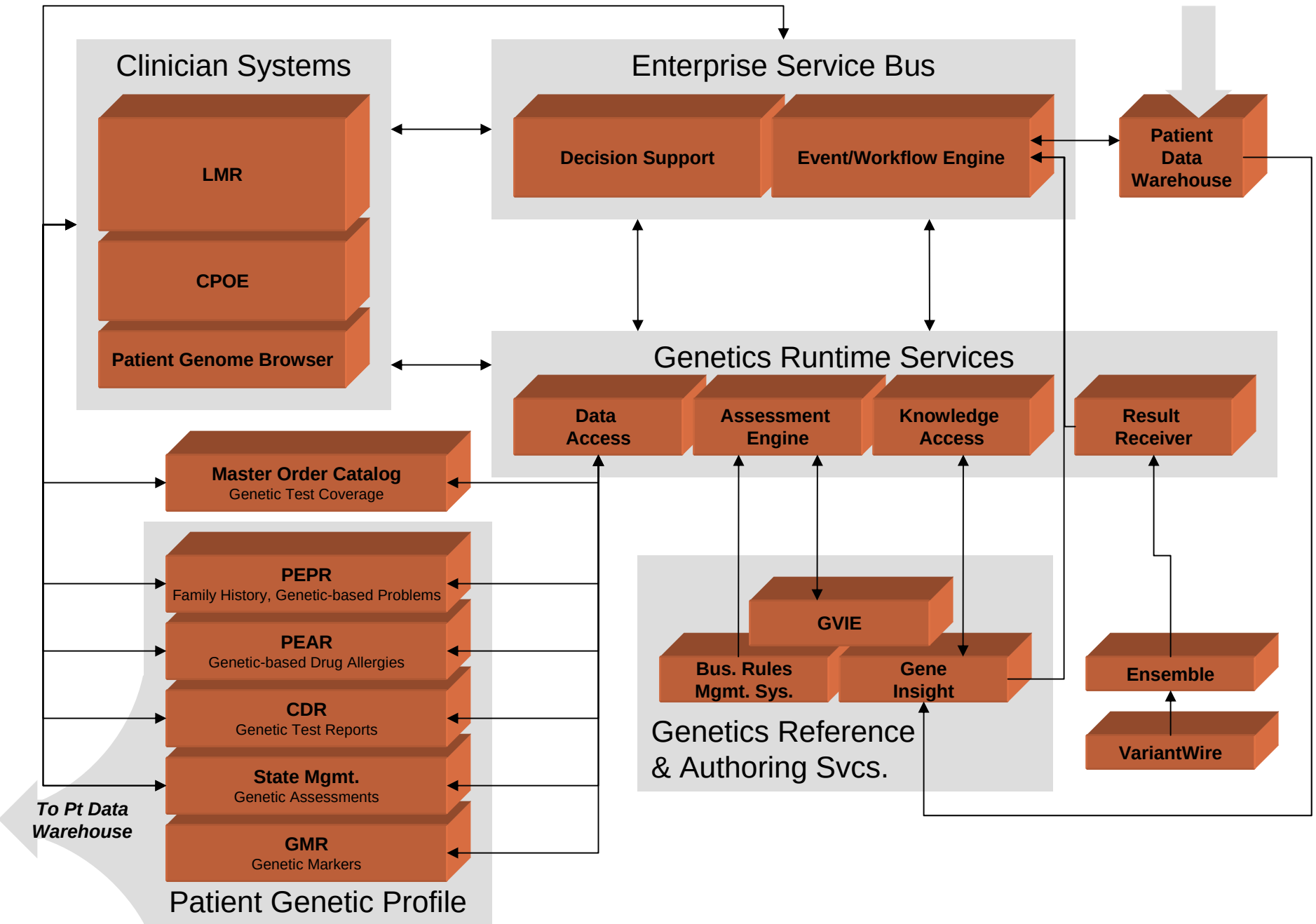
The 23andMe Odds Calculator

The 23andMe Odds Calculator helps you put it all in perspective, allowing you to combine genetic information, age, and ethnicity to get an idea of which common health concerns are most likely to affect a person with your genetic profile. While the Odds Calculator is neither a medical diagnostic nor a substitute for medical advice, it can help you confront the bewildering array of health news reported in the mass media and help you decide where you may want to focus your attention.

See your genes in action.

Gene Journal Marker Effects

Fully Genetics Enabled EHR Architecture



Personalized Medicine Adoption Challenges

- **The utility of EHR-based acceleration of clinical research, centered on the genome, remains largely unproven**
- **Clinical guidelines are largely absent regarding when to test and how to interpret results**
- **Providers and patients don’t understand the tests and their ramifications**
- **Reimbursement is limited**
- **There are unsettled privacy issues**

The Management Challenges

- **Electronic medical record**
  - **An expensive system and a difficult implementation create a challenging business case**
  - **Which results in low adoption and partially effective use**
  - **But the answer may be ARRA**
- **Personalized medicine**
  - **Knowledge of the genome may enable the curing of disease, more appropriate treatments, accurate prediction of prognosis and safer targeting of medication doses**
  - **But there are challenges of medical research, clinical guidelines, reimbursement, provider/patient education and privacy**
  - **The answer is unclear**