

# The Next EHR Paradigm: An App Store Model

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UNIVERSITY *of* WASHINGTON

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# Our Goals

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- > Give an overview of EHRs: past and present
- > Examine where the industry is heading
- > Engage you guys in this transformation

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## **Electronic Health Records: A Brief History**

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## **The Current EHR Landscape**

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## **New Potential Direction: The EHR App Store**

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### **1<sup>st</sup> Requirement: Usable Standards**

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### **2<sup>nd</sup> Requirement: Adoption and Realization**

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Barriers and Open Questions

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Case Study: Utah IAPPS  
Initiative

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# **Thank You!**

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# Electronic Health Records: A Brief History

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# The First Decades

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## > 1960s

- First EHRs appeared (Utah, Mayo Clinic, VA, Regenstrief)

## > 1970s

- VistA

## > 1980s

- Managed care (HMOs)
- HL7 established

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# Evolution

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## > 1990s

- IOM CPR Report
- HIPAA
- IOM *To Err Is Human* Report

## > 2000s

- ONC for HIT established & legislated
- HITECH, providing \$30bn for HIT

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# Reaching Maturity

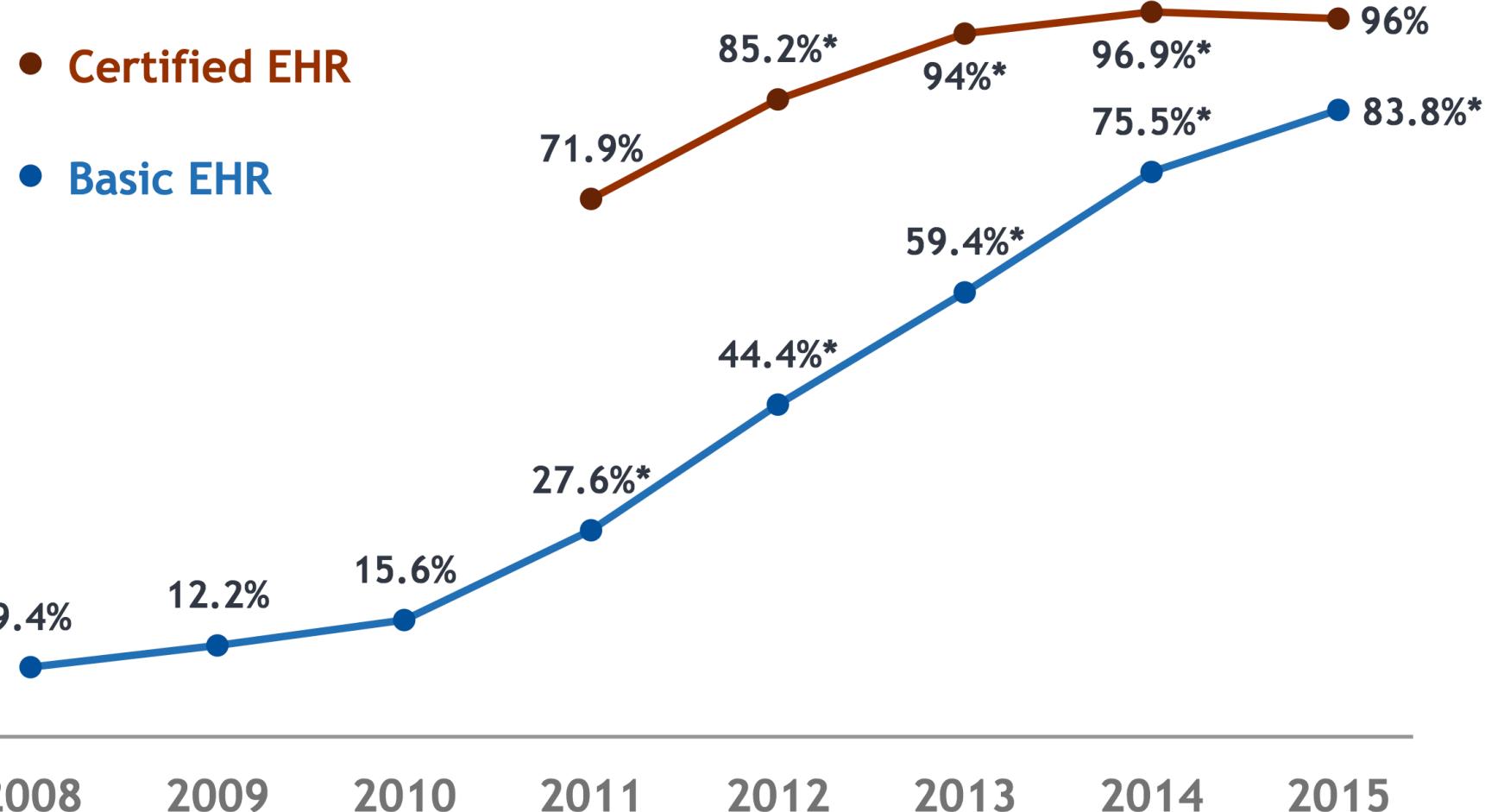
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## > 2010s

- Meaningful Use
- Value-Based Payments
- Interoperability
- 21<sup>st</sup> Century Cares Act:

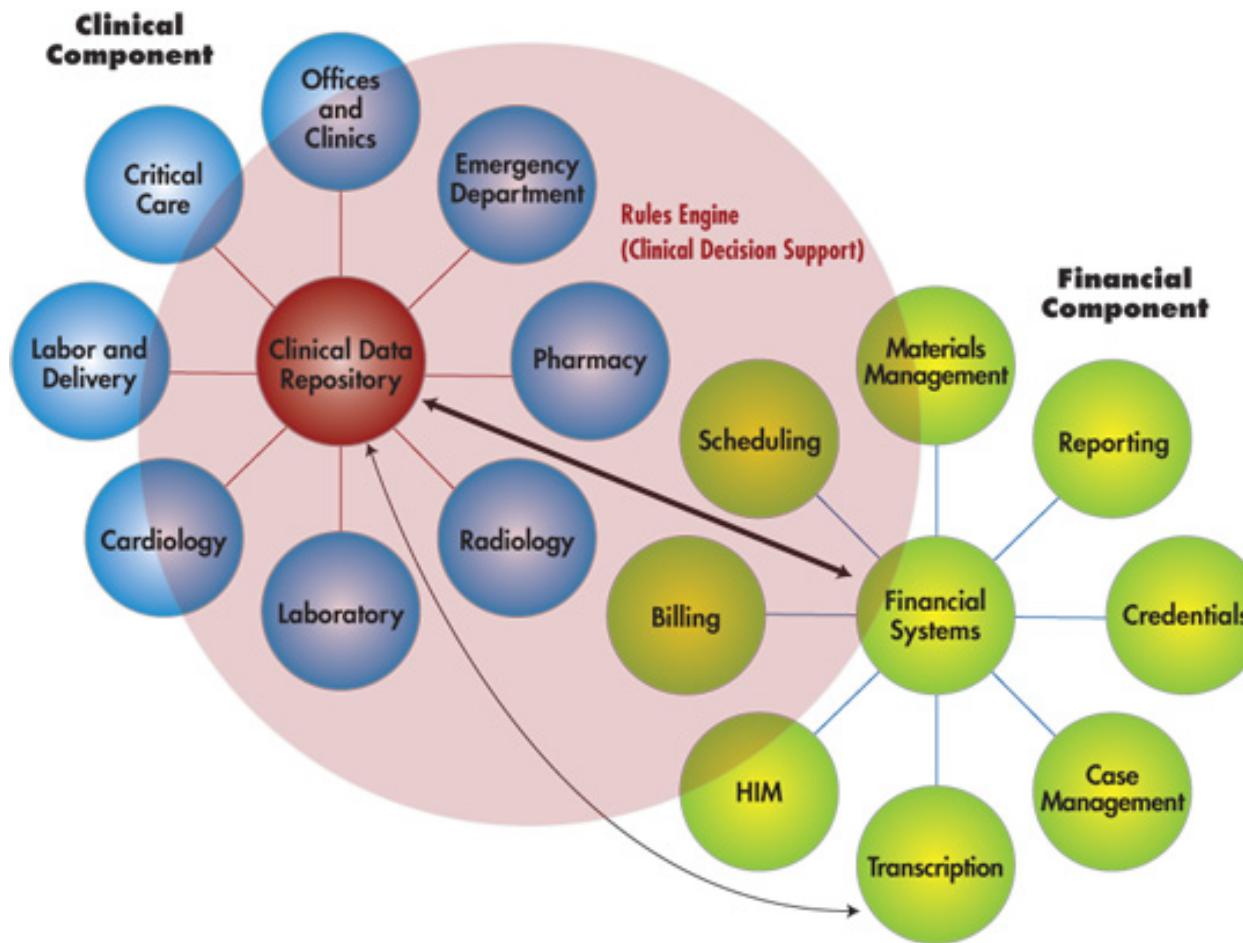
*“[A]llows health information from [certified] technology to be accessed, exchanged, and used without special effort through the use of application programming interfaces or successor technology or standards”*





# The Current EHR Landscape

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# Best-of-Breed Strategy

## Benefits

Avoids mass engineering

Can customize from multiple vendors

Aligns more with clinical departments

## Limitations

Requires wide range of technical skills to manage

Compliance risks with meaningful use

Costly interfaces for data exchange

# Single-Vendor Strategy

## Benefits

Helps meet federal regulations

Manages capital and costs more effectively

Easily builds IT competency in system

Simplifies maintenance and system updates

## Limitations

Potentially radical organizational change

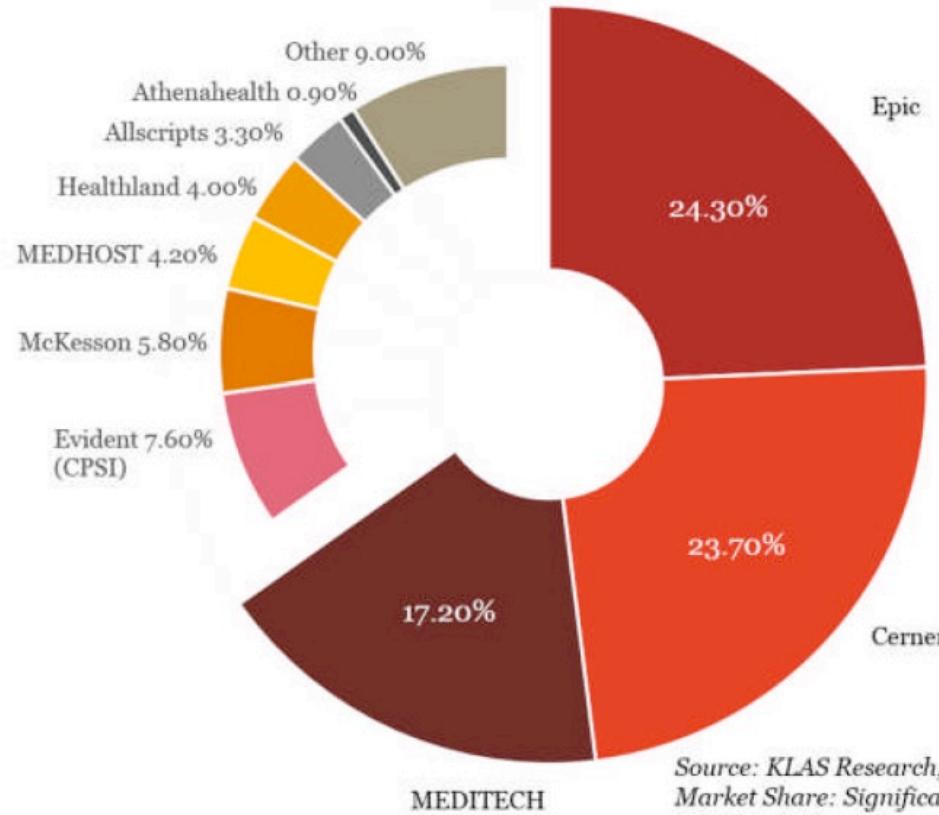
Difficulty with vendor-provided workflows

Increases significance of system failure

Curtails ability to change vendors

## 2015 Acute Hospital Market Share

n=5,250 acute care hospital



Source: KLAS Research, "2016 Hospital EMR Market Share: Significant EMR Decisions Energize U.S. Market"

# Where We Are Today

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- > User are Dissatisfied
- > Costs Are High
- > Barriers to Interoperability Still Exists
- > Patient and Provider-Centered Innovation is Limited

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# New Potential Direction: The EHR App Store

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Search



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Apps

Categories

Home

Top Charts

New Releases



My apps

Shop

Games

Family

Editors' Choice



Account

Redeem

Buy gift card

My wishlist

My Play activity

Parent Guide

## Top Free in Android Apps

1. AliExpress Shopper  
Alibaba Mobile

★★★★★

FREE

2. South Park: Phone Destroyer  
Ubisoft Entertainment

★★★★★

FREE

3. Wish - Shopping  
Wish Inc.

★★★★★

FREE

4. Words With Friends 2  
Zynga

★★★★★

FREE

5. Toon Blast  
Peak Games

★★★★★

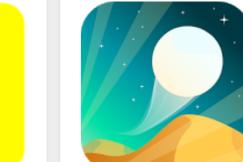
FREE

6. Messenger – Text & Video Chat  
Facebook

★★★★★

7. Snapchat  
Snap Inc

★★★★★

8. Dune!  
VOODOO

★★★★★

9. Netflix  
Netflix, Inc.

★★★★★

10. Instagram  
Instagram

★★★★★

11. Bitmoji – Your Personal Emojis  
Bitstrips

★★★★★

12. Facebook  
Facebook

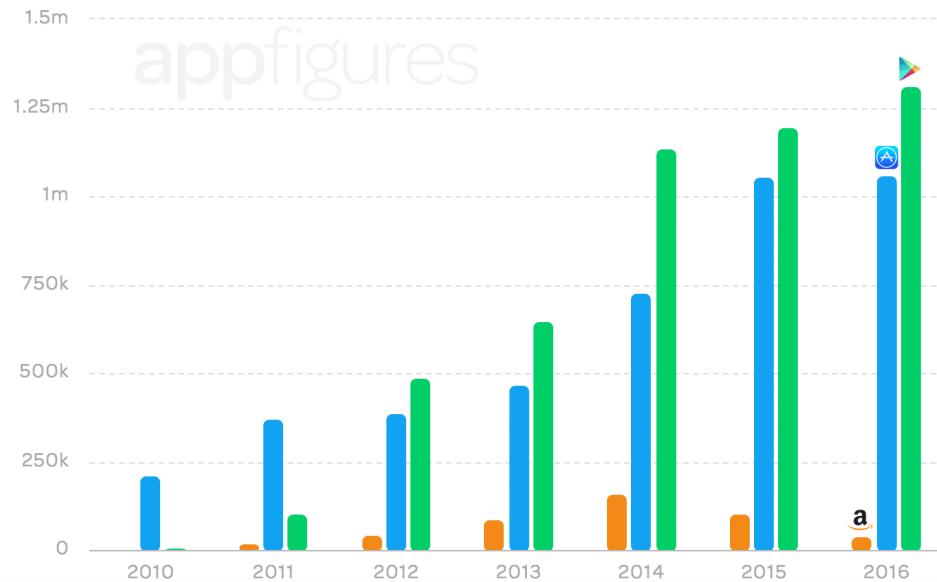
★★★★★



# Apple App Store + Google Play Store



Number Of New Apps Released By Year  
iOS App Store, Google Play, and Amazon Appstore



# 1<sup>st</sup> Requirement: Usable Standards

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# **HL7**

## **Health Level Seven**

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> Data exchange standards

> 1990

- HL7v2

> 1995

- HL7v3 (RIM)

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# FHIR

## Fast Healthcare Interoperability Resources (FHIR)

- > First release in 2013
  - Actively being developed
- > Developer Focused
  - Web Native
  - Great tooling
- > Addresses previous shortcomings
  - Common scenarios
  - Profiles + Extensions
  - Free

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# FHIR

## Fast Healthcare Interoperability Resources (FHIR)

### > FHIR Resources

- Patient
- Observation
- Medication
- Practitioner
- Procedure
- 120+ total

### > Domains

- Clinical
- Financial
- Specialized (e.g. ResearchStudy)

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# FHIR Demo



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# SMART on FHIR: Substitutable Medical Apps, Reusable Technologies

## SMART on FHIR® – Open Platform Architecture



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# SMART on FHIR Demo

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# We are mPOWEr

*a mobile post-operative wound evaluator a patient-centered app for tracking surgical wounds at home*

TRY THE DEMO

HOW IT WORKS

# For the Providers

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Hyperspace - UWMC PAIN CLINIC - Production

Epic Schedule In Basket Review Patient Lists Staff Up To Date

Smith, John

MRN: U6999999 Language: Sign Langua... Allergies: Pcn [Penicilli... eCare: Inactive  
None Need Interp: Yes HM Due?: Due (user deactivated)  
Patient Type: ALERT Verify Ide... Advance Direct: not rec... Behavioral Health Regi... Weight: 155 lb (70.3 kg)  
PCP: Zztrain, Epiccare Physician, PCP TYPE: External BMI: 24.28 kg/m<sup>2</sup>

T/P/R: 98.6 °F (37 °C), 65, 16  
BP: 126/74

SnapShot

mPOWEr

Chart Review

MINDscape

Synopsis

Results Revie...

Review Flows...

History

Demographics

Up To Date

FYI

# mPOWEr

(Graphic wound photos) John Smith

MRN: 9999999 | Male | DOB: 11/23/1974, 42

Recent Procedure

Trauma wound washout Surgeon: Evans  
Procedure date: 07/13/2017 | POD: 15 days  
Discharge date: 07/13/2017 | Post D/C: 15 days

Photo & Session Count

Photos uploaded by staff: 0  
Photos uploaded by patient: 5  
Symptom reports by patient: 5

Patient Drains

This patient isn't tracking any drains.

Add New Photo(s)

Expand All Sessions

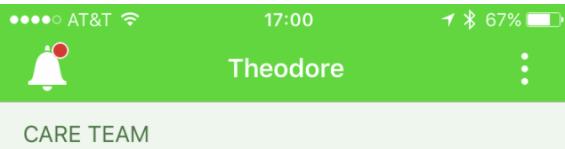
Taken: 7/31/2017 8:10pm POD: 18 | Uploaded: 7/26/2017 by patient



# For the Patients



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Family  
Medicine Ph...

## ACTIVITIES

FHIRWorks



Messages



Health  
Reminders



Questionnaires



mPOWER



Appointments



Health  
Summary



Test Results



Medications



Billing

MyChart 17:00 67% LTE 23:45 70%

mpower-dev.cirg.washington.edu

### Important!

If you have concerns about your wound, contact the clinic.

Clinic staff do not get notified automatically when you track your wound in mPOWER.

If you contact the clinic, let them know you have been using mPOWER to record symptoms and wound photos.

[Continue to mPOWER >](#)

- Tracking history** See your progress over time
- Information** Wound care, discharge info, FAQs
- Contact care team** Communicate with your care team

AT&T 11:14 87% LTE

mPOWER (NO...)

mPOWER - Development version - not for clinical use.

# mPOWER

You're tracking your recovery from procedure on 03/15/2017.

What would you like to do today?

- Track your wound** Please track your wound today >
- Take a picture** Upload a photo of your wound >
- Tracking history** See your progress over time >
- Information** Wound care, discharge info, FAQs >
- Contact care team** Communicate with your care team >
- Settings** Update your information >

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AT&T 11:18 84%

mPOWER - Care (NO...  
mPOWER - Development version - not for clinical use.

# mPOWER

**Your mPOWER Tracking History**

You haven't tracked your wound yet.  
[Collapse All Sessions](#)

**Tracking sessions for surgery on 03/15/2017**

03/16/2017 1 days since surgery | No photos  
No photos were uploaded during this session.

**Your Symptoms Over Time**

Symptom
Drainage
Drainage Fluid
Drainage Color
Dressing
Pain
Redness
Warmth

< >

Menu

AT&T 11:19 84%

mPOWER - Surveys #15...  
mPOWER - Development version - not for clinical use.

# mPOWER

**Add Wound Photos**

Adding photos for Tb-d4ihkex9k53OQ3sqp4QbwBLVUUSclS9mQZHKEC MyChart User

Take a Photo

< Previous Next >

< >

Menu

AT&T 11:15 86%

mPOWER - Surveys #15...  
mPOWER - Development version - not for clinical use.

# mPOWER

**Add Wound Photos**

Adding photos for Tb-d4ihkex9k53OQ3sqp4QbwBLVUUSclS9mQZHKEC MyChart User

Take a Photo

< Previous Next >

Take Photo

Photo Library

More

**Cancel**

29



mPOWEr - Surveys #15...

Adding photos for Tb-  
d4ihkex9k530Q3sqp4QbwBLVUUScIS9mQZHKECa  
MyChart User



Uploading...

 [Add Another Photo](#) [Previous](#) [Next](#)

HyperSpace - EMC FAMILY MEDICINE - FHIRWorks dev week - UWMED E.

Epic FHIRWorks March 2017 | FHIRWorks Screenshots - G MyChart - Home +

mc-fhirworks.epic.com/mychartfhirworks/inside.asp? Theodore UWMed Log Out

MyChart  
Epic Medical Center

Health Visits Messaging Billing Resources Settings

Welcome!

What's in My Record?

- Plan of Care
- Test Results
- Health Summary
- Current Health Issues
- Medications
- Allergies
- Preventive Care
- Medical History
- Immunizations
- Advance Directives
- Administrative Info
- Demographics

Medical Tools

- Lucy
- Download My Record
- Who's Accessed My Record?
- Authorize Sharing
- Health Trends
- Questionnaires
- Research Studies
- Wallet Card
- mPOWER
- Hello MyChart

Quick Links

- View test results
- Ask a question
- Schedule an appointment
- Refill medications
- Review health summary
- View billing summary

To Do

Overdue health reminders

- Eye exam for diabetic complications *Overdue*
- Urine Protein Check *Overdue*
- Pneumococcal vaccination *Overdue*

REQUEST APPT

< March 2017 >

S	M	T	W	T	F	S
1	2	3	4			
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Care Team

Family Medicine Physician  
Primary Care Provider  
Family Medicine

What's New in MyChart

Talk face-to-face

Video visits are now available for dermatology appointments. [Schedule a video visit](#)

Share your record

You can share your medical record with organizations across the world. [Learn more](#)

https://mc-fhirworks.epic.com/mychartfhirworks/inside.asp?mode=stdredirect&option=mPOWER

- %APP%TITLEURL% - url or json object containing style

Cancel Back Next Accept

2:11 PM 2:16 PM

7172 Results Nurse Triage Chart Completion PtAdvice Request Pt Questionnaires Referral Rqst Staff Message

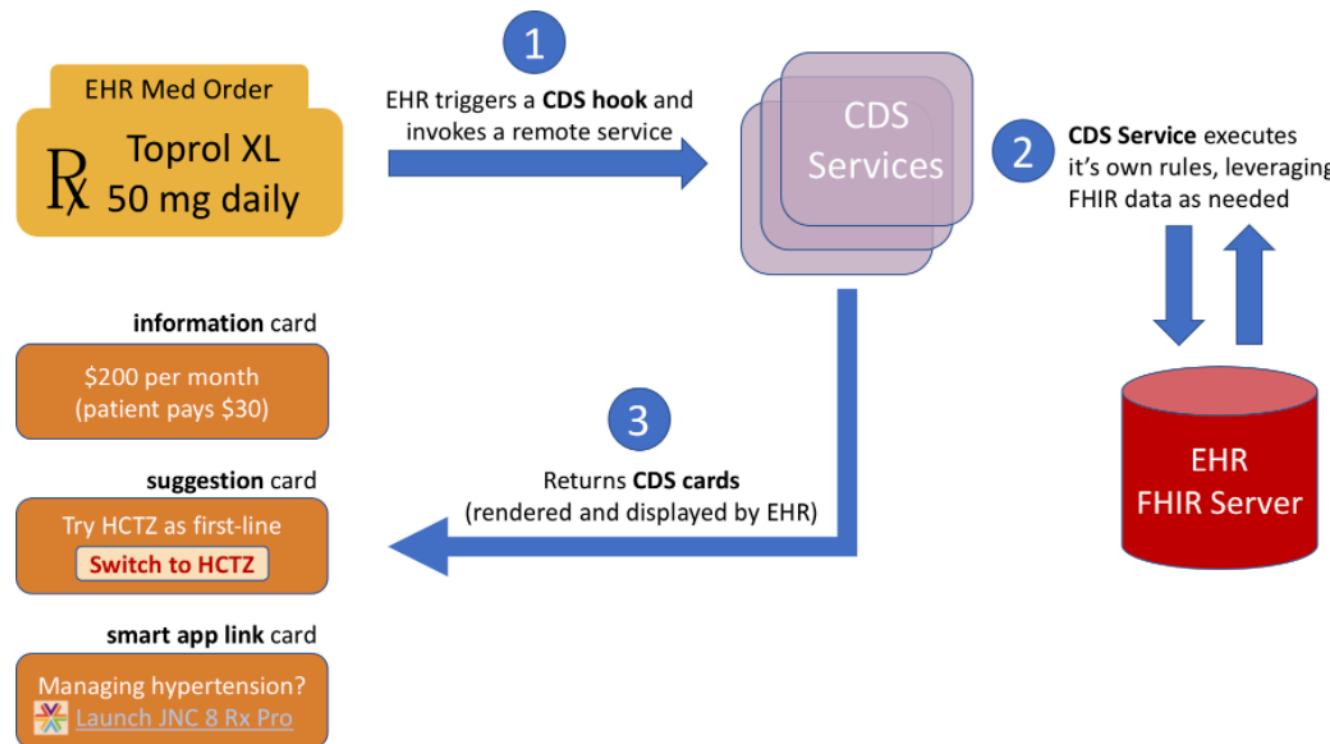
HyperSpace - EMC FA... Snipping Tool

MyChart - Home and... IC-Default

UWMED E.

# CDS Hooks:

## “A Vendor-Agnostic Decision Support Spec”



# CDS Hooks Demo

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# 2<sup>nd</sup> Requirement: Adoption and Realization

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# EHR FHIR Support

Reflects a real-time view of each sandbox's published conformance metadata (does not guarantee actual conformance)

edit columns

Epic

Cerner

Allscripts Professional

## Support:

FHIR Version notes	1.0.2	1.0.2	1.0.2
JSON Format	✓	✓	✓
XML Format	✓	✗	✓
SMART notes	✓	✓	✓

## Resources:

AllergyIntolerance params			
Appointment params			
Binary			
CarePlan params			
Condition params			
Contract params			
Device params			
DiagnosticOrder params			
DiagnosticReport params			
DocumentReference params			
Encounter params			
FamilyMemberHistory params			

# Argonaut

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- > Accenture
- > Athenahealth
- > Beth Israel Deaconess Medical Center
- > Cerner
- > Epic
- > Intermountain Health
- > Mayo Clinic
- > McKesson
- > MEDITECH
- > Partners Healthcare System
- > SMART at Boston Children's Hospital Informatics Program
- > Surescripts
- > The Advisory Board Company
- > Etc.

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# Barriers and Open Questions

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# Open Questions

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- > What is the best monetization model?
- > How do we address fragmentation of app stores?
- > Who is responsible for quality control of apps?
- > How do we catalog and disseminate useful applications?

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# Case Study: Utah IAPPS Initiative

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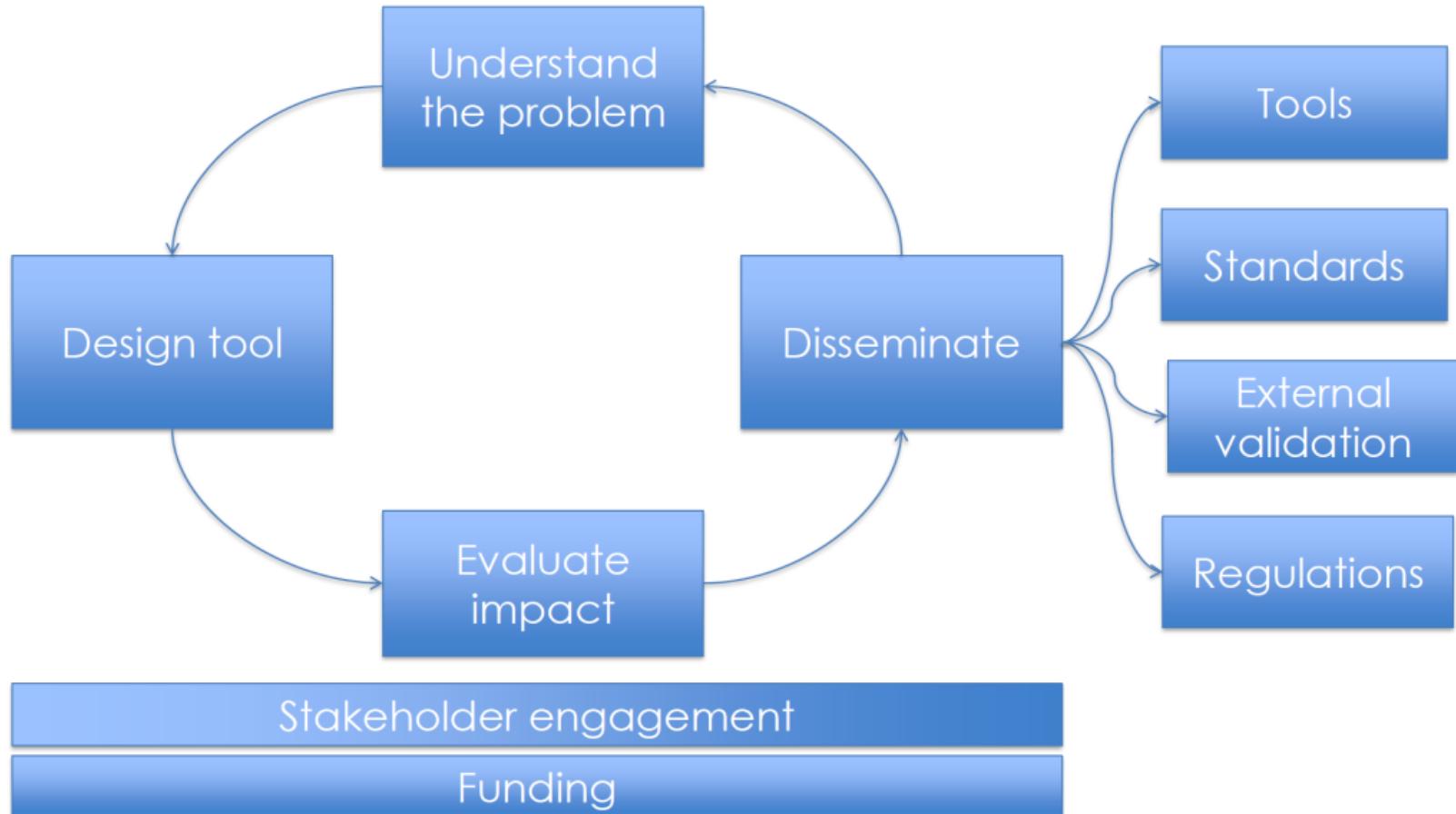
# University of Utah - IAPPS Initiative

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- > Interoperable APPs and Services
- > **Goal:** “Improve patient care and provider experience through innovative, interoperable extensions...”
- > **Institutional Support** for collaboration between “research, operations, and clinical services”



Adapted from: Kawamoto K, Del Fiol G, Brooke B, Weir CR. SMART on FHIR Apps from the University of Utah Interoperable Apps and Services (IAPPS) Initiative: Extending the EHR to Optimize Patient Care [Internet]. AMIA 2017 Annual Symposium; 2017 Nov 6; Washington Hilton, 1919 Connecticut Ave NW, Washington, DC 20009. Available: <https://amia2017.zerista.com/event/member/389202>



Adapted from: Kawamoto K, Del Fiol G, Brooke B, Weir CR. SMART on FHIR Apps from the University of Utah Interoperable Apps and Services (IAPPS) Initiative: Extending the EHR to Optimize Patient Care [Internet]. AMIA 2017 Annual Symposium; 2017 Nov 6; Washington Hilton, 1919 Connecticut Ave NW, Washington, DC 20009. Available: <https://amia2017.zerista.com/event/member/389202>

# Thank You!

For Dessert, We Put Together Some Useful  
Links:

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[psb.re/fhir](https://psb.re/fhir)