



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

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Harvard Medical School

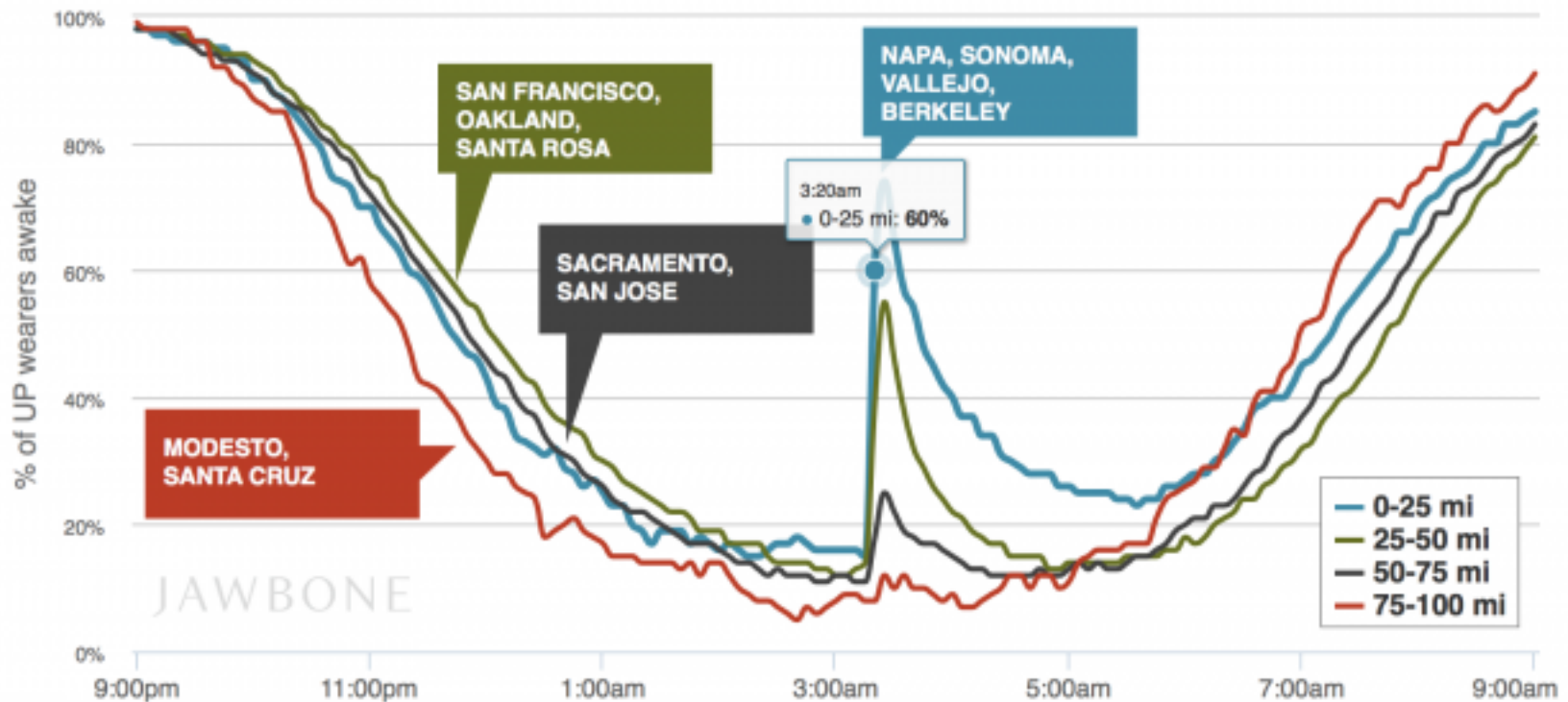
 @mandl

www.chip.org



Virginia 2011



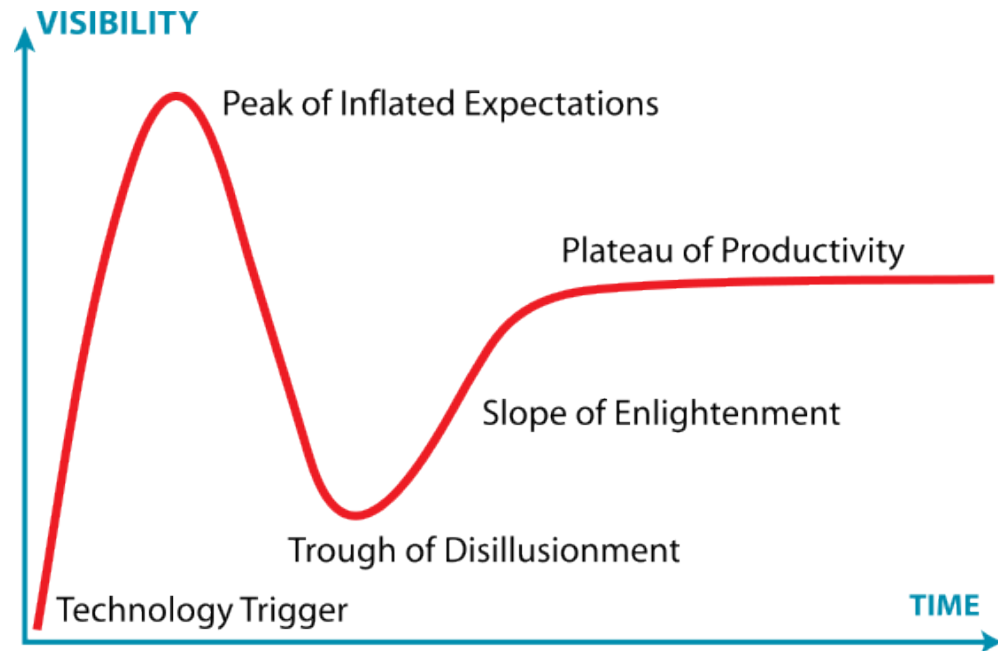


We wish all the people in the Bay Area who were affected by the earthquake a speedy recovery and a good night's sleep.



Hype Curve and HIT

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



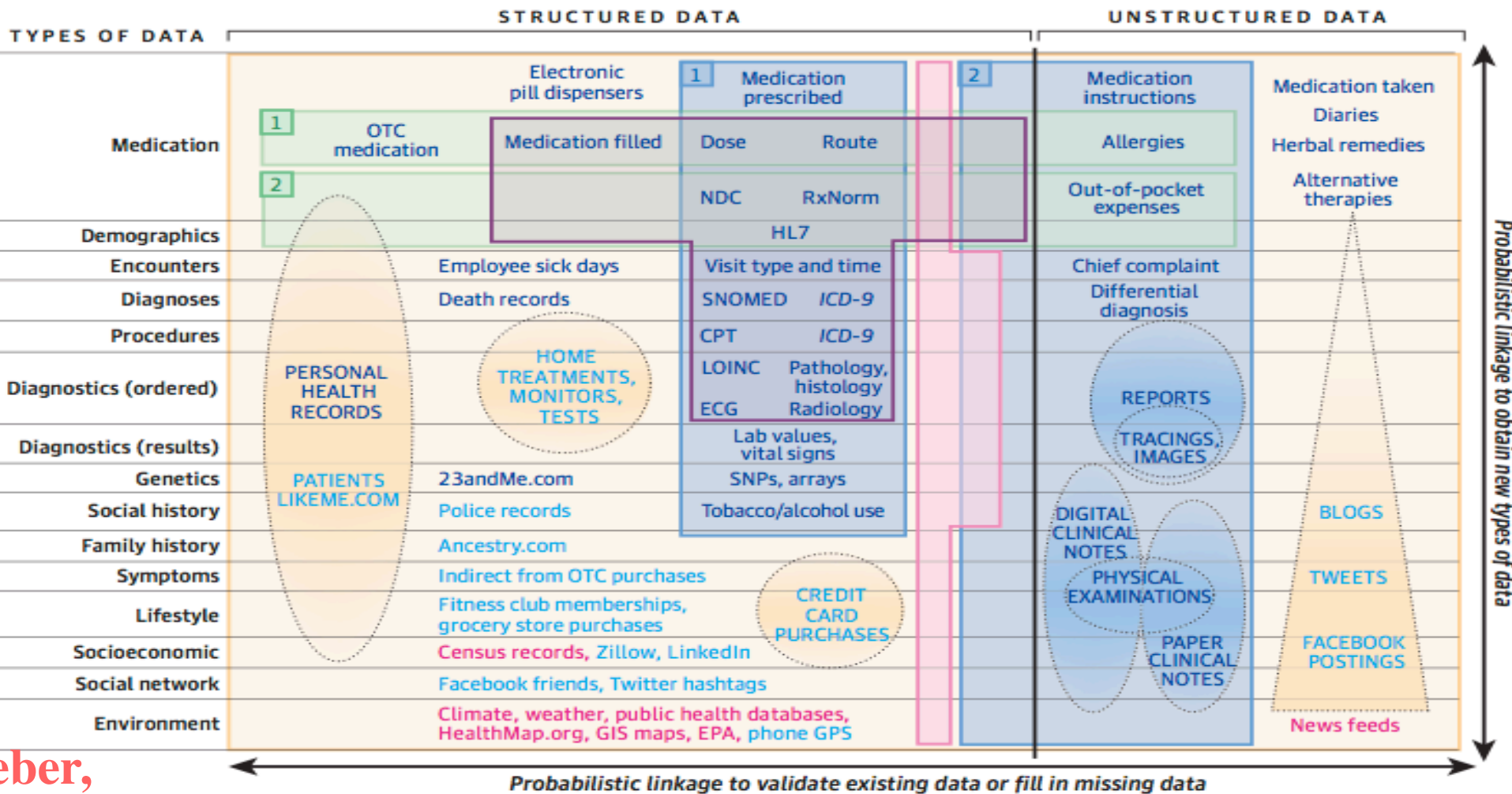


Point of Care is a Walled Garden

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



Examples of biomedical data

- 1 2

 Pharmacy data
- 1 2

 Health care center (electronic health record) data
- 1 2

 Claims data
- 1 2

 Registry or clinical trial data
- 1 2

 Data outside of health care system

Ability to link data to an individual

- 1 2

 Easier to link to individuals
- 1 2

 Harder to link to individuals
- 1 2

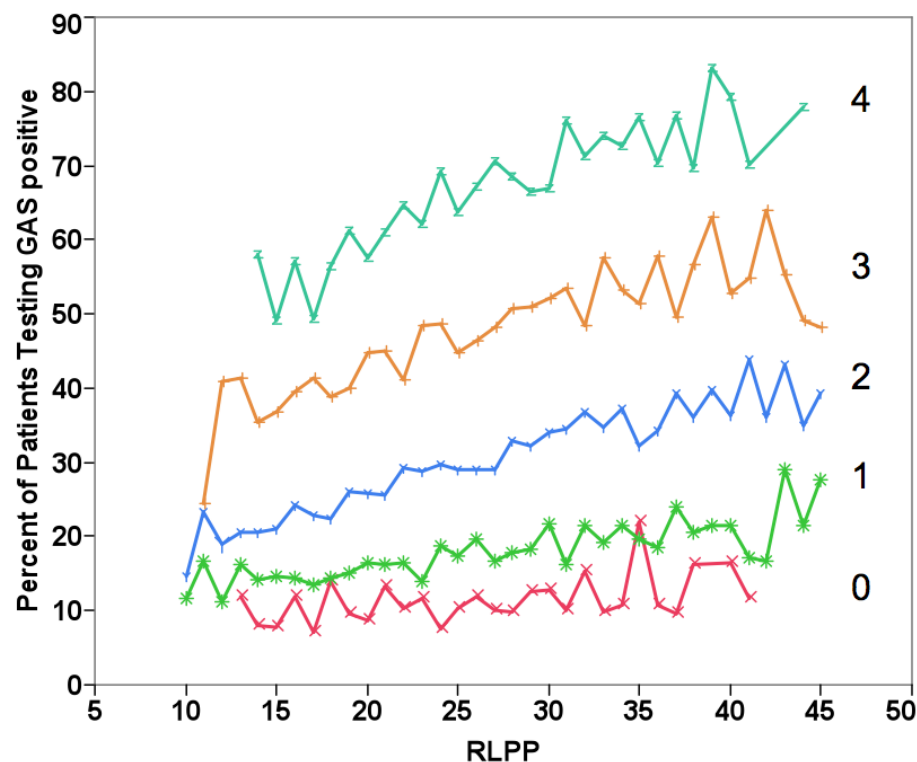
 Only aggregate data exists

Data quantity





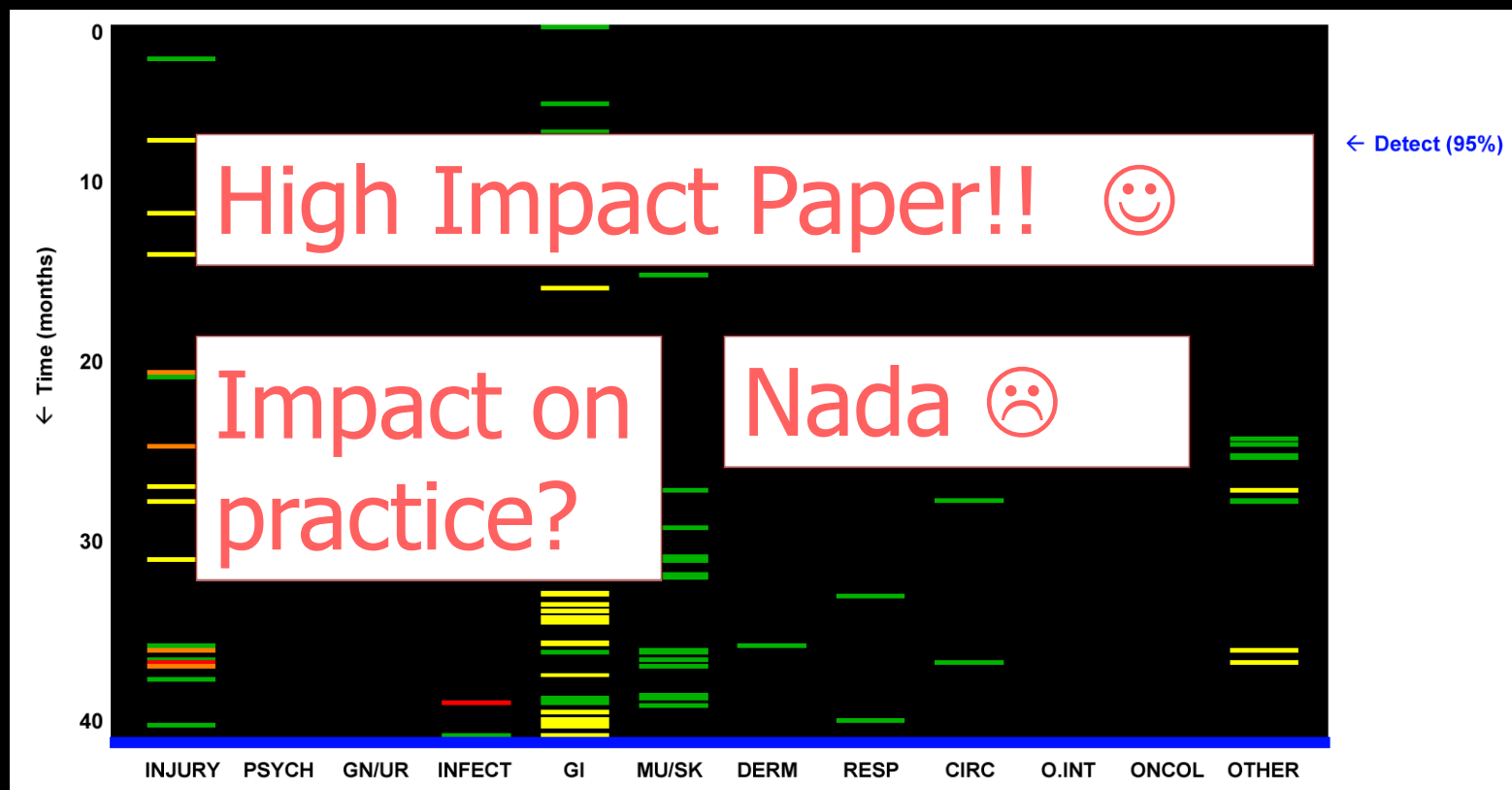
Adding Context is Powerful



Annals of Internal Med



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.

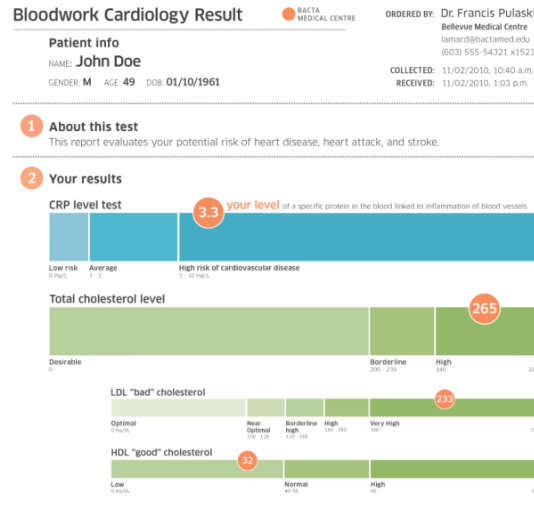
The Apple iPhone, for example, uses a software platform with a published interface that allows software developers outside Apple to create applications; there are now nearly 10,000 applications that consumers can download and use with the common phone interface. The platform separates the system from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



Designing the App Store for Health



SMART



The NEW ENGLAND JOURNAL of MEDICINE

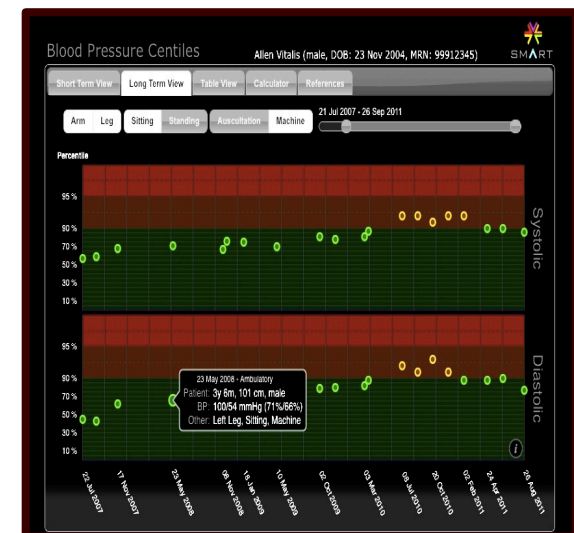
No Small Change for the Health Information Economy

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

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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?**



chip

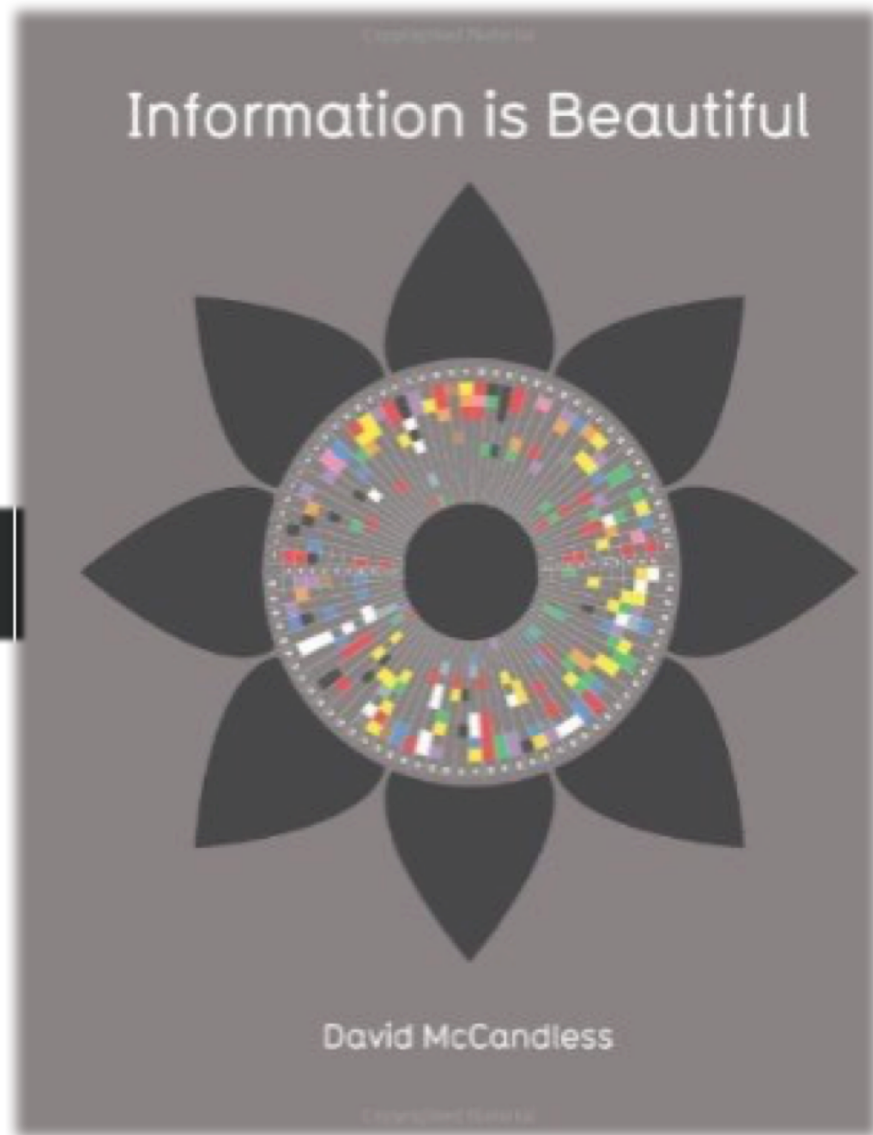


Inspired by a

WIRED

18.12 Issue

Design Challenge





State-of-the-Art ???

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

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.		



An
Inspired Design
from Dave McCandless
(cc license)

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

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 risk of a cardiovascular event at ReynoldsRisk.org

4 What now?



Diet & exercise- can improve your cholesterol levels



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



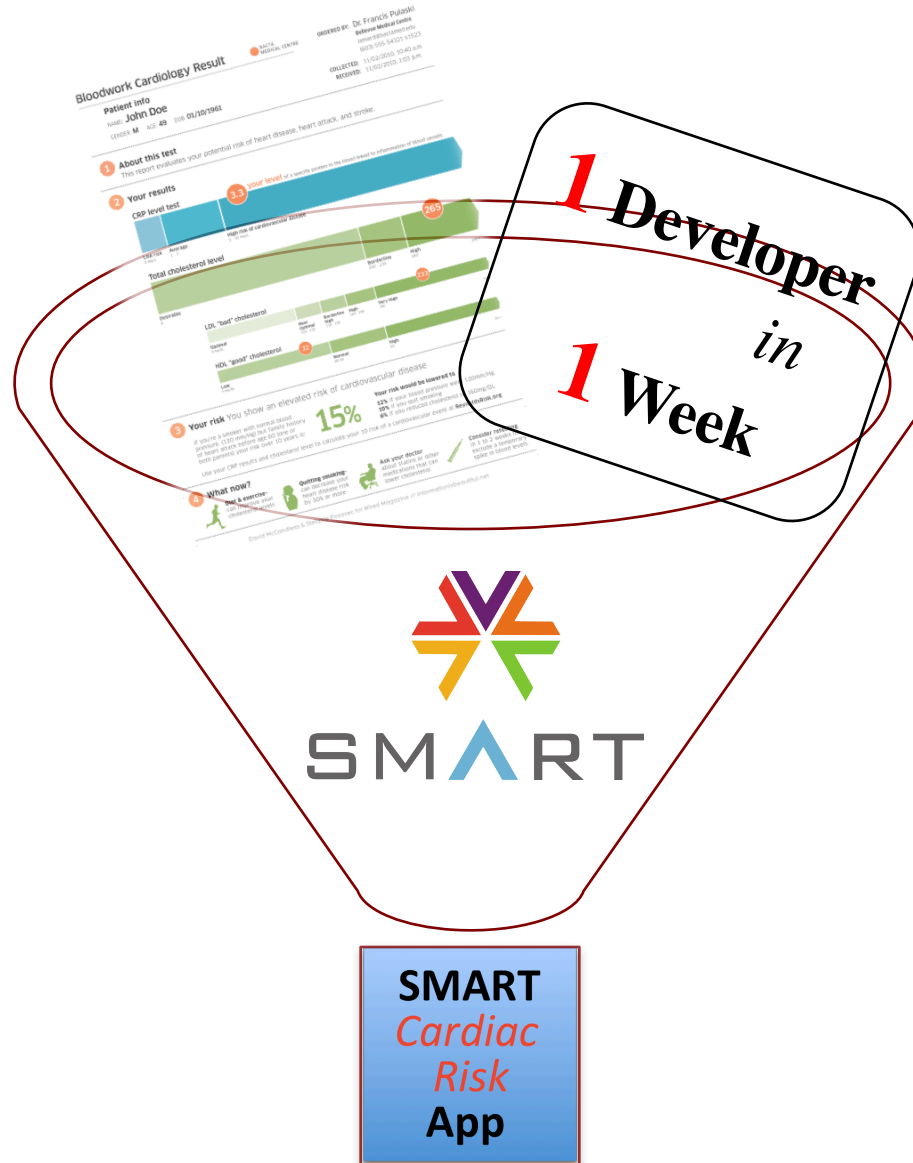
Ask your doctor about statins or other medications that can lower cholesterol



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

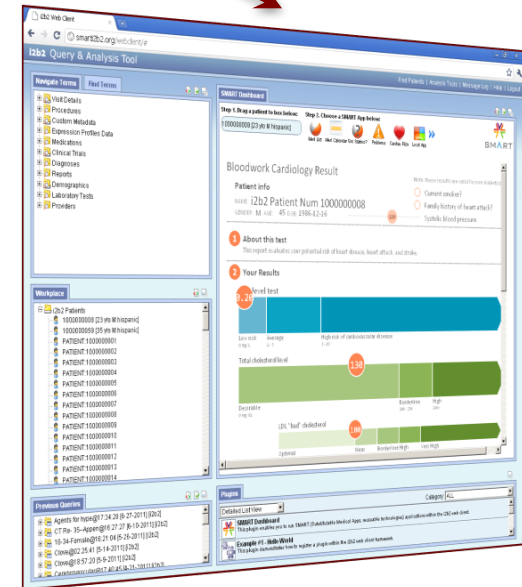
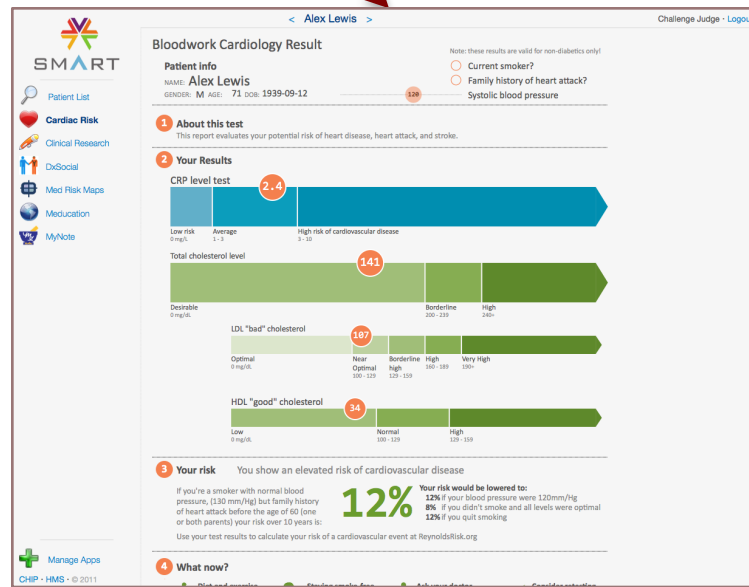
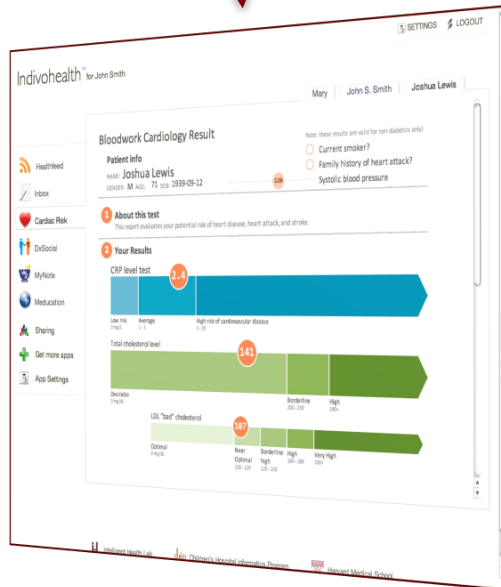


1 Design + 1 Developer + 1 Week













1 SMART App in 3 SMART Systems








SMART

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





< Alex Lewis > Challenge Judge

Med List CMI Demos English Regular


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


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.
Es muy importante que tome este medicamento cada día a la misma hora todos los días.


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


www.meducation.com
0 2 E 6 H G U 6

 Pharmacy
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Blood Pressure Centiles

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



Short Term View

Long Term View

Table View

Calculator

References

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

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

Systolic Diastolic
82% / 75%

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

Note: Only ambulatory blood pressures are displayed.

Blood Pressure Centiles

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



Short Term View

Long Term View

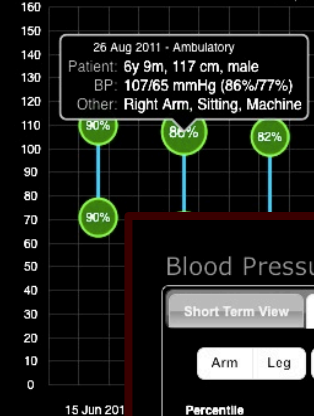
Table View

Calculator

References

mmHg

Help >>



Note: Only ambulatory blood

Blood Pressure Centiles

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



Short Term View

Long Term View

Table View

Calculator

References

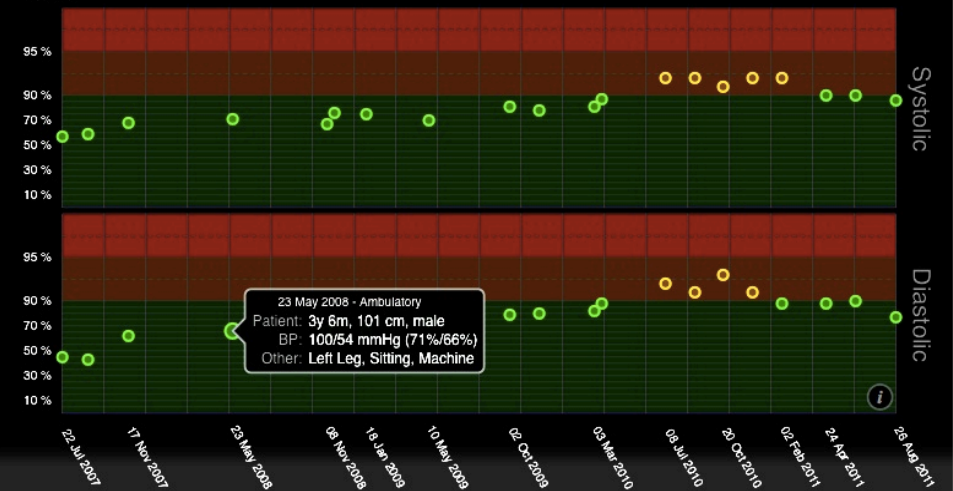
Arm Leg

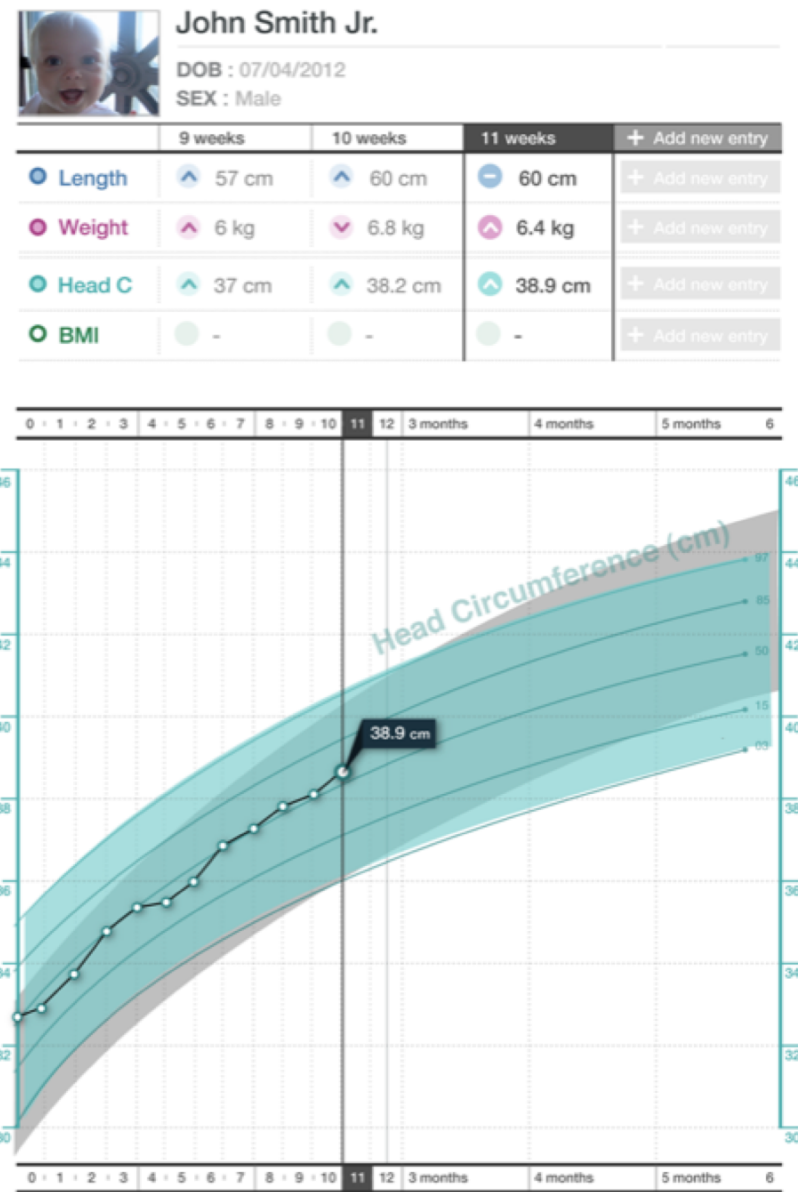
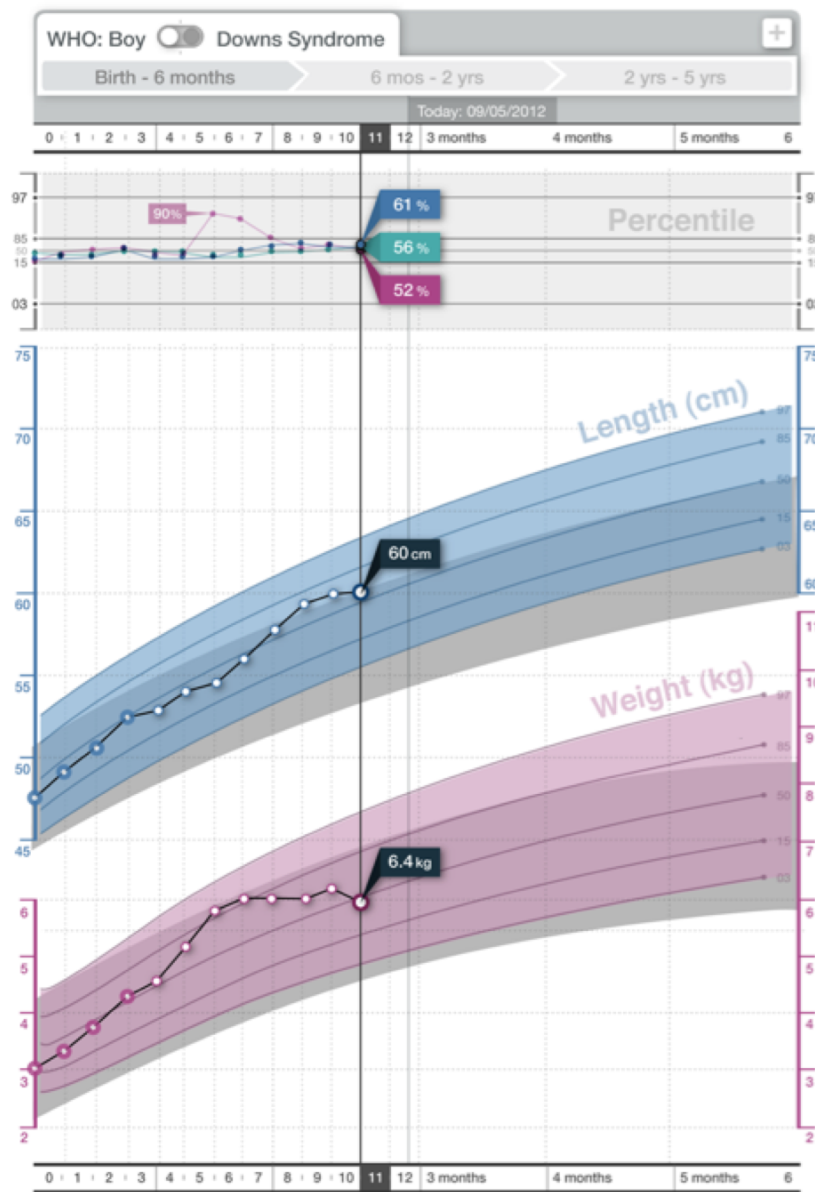
Sitting Standing

Auscultation Machine

21 Jul 2007 - 26 Sep 2011


Percentile







Trial Eligibility



FemaleMale

43y

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

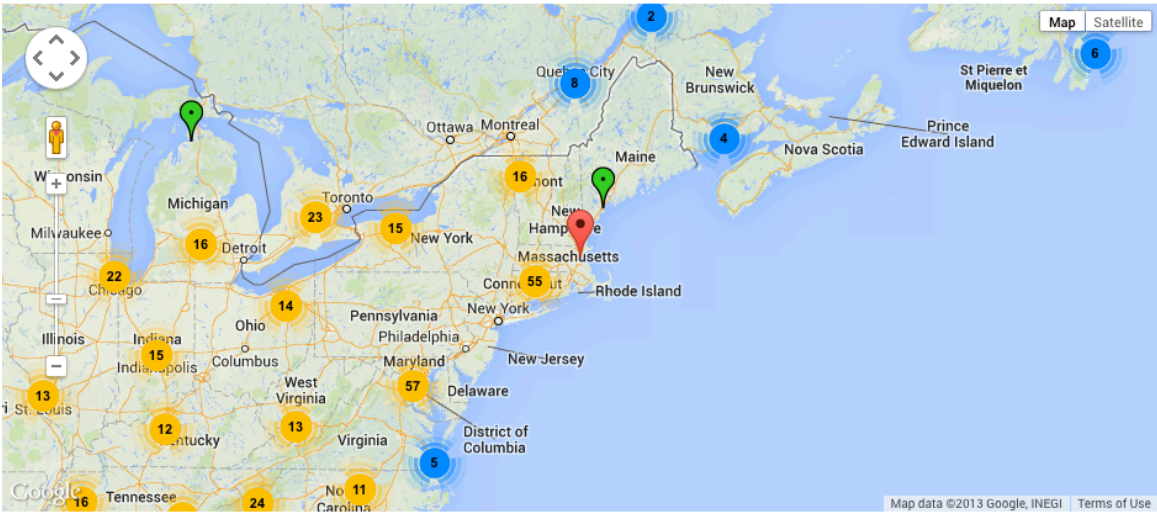
☒ N/A (8)

☒ Phase 1 (8)

☒ Phase 2 (23)

☒ Phase 3 (17)

☒ Phase 4 (26)





Decision Support Integration e.g., Immunization Forecasting

< Amy Shaw >

Neelima Karipineni · Logout



Patient List



Alerts



API Playground



API Verifier



BP Centiles



Direct Messages



EMR View (Dev)



Med List



My App



Problems



Manage Apps

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	5/24/07				
DTAP	3/1/12	9/27/07				
HepB	1/2/12 - 2/1/12	9/27/07				
POLIO	3/1/12	9/27/07	1/27/11	5/27/11		
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					



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:

 mercaptopurine 10 mg/mL oral Liq (compou
 mercaptopurine 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



 **CDS Hooks** Demo


Rx View

Patient View

Change Patient

 Quick Add

 Reset

 Configure Hooks

Context

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

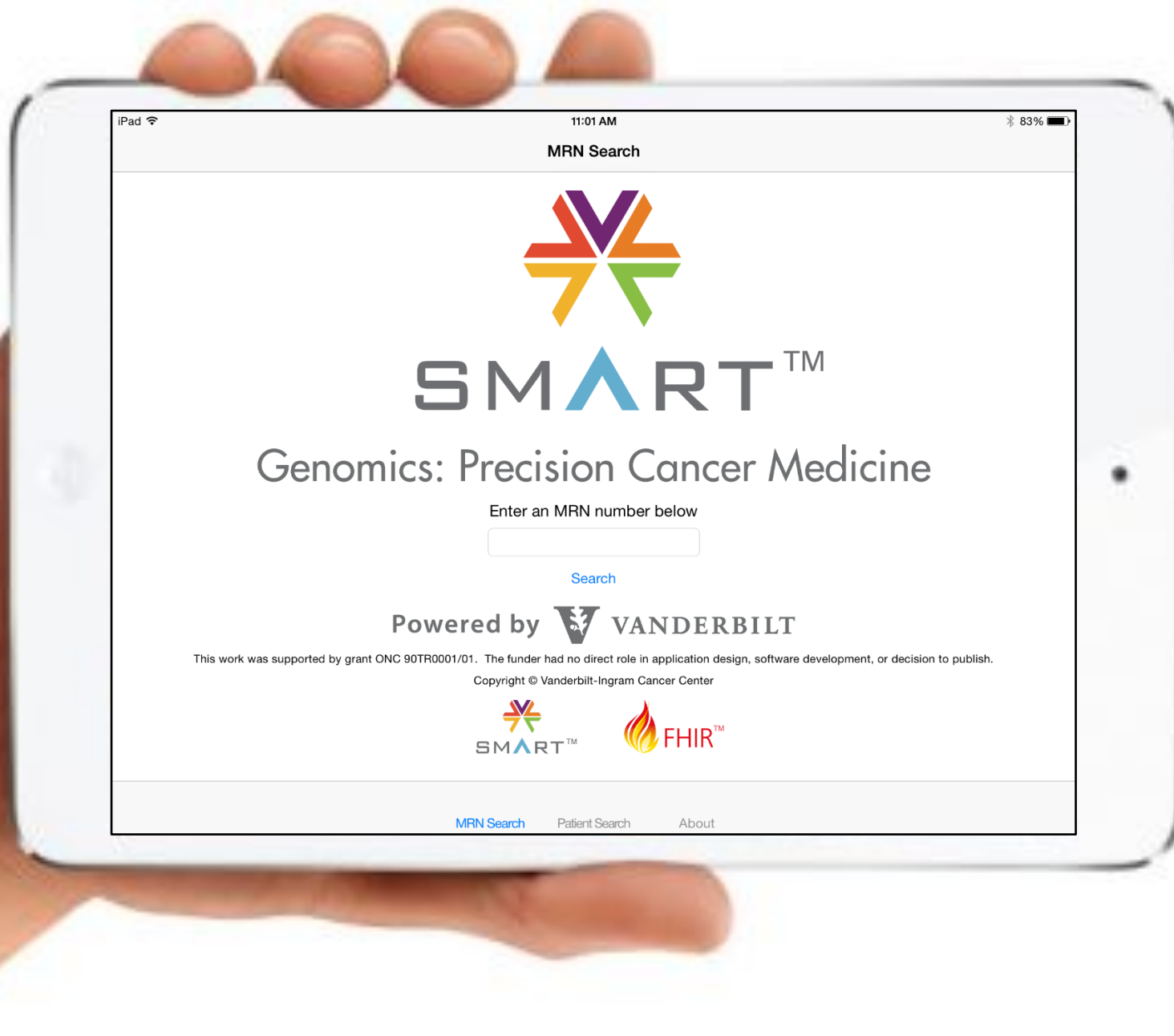
End date 

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

11:03 AM

83%

[Patient Search](#)

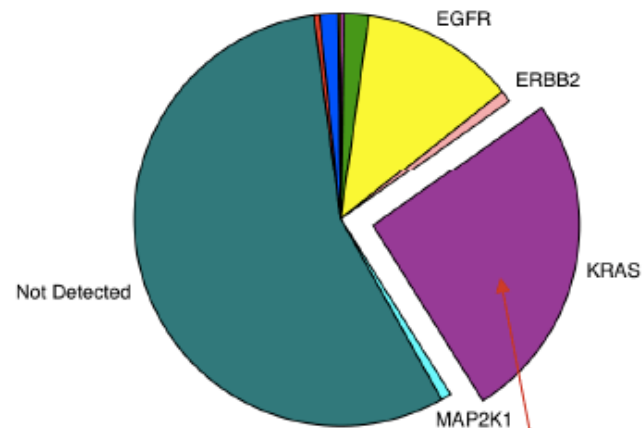
(MRN:)

Male,

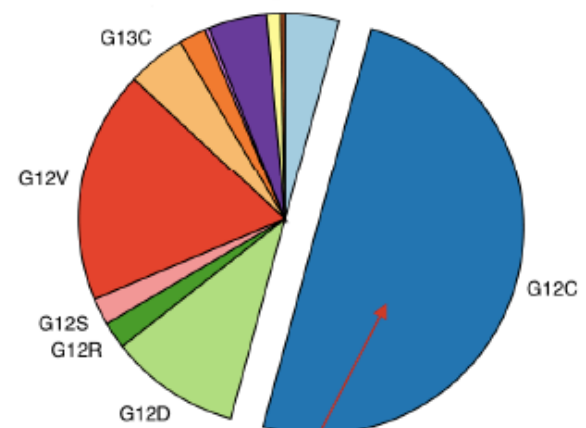
Diagnosis: Lung Cancer

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

CHIP SMART Genomics Advisor

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

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, Clozaril, clopidogrel, celecoxib

Risk Graph

DM1 DM2 HYP CHD

Radar Graphs

Diabetes Mellitus Type 1

Diabetes Mellitus Type 2

Hypertension

Coronary Heart Disease

Hypertension SNP: rs2877716 Relative Risk: 1.03

SNP Locus CHR Code Risk Frequency

Type 1 Diabetes

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%
				Total Relative Risk: 0.51	

Type 2 Diabetes

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%
				Total Relative Risk: 0.83	

Hypertension

rs12413409	CYP17A1	10	GG	1.03	82.8%
rs17367504	MTHFR	1	AA	1.03	74.0%
rs3184504	SH2B3	12	CC	0.93	28.1%
				Total Relative Risk: 0.99	

Coronary Heart Disease

rs1746048	CXCL12	10	CC	1.05	70.6%
rs3184504	SH2B3	12	CC	0.89	30.2%
rs6725887	WDR12	2	TT	0.95	74.0%
				Total Relative Risk: 0.89	

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 patient's 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

CHIP · HMS · © 2012



New Posts +3



Nicole Fisher
Contributor

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*health policy expert
covering health
innovation, outcomes &
justice*
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PHARMA & HEALTHCARE

5/29/2014 @ 4:43AM | 3,417 views

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

[+ Comment Now](#) [+ Follow Comments](#)

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?



gallery.smarthealthit.org

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You are here: [Home](#)

Category

- ☒ All 32
- ☐ Clinical Care 23
- ☐ Clinical Research 2
- ☐ Patient Education 7

Tags AND OR

- ☐ Discharge planning 2
- ☐ Skill-based learning 1
- ☐ Asthma & Allergies 3
- ☐ Cardiovascular 5
- ☐ Diabetes 7
- ☐ Medications 9
- ☐ Pediatrics 4
- ☐ Rheumatology 2
- ☐ Diagnosis 15
- ☐ Reference 11
- ☐ DSTU2 5

Tech

- ☐ Open Source 8
- ☐ iOS App 3

Name A to Z 32 apps

AppWorks

BMJ Content Discovery

BP Centiles

Bilirubin Chart

Cardiac Risk

Carefluence

Cerner HIE on SMART

ClinDat

Crimson Care Management

MedPilot



CME »



Time for a Patient-Driven Health Information Economy?

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

Share:

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).

Reasons for Pursuing Patient-Controlled Data	Reasons for Not Pursuing Patient-Controlled Data
• To share data with family members	• Lack of time
• To share data with friends	• Lack of interest
• To share data with researchers	• Lack of knowledge
• To share data with healthcare providers	• Lack of trust
• To share data with others with the same condition	• Lack of resources
• To share data with others with the same disease	• Lack of access
• To share data with others with the same symptoms	• Lack of motivation
• To share data with others with the same diagnosis	• Lack of information
• To share data with others with the same treatment	• Lack of support
• To share data with others with the same prognosis	• Lack of confidence
• To share data with others with the same outcome	• Lack of understanding
• To share data with others with the same experience	• Lack of awareness
• To share data with others with the same journey	• Lack of resources
• To share data with others with the same story	• Lack of motivation
• To share data with others with the same hope	• Lack of information
• To share data with others with the same dream	• Lack of support
• To share data with others with the same vision	• Lack of confidence
• To share data with others with the same mission	• Lack of understanding
• To share data with others with the same purpose	• Lack of awareness
• To share data with others with the same passion	• Lack of resources
• To share data with others with the same commitment	• Lack of motivation
• To share data with others with the same dedication	• Lack of information
• To share data with others with the same devotion	• Lack of support
• To share data with others with the same loyalty	• Lack of confidence
• To share data with others with the same integrity	• Lack of understanding
• To share data with others with the same honesty	• Lack of awareness
• To share data with others with the same transparency	• Lack of resources
• To share data with others with the same accountability	• Lack of motivation
• To share data with others with the same responsibility	• Lack of information
• To share data with others with the same obligation	• Lack of support
• To share data with others with the same duty	• Lack of confidence
• To share data with others with the same task	• Lack of understanding
• To share data with others with the same job	• Lack of awareness
• To share data with others with the same work	• Lack of resources
• To share data with others with the same effort	• Lack of motivation
• To share data with others with the same energy	• Lack of information
• To share data with others with the same enthusiasm	• Lack of support
• To share data with others with the same excitement	• Lack of confidence
• To share data with others with the same joy	• Lack of understanding
• To share data with others with the same happiness	• Lack of awareness
• To share data with others with the same love	• Lack of resources
• To share data with others with the same care	• Lack of motivation
• To share data with others with the same compassion	• Lack of information
• To share data with others with the same empathy	• Lack of support
• To share data with others with the same understanding	• Lack of confidence
• To share data with others with the same knowledge	• Lack of understanding
• To share data with others with the same wisdom	• Lack of awareness
• To share data with others with the same insight	• Lack of resources
• To share data with others with the same intuition	• Lack of motivation
• To share data with others with the same instinct	• Lack of information
• To share data with others with the same gut feeling	• Lack of support
• To share data with others with the same hunch	• Lack of confidence
• To share data with others with the same suspicion	• Lack of understanding
• To share data with others with the same doubt	• Lack of awareness
• To share data with others with the same uncertainty	• Lack of resources
• To share data with others with the same confusion	• Lack of motivation
• To share data with others with the same frustration	• Lack of information
• To share data with others with the same anger	• Lack of support
• To share data with others with the same sadness	• Lack of confidence
• To share data with others with the same fear	• Lack of understanding
• To share data with others with the same anxiety	• Lack of awareness
• To share data with others with the same stress	• Lack of resources
• To share data with others with the same tension	• Lack of motivation
• To share data with others with the same pressure	• Lack of information
• To share data with others with the same burden	• Lack of support
• To share data with others with the same weight	• Lack of confidence
• To share data with others with the same load	• Lack of understanding
• To share data with others with the same responsibility	• Lack of awareness
• To share data with others with the same obligation	• Lack of resources
• To share data with others with the same duty	• Lack of motivation
• To share data with others with the same task	• Lack of information
• To share data with others with the same job	• Lack of support
• To share data with others with the same work	• Lack of confidence
• To share data with others with the same effort	• Lack of understanding
• To share data with others with the same energy	• Lack of awareness
• To share data with others with the same enthusiasm	• Lack of resources
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• To share data with others with the same energy	• Lack of support
• To share data with others with the same enthusiasm	• Lack of confidence
•	

Abstract Research in Training Development/Interventions	
Issue or Challenge	Implications
Complexity	Complex interventions require careful analysis and evaluation processes. Interventions that combine multiple components may be more effective than single components.
How best to conduct an evaluation	Conducting a rigorous, replicable evaluation is difficult. Use of a randomized controlled trial is the gold standard, but other designs may be more appropriate for certain interventions.
Use of practice-relevant evidence	Use of practice-relevant evidence is essential. Practice-relevant evidence is more likely to be accepted by practitioners and more likely to be implemented.
Transfer of training	Transfer of training is a challenge. Interventions that focus on the underlying principles of learning and transfer of training may be more effective than those that focus on specific content.
Measurement	Measurement is a challenge. Interventions that use multiple measures of outcomes may be more effective than those that use a single measure.
How to conduct	How to conduct an intervention is a challenge. Interventions that are tailored to the needs of the target audience may be more effective than those that are not.
Measurement of impact	Measurement of impact is a challenge. Interventions that use multiple measures of outcomes may be more effective than those that use a single measure.
Cost-effectiveness	Cost-effectiveness is a challenge. Interventions that are cost-effective may be more likely to be implemented.

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



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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.



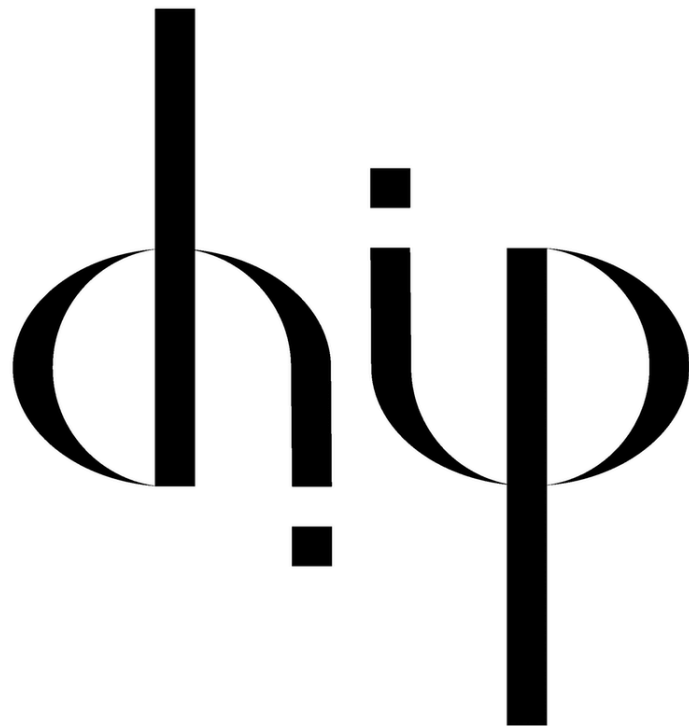
Earlier this year, [the Office of the National Coordinator for Health Information Technology \(ONC\)](#) announced its vision for [Connecting and Accelerating a Fast Healthcare Interoperability Resources \(FHIR\) App Ecosystem](#), with a total of \$625,000 in funding support. This strategy expressed 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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