



# Bringing Big Data and Research to the Point of Care by Creating the "App Store" for Health

***Kenneth D. Mandl, MD, MPH***  
***Director, Computational Health Informatics Program***  
***Boston Children's Hospital***

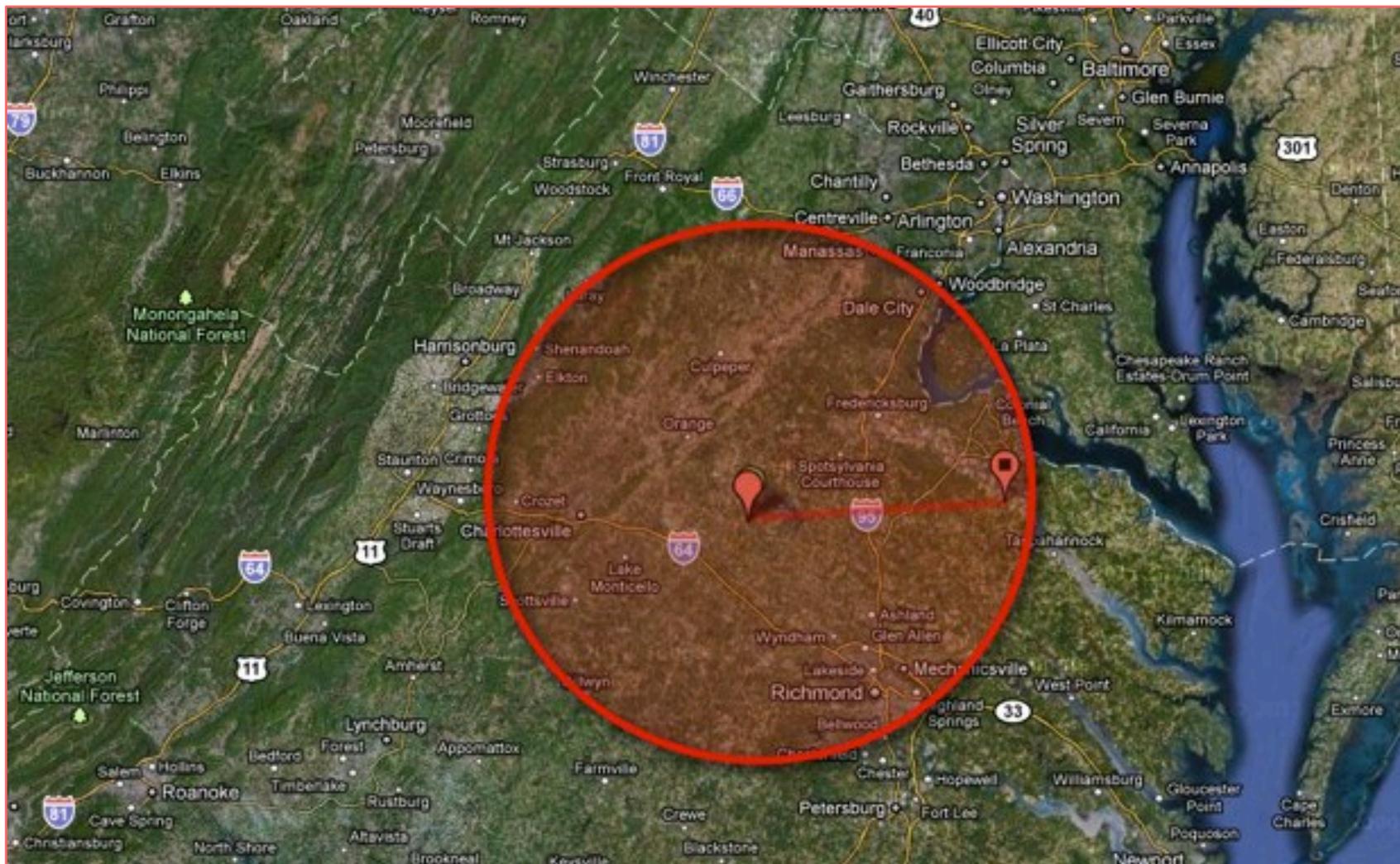
***Professor of Biomedical Informatics and of Pediatrics***  
***Harvard Medical School***

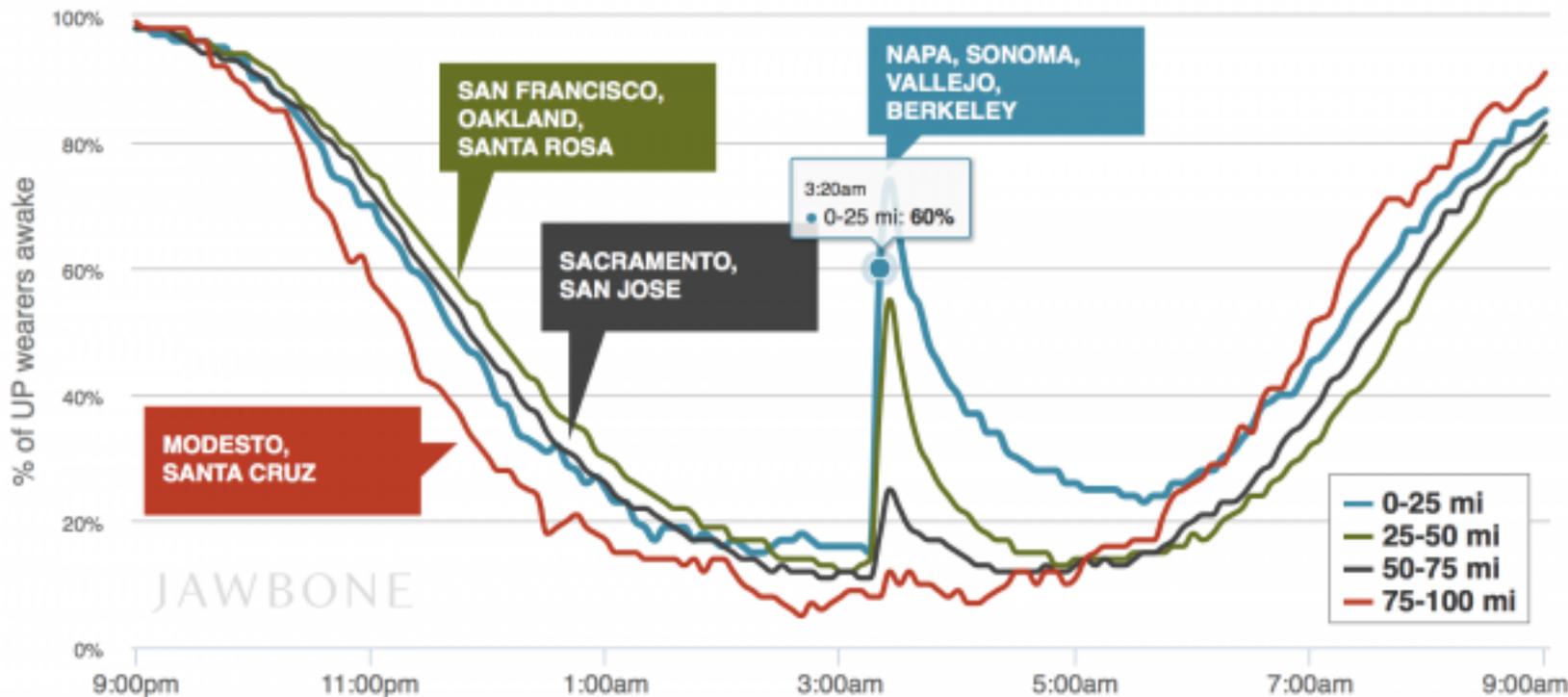
 @mandl

[www.chip.org](http://www.chip.org)



## Virginia 2011



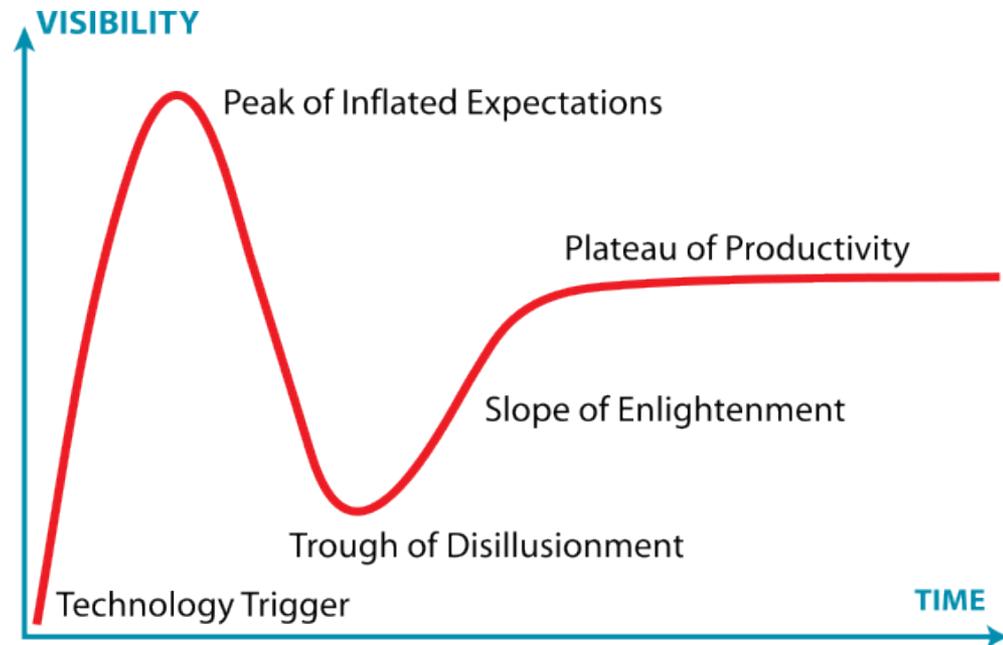


We wish all the people in the Bay Area who were affected by the earthquake a speedy recovery and a good night's sleep.



## Hype Curve and HIT

- \$48B investment in HIT
- \$1.4B at Partners
- North of \$0.5T total



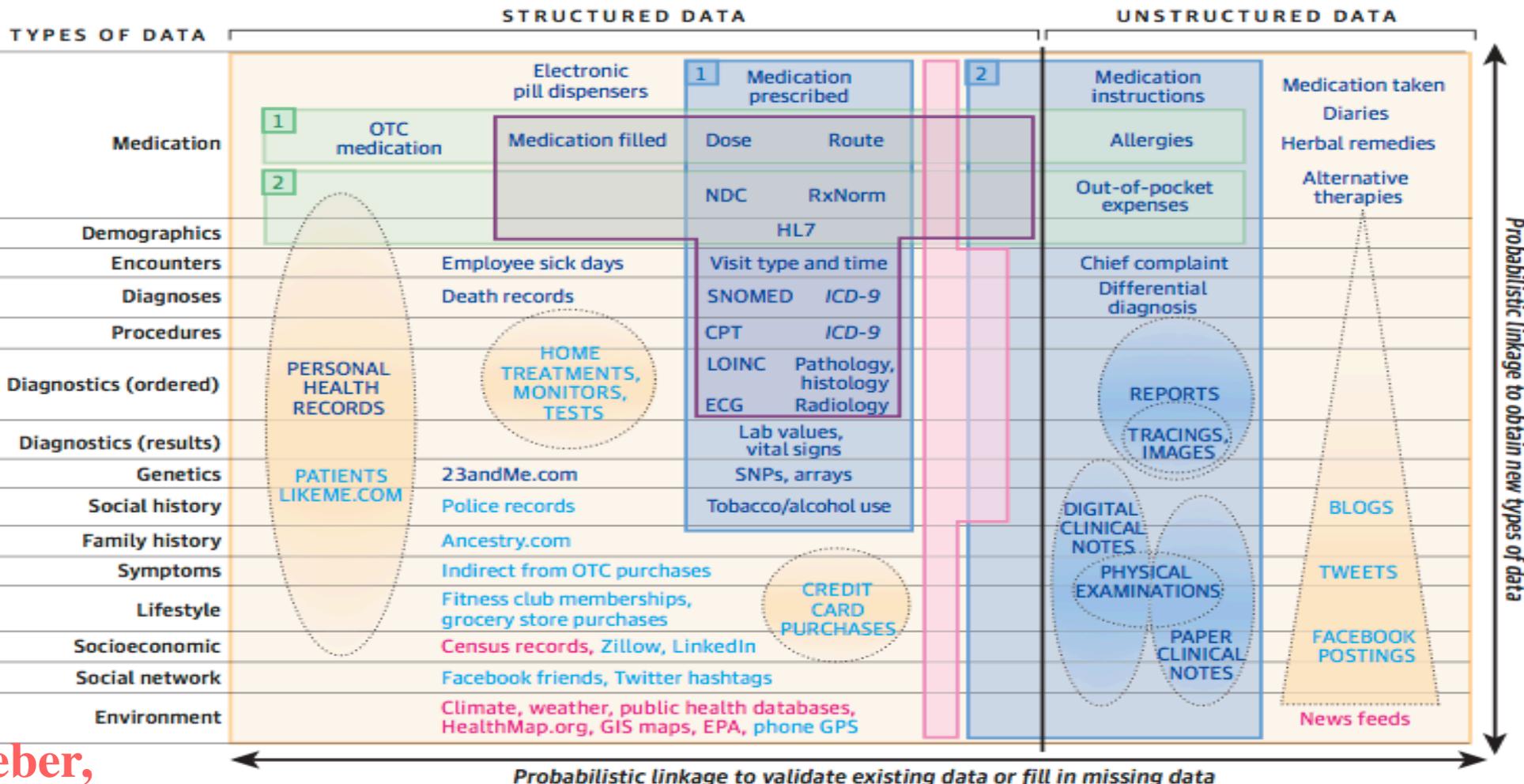


## **Point of Care is a Walled Garden**

But 6 years later, we have an infrastructure that shows the clinician, one patient at a time, what he or she typed in in the past--a very narrow slice of big data



The Tapestry of Potentially High-Value Information Sources That May be Linked to an Individual for Use in Health Care



Probabilistic linkage to validate existing data or fill in missing data

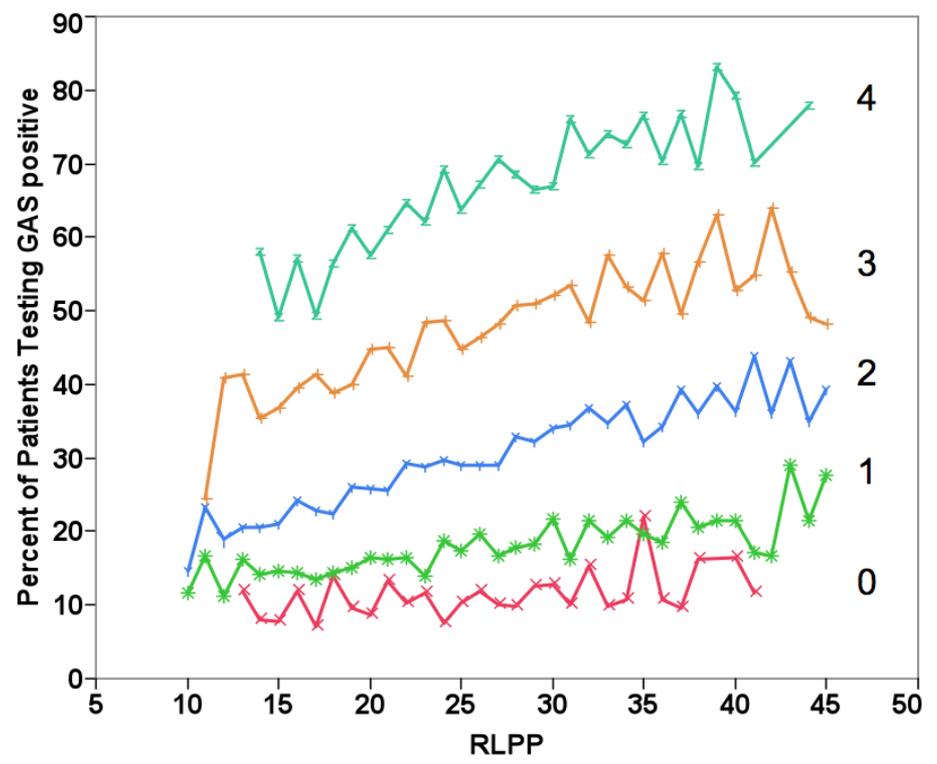
Probabilistic linkage to obtain new types of data

<b>Examples of biomedical data</b> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <div style="border: 1px solid green; padding: 2px; margin-bottom: 5px;">1 2</div> Pharmacy data  <div style="border: 1px solid purple; padding: 2px; margin-bottom: 5px;"> </div> Claims data  <div style="border: 1px solid orange; padding: 2px; margin-bottom: 5px;"> </div> Data outside of health care system           </div> <div style="width: 45%;"> <div style="border: 1px solid blue; padding: 2px; margin-bottom: 5px;">1 2</div> Health care center (electronic health record) data  <div style="border: 1px solid pink; padding: 2px; margin-bottom: 5px;"> </div> Registry or clinical trial data           </div> </div>		<b>Ability to link data to an individual</b> <ul style="list-style-type: none"> <li>■ Easier to link to individuals</li> <li>■ Harder to link to individuals</li> <li>■ Only aggregate data exists</li> </ul>	<b>Data quantity</b> <div style="display: flex; align-items: center;"> <div style="border: 1px dashed orange; width: 20px; height: 10px; margin-right: 5px;"></div> <div style="border: 1px solid blue; width: 20px; height: 10px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: space-between; width: 100px;"> <span>More</span> <span>Less</span> </div>
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eber,  
andl,  
hane  
MA

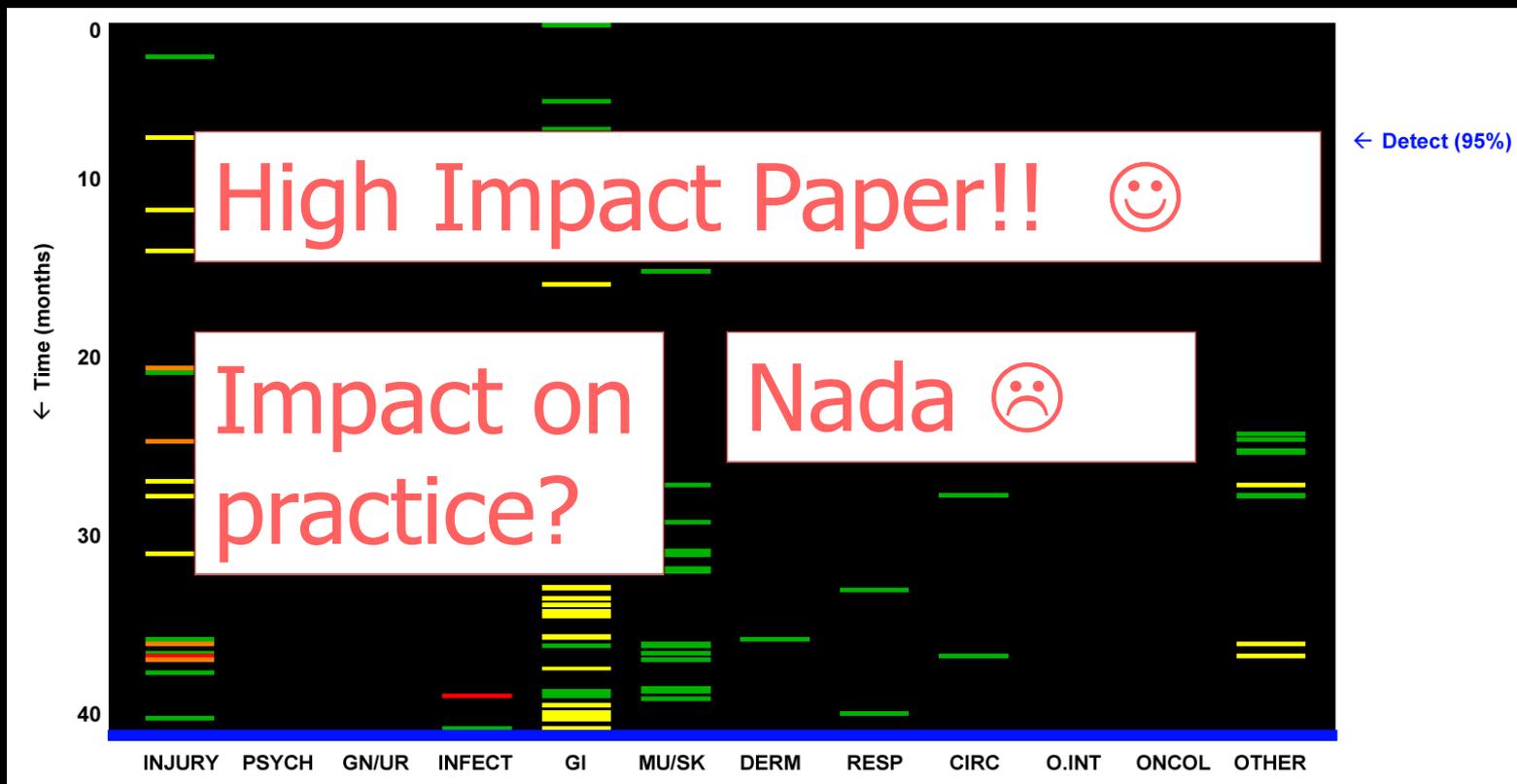


## Adding Context is Powerful





# Predictive Medicine: Domestic Violence



Reis, Kohane, Mandl BMJ



## Turns out it Matters

**JAMA** The Journal of the  
American Medical Association

Viewpoint | October 20, 2014 **FREE**



### **Ebola in the United States: EHRs as a Public Health Tool at the Point of Care**

Kenneth D. Mandl, MD, MPH

This Viewpoint discusses how health information technology and electronic health records (EHRs) could be transformed into platforms for public health responses to disease.

**Topics:** ebola virus; ebola virus disease; public health medicine; electronic medical records

JAMA. Published online October 20, 2014. doi:10.1001/jama.2014.15064





**DATA ARE NOT  
INTEROPERABLE**





# The NEW ENGLAND JOURNAL of MEDICINE

## No Small Change for the Health Information Economy

Kenneth D. Mandl, M.D., M.P.H., and Isaac S. Kohane, M.D., Ph.D.

The economic stimulus package signed by President Barack Obama on February 17 included a \$19 billion investment in health information technology. How can we best take advantage of this unprecedented opportunity to computerize health care and stimulate the health information economy while also stimulating the U.S. economy? A health care system adapting to the effects of an aging population, growing expenditures, and a diminishing primary care workforce needs the support

of a flexible information infrastructure that facilitates innovation in wellness, health care, and public health.

Flexibility is critical, since the system will have to function under new policies and in the service of new health care delivery mechanisms, and it will need to incorporate emerging information technologies on an ongoing basis. As we seek to design a system that will constantly evolve and encourage innovation, we can glean lessons from large-scale information-

technology successes in other fields. An essential first lesson is that ideally, system components should be not only interoperable but also substitutable.

The Apple iPhone, for example, uses a software platform with a published interface that allows software developers outside Apple to create applications; there are now nearly 10,000 applications that consumers can download and use with the common phone interface. The platform separates the system from the functional-



# Designing the App Store for Health



SMART

## Bloodwork Cardiology Result

### Patient info

NAME: **John Doe**  
GENDER: M AGE: 49 DOB: 01/10/1961

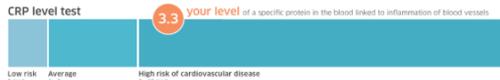
ORDERED BY: Dr. Francis Pulaski  
Bellevue Medical Centre  
famor@buhalmed.edu  
617.632.555-54321 x1523  
COLLECTED: 11/02/2010, 10:40 a.m.  
RECEIVED: 11/02/2010, 1:03 p.m.

### 1 About this test

This report evaluates your potential risk of heart disease, heart attack, and stroke.

### 2 Your results

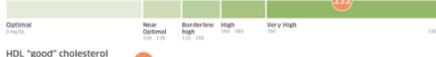
#### CRP level test



#### Total cholesterol level



#### LDL "bad" cholesterol



#### HDL "good" cholesterol



### 3 Your risk You show an elevated risk of cardiovascular disease

Your risk would be lowered to **15%**  
 12% if your blood pressure were 120mm/Hg  
 10% if you quit smoking  
 6% if you reduced cholesterol to 160mg/DL  
 rol level to calculate your 10 risk of a cardiovascular event at [ReynoldsRisk.org](http://ReynoldsRisk.org)

- Quitting smoking - can decrease your heart disease risk by 50% or more
- Ask your doctor about statins or other medications that can lower cholesterol
- Consider retesting in 1 to 2 weeks to exclude a temporary spike in blood levels

iefanie Posavec for Wired Magazine // [informationisbeautiful.net](http://informationisbeautiful.net)



## The NEW ENGLAND JOURNAL of MEDICINE

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# 'API'



**Can EMRs behave  
like iPhones or  
Androids in that  
innovators  
readily create and  
widely distribute  
SUBSTITUTABLE  
apps across  
thousands of  
installs?**

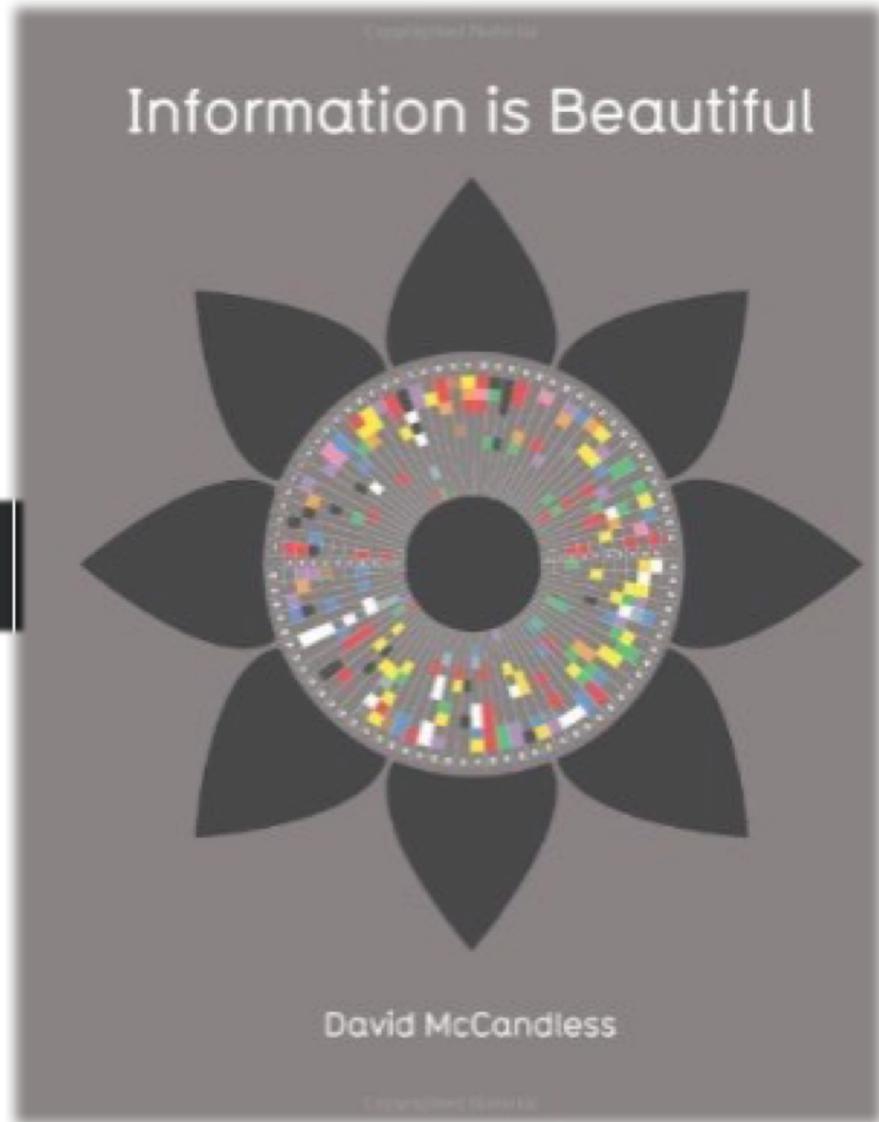


*Inspired by a*

**WIRED**

18.12 Issue

*Design Challenge*





## State-of-the-Art ???

<input checked="" type="checkbox"/> ALIGN HERE		SEND TO: <input type="text"/>	
PATIENT NAME <b>DOE, JOE</b>		PATIENT ID NO. <b>NOT GIVEN</b>	
ACCESSION NO. <b>36904447</b>	BIRTH DATE <b>55</b>	GENDER <b>MALE</b>	SAMPLE ID NO. <b>NOT GIVEN</b>
REMARKS <b>SAMPLE REPORT, NO SAMPLE SENT</b>		REFERRING PHYSICIAN <input type="text"/>	
DATE COLLECTED <b>06/11/2010</b>		TIME <b>NOT GIVEN</b>	
RECEIVED <b>06/11/2010</b>		TIME <b>09:41</b>	
REPORTED <b>06/11/2010</b>		TIME <b>10:00</b>	
STATUS <b>FINAL</b>			

TEST	RESULT (* = OUT OF RANGE)	UNITS	REFERENCE RANGE
Cardio CRP		0.4 mg/L	
For Ages > 17 Years:			
CCRP mg/L	Risk According to AHA/CDC Guidelines		
<1.0	Lower Relative Cardiovascular Risk.		
1.0-3.0	Average Relative Cardiovascular Risk		
3.1-10.0	Higher Relative Cardiovascular Risk. Consider retesting in 1 to 2 weeks to exclude a benign transient elevation in the baseline CRP value secondary to infection or inflammation.		
>10.0	Persistent elevations upon retesting, may be associated with infection and inflammation.		



## Bloodwork Cardiology Result



ORDERED BY: Dr. Francis Pulaski  
 Bellevue Medical Centre  
 lamar.d@bactamed.edu  
 (603) 555-54321 x1523

COLLECTED: 11/02/2010, 10:40 a.m.  
 RECEIVED: 11/02/2010, 1:03 p.m.

### Patient info

NAME: **John Doe**  
 GENDER: M AGE: 49 DOB: 01/10/1961

An Inspired Design from Dave McCandless (cc license)

### 1 About this test

This report evaluates your potential risk of heart disease, heart attack, and stroke.

### 2 Your results

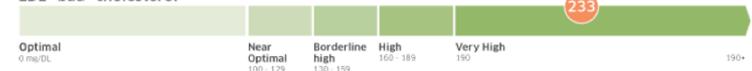
#### CRP level test



#### Total cholesterol level



#### LDL "bad" cholesterol



#### HDL "good" cholesterol



### 3 Your risk You show an elevated risk of cardiovascular disease

If you're a smoker with normal blood pressure (130 mm/Hg) but family history of heart attack before age 60 (one or both parents) your risk over 10 years is:

**15%**

Your risk would be lowered to

- 12% if your blood pressure were 120mm/Hg
- 10% if you quit smoking
- 6% if you reduced cholesterol to 160mg/DL

Use your CRP results and cholesterol level to calculate your 10 year risk of a cardiovascular event at [ReynoldsRisk.org](http://ReynoldsRisk.org)

### 4 What now?



**Diet & exercise-** can improve your cholesterol levels



**Quitting smoking-** can decrease your heart disease risk by 50% or more



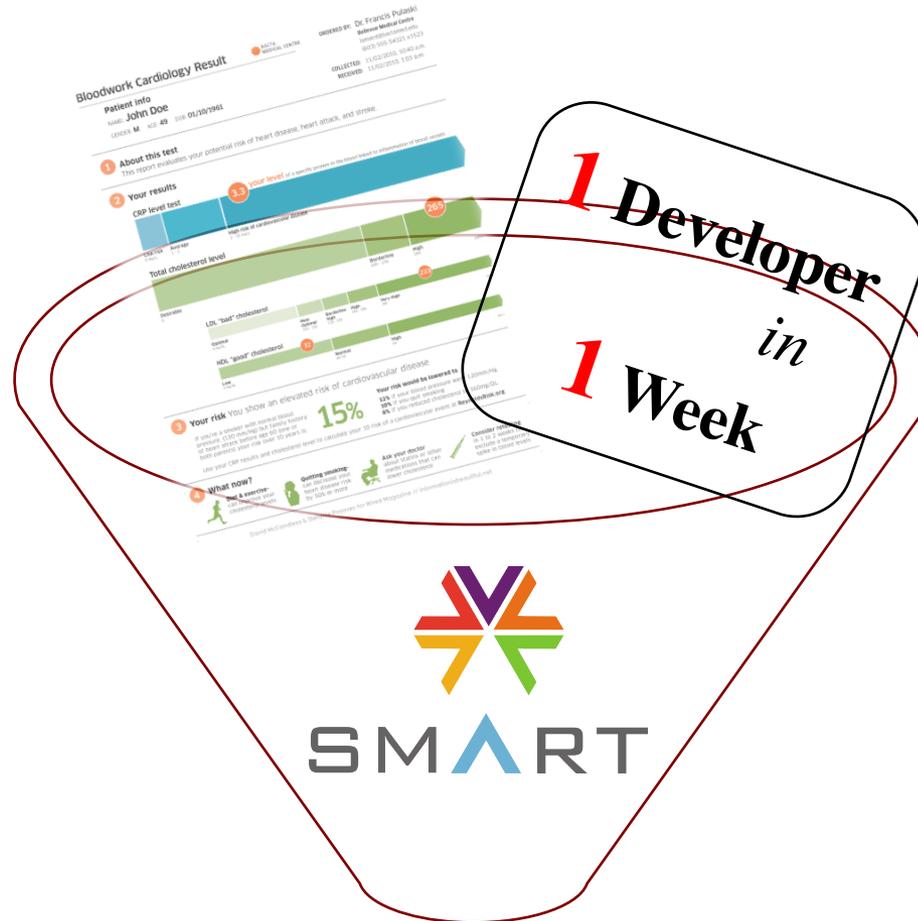
**Ask your doctor** about statins or other medications that can lower cholesterol



**Consider retesting** in 1 to 2 weeks to exclude a temporary spike in blood levels



# 1 Design + 1 Developer + 1 Week



**SMART**  
*Cardiac*  
*Risk*  
**App**



# 1 SMART App in 3 SMART Systems



Indivohealth™ for John Smith

SETTINGS LOGOUT

Mary John S. Smith Joshua Lewis

### Bloodwork Cardiology Result

Note: these results are valid for non-diabetics only!

Current smoker?  
 Family history of heart attack?  
 Systolic blood pressure

1 About this test  
This report evaluates your potential risk of heart disease, heart attack, and stroke.

2 Your Results

CRP level test: 2.4

Total cholesterol level: 161

LDL "bad" cholesterol: 107

Desirable (0 mg/dL) | Average (1-3) | High risk of cardiovascular disease (9-10)  
 Desirable (0 mg/dL) | Borderline (100-159) | High (≥200)  
 Optimal (0 mg/dL) | Near Optimal (100-129) | Borderline High (130-159) | High (160-199) | Very High (≥200)

Alex Lewis

Challenge Judge · Logout

### Bloodwork Cardiology Result

Current smoker?  
 Family history of heart attack?  
 Systolic blood pressure

1 About this test  
This report evaluates your potential risk of heart disease, heart attack, and stroke.

2 Your Results

CRP level test: 2.4

Total cholesterol level: 161

LDL "bad" cholesterol: 107

HDL "good" cholesterol: 34

Low risk (0 mg/dL) | Average (1-3) | High risk of cardiovascular disease (9-10)  
 Desirable (0 mg/dL) | Borderline (100-159) | High (≥200)  
 Optimal (0 mg/dL) | Near Optimal (100-129) | Borderline High (130-159) | High (160-199) | Very High (≥200)

3 Your risk  
You show an elevated risk of cardiovascular disease

If you're a smoker with normal blood pressure, (130 mm/Hg) but family history of heart attack before the age of 60 (one or both parents) your risk over 10 years is:

**12%** Your risk would be lowered to:

26% if your blood pressure were 120mm/Hg  
 26% if you didn't smoke and all levels were optimal  
 12% if you quit smoking.

Use your test results to calculate your risk of a cardiovascular event at ReynoldsRisk.org

4 What now?

Web Client

SMART Dashboard

### Bloodwork Cardiology Result

Current smoker?  
 Family history of heart attack?  
 Systolic blood pressure

1 About this test  
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Problem Orders

Agnets for type2 [7/24/20 9:27:21 AM] [3242]  
 CT for 35-Age@ [8/27/20 10:10:11] [3242]  
 16-34-Age@ [8/27/20 9:24:10] [3242]  
 Cmw@ [8/27/20 8:14:21] [3242]  
 Cmw@ [8/27/20 8:4:20] [3242]



**SMART**

- Patient List
- Cardiac Risk
- Clinical Research
- DxSocial
- Med Risk Maps
- Meducation
- MyNote

Alex Lewis > Challenge Judge

Med List | CMI | Demos | English | Regular

**Meducation**  
www.meducation.com  
0 1 W K G V 3 R

**Pharmacy**  
Health & Wellness  
Polyglot Systems, Inc.  
2000 Aerial Center Parkway  
Morrisville, NC 27560  
(919) 653-4392

**Coumadin Tablet 5 mg**

**How to take medicine**  
Take the medicine by mouth once a day.

Breakfast	Lunch	Dinner	Bedtime
1			

Take one (1) pill each time.

**Instructions**  
Swallow the medicine without crushing or chewing it.  
This medicine may be taken with or without food.  
It is very important that you take the medicine at about the same time every day. It will work best if you do this.

Alex Lewis > Challenge Judge

Med List | CMI | Demos | Spanish | Regular

**Meducation**  
www.meducation.com  
0 2 W K G V 3 R

**Pharmacy**  
Health & Wellness  
Polyglot Systems, Inc.  
2000 Aerial Center Parkway  
Morrisville, NC 27560  
(919) 653-4392

**Coumadin Tablet 5 mg**

**Cómo tomar el medicamento**  
Tome el medicamento por la boca una vez al día.  
Take the medicine by mouth once a day.

Desayuno	Almuerzo	Comida	Al acostarse
1			

Tome una (1) pastilla cada vez.  
Take one (1) pill each time.

**Instrucciones**  
Trague el medicamento sin aplastarlo o masticarlo.  
Este medicamento se puede tomar con o sin alimentos.

Indivohealth™ for John Smith

SETTINGS LOGOUT

Mary | John S. Smith | Joshua Lewis

- Healthfeed
- Inbox
- Cardiac Risk
- DxSocial
- MyNote
- Meducation
- Sharing
- Get more apps
- App Settings

Med List | CMI | Demos | Spanish | Regular

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0 2 E 6 H G U 6

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### Blood Pressure Centiles

Allen Vitalis (male, DOB: 23 Nov 2004, MRN: 99912345) SMART

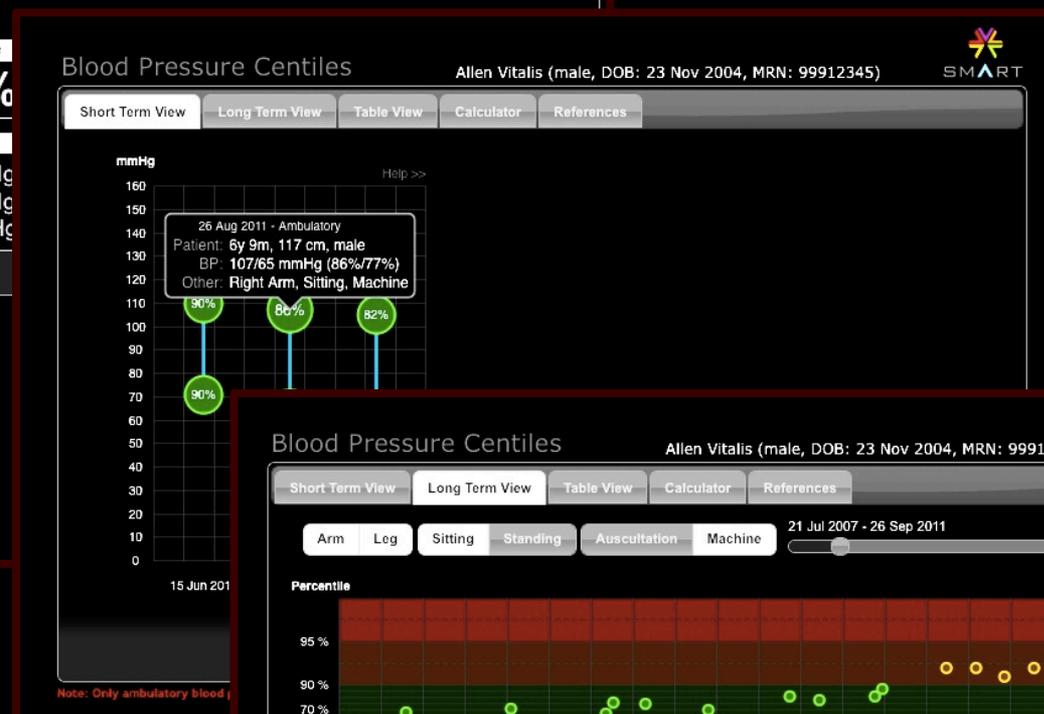
Short Term View Long Term View Table View Calculator References

6y 11m, 117 cm, male, 105/64 mmHg

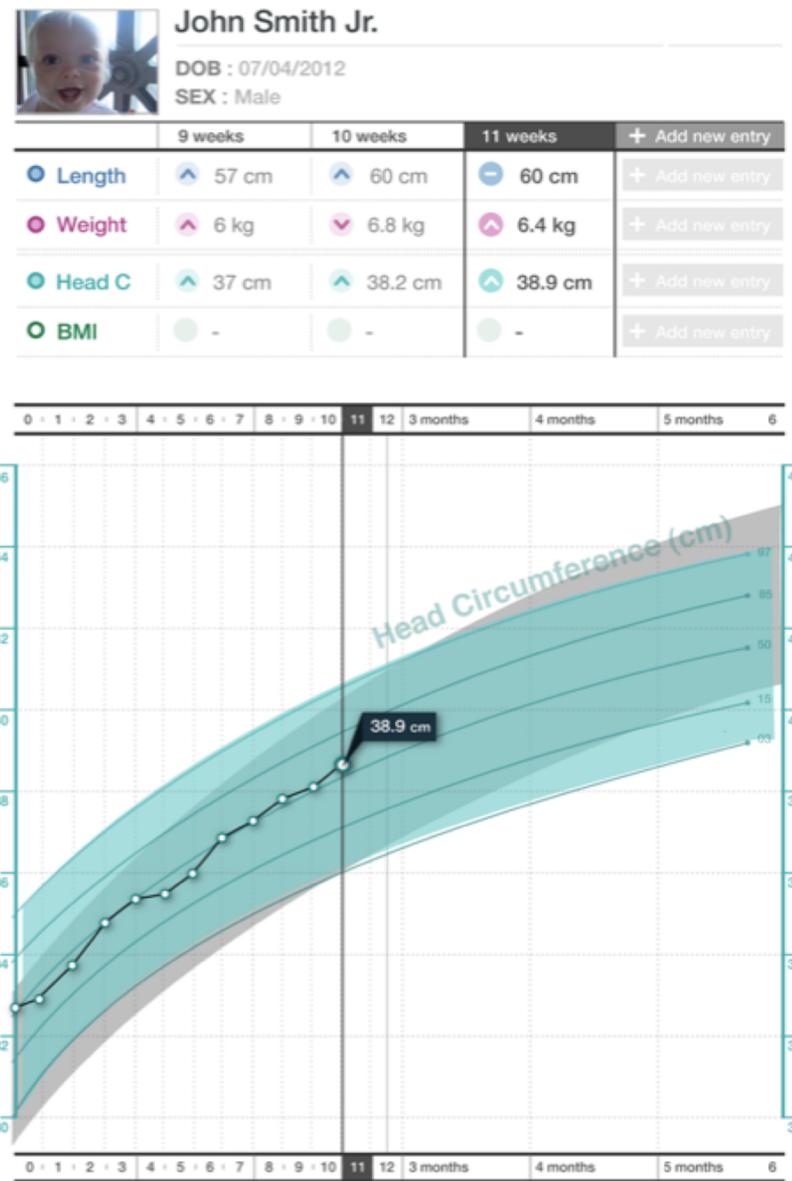
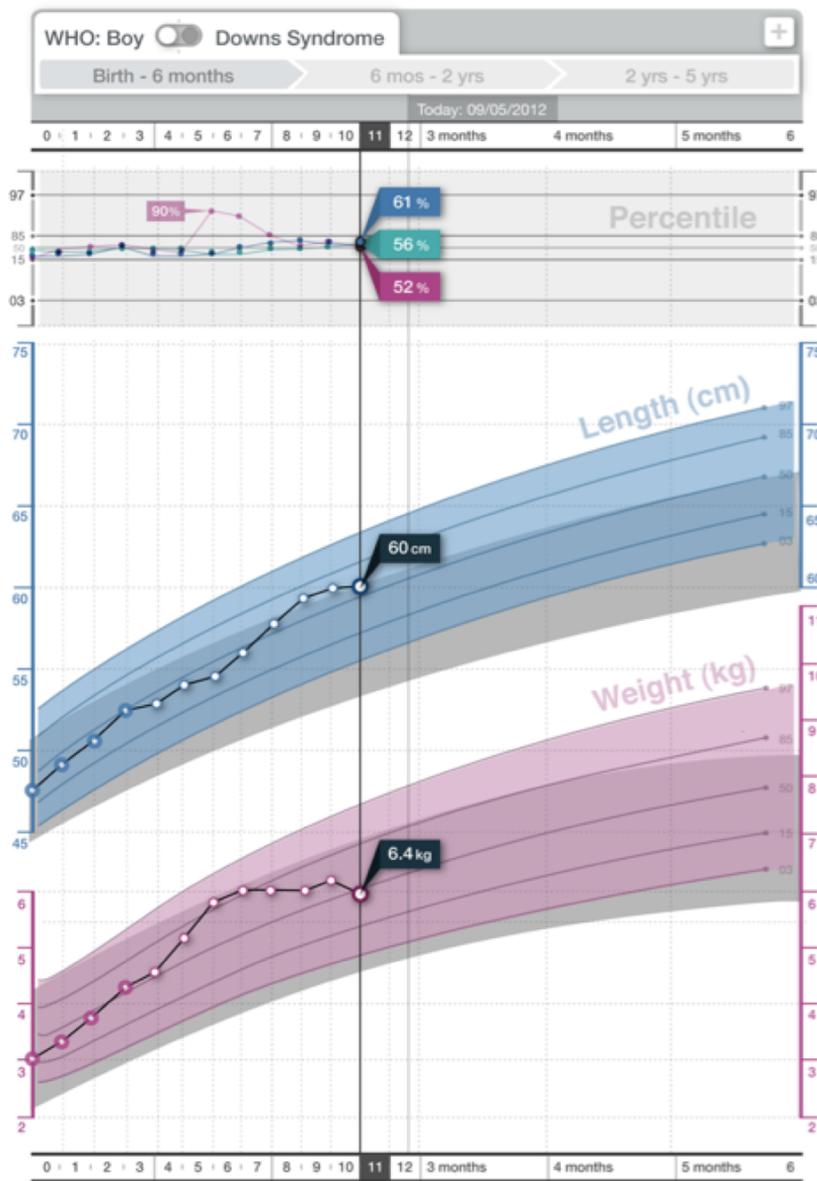
Patient		Systolic	Diastolic
BP	105 / 64 mmHg	<b>82%</b>	<b>75%</b>
Age	6 y 11 m		
Height	117 cm		
Gender	<input checked="" type="radio"/> Male <input type="radio"/> Female		

Thresholds	
99%	119 / 82 mmHg
95%	113 / 75 mmHg
90%	109 / 71 mmHg

Note: Only ambulatory blood pressures are displayed.



# SMART BP Centiles App Running on Cerner





### Trial Eligibility



Female Male 43 y  
 Boston, MA

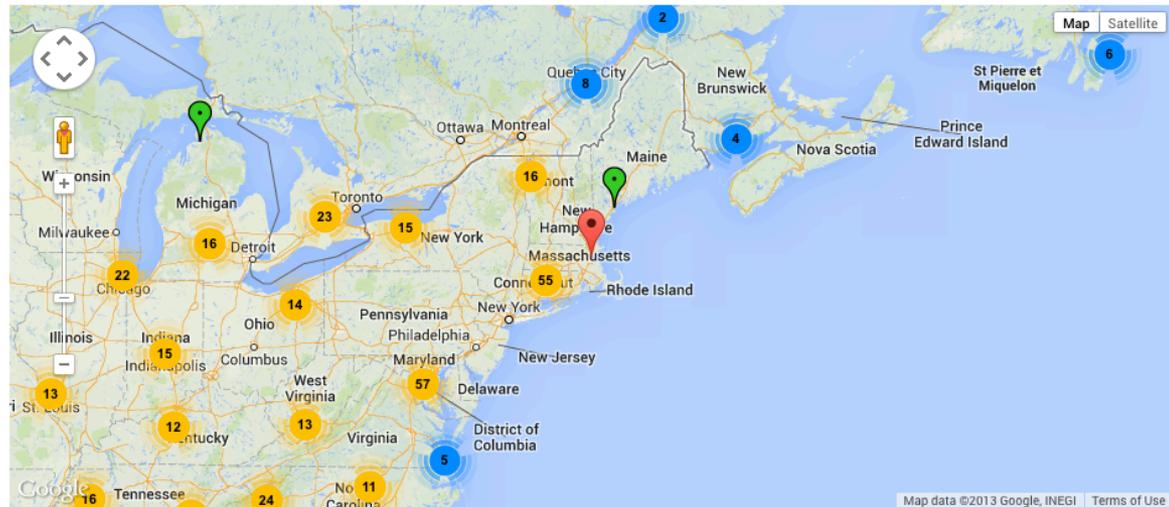
rheumatoid arthritis +methotrexate Cancel Refresh

#### Intervention / Observation

- Biological (14)
- Device (1)
- Dietary Supplement (1)
- Drug (69)
- Observational (14)
- Other (4)
- Procedure (1)

#### Trial phase

- N/A (8)
- Phase 1 (8)
- Phase 2 (23)
- Phase 3 (17)
- Phase 4 (26)





# Decision Support Integration e.g., Immunization Forecasting

< Amy Shaw >

Neelima Karipineni · Logout



## Immunization Record SMART Application



Immunizations **References**

Child Adult Administered Due Recommended Not Recommended Optional

Amy Shaw (female, DOB: 2007-03-20)

[Show Allergies](#)

Vaccine	Due	Doses			
ROTAVIRUS	5/1/12	<a href="#">5/24/07</a>			
DTAP	3/1/12	<a href="#">9/27/07</a>			
HepB	1/2/12 - 2/1/12	<a href="#">9/27/07</a>			
POLIO	3/1/12	<a href="#">9/27/07</a>	<a href="#">1/27/11</a>	<a href="#">5/27/11</a>	
HPV	1/1/23 - 1/1/24				
MENING	1/1/23 - 1/1/24				
HepA	1/1/13 - 7/1/13				
ZOSTER	Not indicated - Patient not yet indicated for ZOSTER vaccine				
VARICELLA	1/1/13 - 4/1/13				
HIB	3/1/12				
MMR	1/1/13 - 4/1/13				
PneumoPCV	3/1/12 - 4/1/12				
FLU	Not indicated - Current date is not within influenza season				

- Patient List
- Alerts
- API Playground
- API Verifier
- BP Centiles
- Direct Messages
- EMR View (Dev)
- Med List
- My App
- Problems
- Manage Apps



# Personalization of Therapy

**\*\* Associate Attending(s) \*\***

**\*\* No Known Allergies \*\***

BSA: 1.79 m2

Age: 18 years

Weight for Calc: 64.7 kg [07/24/2012]

DOB: 9/28/1993

Sex: Male

Outpatient [08/01/2012 13:02 - 08/01/2012 23:59]

Find:  Starts with  Type:  Prescriptions

Folder:

- mercaptapurine 10 mg/mL oral Liq (compou
- mercaptapurine 50 mg oral tablet**

**Discern:**



## Patient with TPMT Deficiency

DRISCOLL, ALEXANDER has a documented problem of TPMT - Thiopurine methyltransferase deficiency. Thiopurine methyltransferase (TPMT) is the enzyme responsible for the metabolism of mercaptopurine. Patients with TPMT - Thiopurine methyltransferase deficiency MAY require REDUCED doses of mercaptopurine.

Please page the Pharmacogenomics Service (pager #7454) if further information is required.

**Alert Action**

- Cancel order
- Acknowledge and override
- Modify**

History

OK



## Rx View

Patient: Daniel X. Adams ID: 1288992

### Treating:

Choose a problem

### Medication:

Search for a drug...

*mercaptopurine 10 MG Oral Tablet*

Take 1 pill by mouth daily

### Start date

2016-11-27

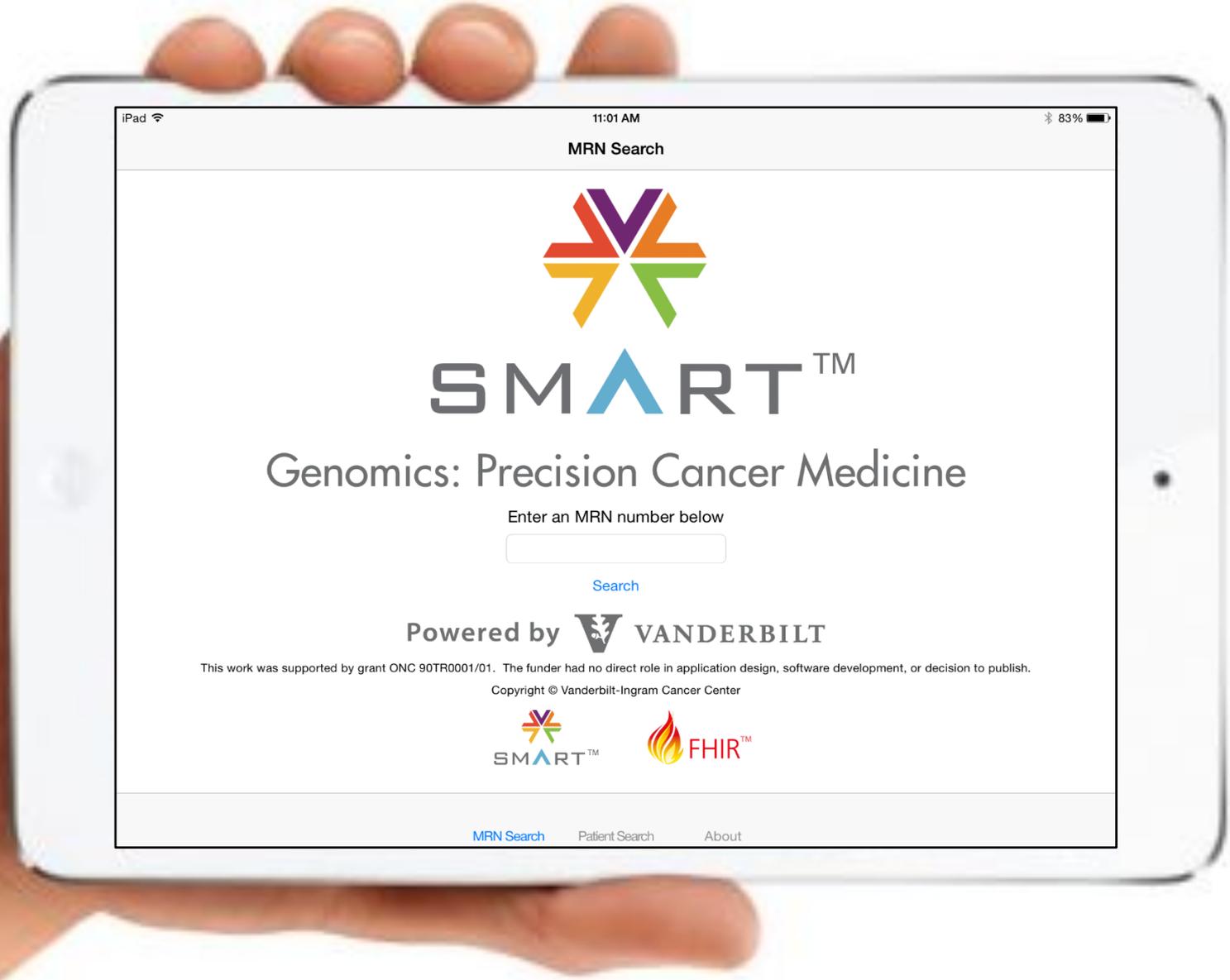
### End date

2016-12-27

### TPMT - Thiopurine methyltransferase deficiency

Daniel X. Adams has a documented problem of Thiopurine Methyltransferase (TPMT) deficiency. TPMT is the enzyme responsible for the metabolism of mercaptopurine. Patients with TPMT deficiency MAY require REDUCED doses of mercaptopurine.

Please page the Pharmacogenomics Service (pager #7454) if further information is required.



iPad 11:01 AM 83%

MRN Search



**SMART**<sup>TM</sup>

Genomics: Precision Cancer Medicine

Enter an MRN number below

[Search](#)

Powered by  **VANDERBILT**

This work was supported by grant ONC 90TR0001/01. The funder had no direct role in application design, software development, or decision to publish.  
Copyright © Vanderbilt-Ingram Cancer Center



[MRN Search](#) [Patient Search](#) [About](#)

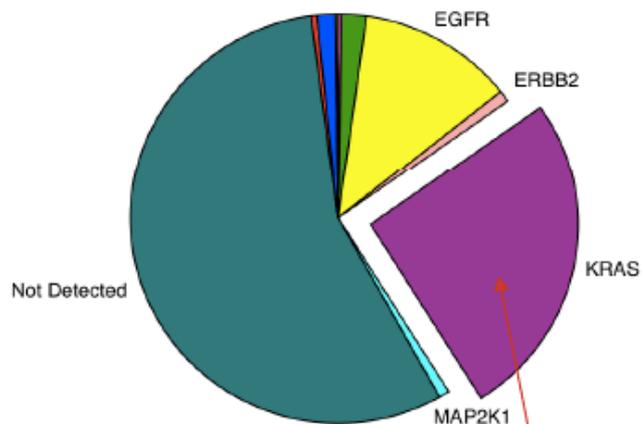


< Patient Search

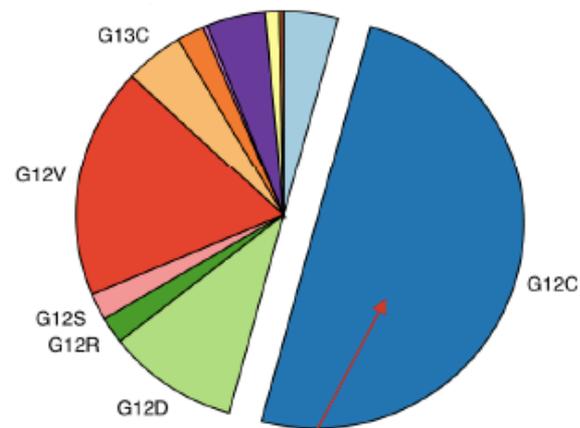
[Redacted] (MRN: [Redacted])

Male, [Redacted]  
Diagnosis: Lung Cancer  
Mutation: KRAS G12C

Mutated Genes Observed in Lung Cancer



Observed Variants in Lung Cancer Patients with KRAS Mutation



A gene mutation was detected in this patient, so variant level information is also provided. They have the most common variant of KRAS seen in the *lung cancer* population.



# Big Data Mashups: e.g., Personalized Medicine

- Linkage to external decision support services
  - ✓ Pharmacogenomic rule sets
  - ✓ Decision support for doctors

< William Robinson > Demo User · Logout

SMART Genomics Advisor

SMART

- Patient List
- Alerts
- Diabetes Monograph
- Genomics Advisor

**Robinson, William**  
DOB 1965-08-09 AGE 47 SEX M

SNP	Locus	CHRM	Code	Risk	Frequency
<b>Type 1 Diabetes</b>					
rs7202877	16Q23	16	TT	0.95	81.0%
rs5753037	22Q12	22	CC	0.93	37.2%
rs3087243	CTLA4	2	AG	0.98	49.4%
rs3825932	CTSH	15	CT	0.94	43.4%
rs1990760	IFIH1	2	TT	1.16	36.2%
rs6822844	IL2	4	GT	0.73	30.2%
rs3184504	SH2B3	12	CC	0.74	26.0%
<b>Total Relative Risk: 0.51</b>					
<b>Type 2 Diabetes</b>					
rs2877716	ADCY5	3	CC	1.05	59.3%
rs2383208	CDKN2A	9	AG	0.88	28.2%
rs4402960	IGF2BP2	3	GG	0.92	46.2%
rs2237892	KCNO1	11	CC	1.03	86.5%
rs2793831	NOTCH2	1	TT	0.97	79.9%
rs7578597	THADA	2	TT	1.03	81.4%
rs7961581	TSPAN8	12	TT	0.95	53.4%
<b>Total Relative Risk: 0.83</b>					
<b>Hypertension</b>					
rs12413409	CYP17A1	10	GG	1.03	82.8%
rs17367504	MTHFR	1	AA	1.03	74.0%
rs3184504	SH2B3	12	CC	0.93	28.1%
<b>Total Relative Risk: 0.99</b>					
<b>Coronary Heart Disease</b>					
rs1746048	CXCL12	10	CC	1.05	70.6%
rs3184504	SH2B3	12	CC	0.89	30.2%
rs6725887	WDR12	2	TT	0.95	74.0%
<b>Total Relative Risk: 0.89</b>					

**Genomics Data**  
Patient ID: 141  
Data format: 23andme

**Current Medications**  
Chantix, Pramipexole, rosuvastatin, pantoprazole, glimepiride, Ramipril, Nitroglycerin, montelukast, Doxycycline, Ramipril, Chantix, Niacin, Simvastatin, Simvastatin, glimepiride, Metformin, Niacin, Atenolol, Clarithromycin, clopidogrel, celecoxib

**Risk Graph**

**Radar Graphs**

Diabetes Mellitus Type 1

Diabetes Mellitus Type 2

Hypertension

Hypertension SNP: rs2877716  
Relative Risk: 1.03

Coronary Heart Disease

**Disease Information**  
Patient is not at increased genomic risk for any Diabetes related comorbidities

**Drug Advice**

SNP	Genotype	Advice
rs20455	AA	Patients with the AA genotype who are treated with statins may have a decreased, but not absent, risk for adverse cardiovascular events as compared to patients with the AG or GG genotype. Other genetic and clinical factors may also influence a patients risk for adverse cardiovascular events.
rs2306283	AA	is not associated with decreased plasma AUC of pravastatin.
rs4149056	TT	A person with this genotype may have no increased risk of simvastatin-related myopathy.

Manage Apps

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## Who's Who Of Health Care Join Forces For SMART Technology

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In the new app-driven health economy, ease of use of IT for providers and patients is a must. Equally important is a sound technical approach and business plan for application creators looking for success, sustainability, and a large market for their innovations. Under the leadership of [Boston Children's Hospital's](#) Drs. [Kenneth Mandl](#), [Isaac Kohane](#), [Joshua Mandel](#) and an advisory

Now the colors yo  
stay the colors yo

- Clayton Christensen, HBS
- American Medical Association
- The Advisory Board Company
- AARP
- Blue Cross Blue Shield Association
- BMJ
- Canadian Institutes of Health Research
- CMS
- HCA
- Lily
- MyHealthBook
- Polyglot Systems
- Premier
- Surescripts
- UK NHS
- Quest



## Perfect Storm for SMART Adoption

- EHR Vendors Implementing SMART API
- Health systems standardizing on SMART
- MU3 Policy requiring apps for patients
- Vendor implementation of S4S—patient access
- ONC/CMS Imprimatur and \$ for Gallery
- Decision Support Model
- SMART Genomics (PMI)



## SMART Strongholds

- Boston Children's Hospital
- Duke Medical Center
- Intermountain
- Geisenger
- ?Partners?



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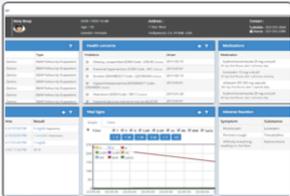
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- DSTU2 5

**Tech**

- Open Source 8
- iOS App 3

**Name** A to Z 32 apps



**AppWorks**



**BMJ Content Discovery**



**BP Centiles**



**Bilirubin Chart**



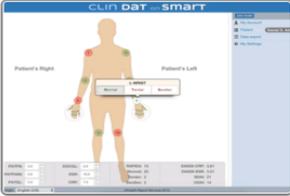
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**Carefluence**



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## Perspective

### Time for a Patient-Driven Health Information Economy?

Kenneth D. Mandl, M.D., M.P.H., and Isaac S. Kohane, M.D., Ph.D.

N Engl J Med 2016; 374:205-208 | January 21, 2016 | DOI: 10.1056/NEJMp1512142

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Metrics

As patients strive to manage their own health and illnesses, many wonder how to get a copy of their health data to share with their physicians, load into apps, donate to researchers, link to their genomic data, or have on hand just in case. To seek diagnosis or better care (see [table](#)), many patients are taking steps outside traditional doctor–patient relationships. Some join 23andMe to obtain genetic information. Others bring data to the Undiagnosed Diseases Network at the National Institutes of Health (NIH). Patients are coalescing with others with the same disease in what the Patient Centered Outcomes Research Institute calls patient-powered research networks. But such patients have found no easy way to get copies of their electronic health records (EHRs).

Reason	Percentage
Share data with family	31%
Share data with friends	28%
Share data with researchers	25%
Share data with healthcare providers	22%
Share data with other patients	18%
Share data with insurance companies	15%
Share data with employers	12%
Share data with government agencies	10%
Share data with pharmaceutical companies	8%
Share data with academic institutions	7%
Share data with other organizations	5%
Share data with the public	3%
Share data with no one	2%

Selected Reasons for Pursuing Patient-Controlled Data.



## Sync for Science <http://syncfor.science>

Goal: helping patients share EHR data w/researchers

- PMI is one early S4S "customer" (research study). There will be lots more, if we're successful.
- Approach: SMART, FHIR, Argonaut, and MU3 API certification requirements
- Collaborators: Government (NIH, ONC, OSTP), EHR vendors (Allscripts, athenahealth, Cerner, drchrono, eClinicalWorks, Epic, McKesson)
- Timeline: testing vendor implementations Q3 2016, deploying to



# A Foundation for Discovering Clinical Health IT Applications

June 1, 2016, 11:00 am / [Karen B. DeSalvo](#), Former National Coordinator for Health IT, and [Andy Slavitt](#) / Acting Administrator, CMS



30

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Every day across America, health information technology (health IT) professionals and development teams are creating interoperability solutions using application programming interfaces (APIs). As this surge of innovation grows with each passing year, the likelihood that teams across the nation are creating similar or duplicative health IT applications is also increasing. Unfortunately, our capability to search for, discover, compare, and test existing applications has been limited and this lack of available information may contribute to a lag in the diffusion of innovation across the health IT application ecosystem.



Earlier this year, [the Office of the National Coordinator for Health Information Technology \(ONC\)](#) announced its vision for [Connecting and Accelerating a Fast Healthcare Interoperability Resources \(FHIR\) App Ecosystem](#), with a total of \$625,000 in funding support. This strategy expressed three complementary goals: 1) [help consumers get and use their data](#); 2) [improve user-experience for providers](#); and 3) [coordinate open information about market-ready electronic health record \(EHR\) app solutions](#).



Today, we are excited to announce that Boston Children's Hospital, has been awarded approximately \$275,000 to address our stated third goal of coordinating open information about market-ready EHR app solutions. This new cooperative agreement will support the development of an online app discovery site aimed at streamlining a developer's ability to publish their health IT



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