

The Promise and Possibilities of SMART on FHIR & CDS Hooks

Rick Freeman

CEO



September 24, 2018



INTEROPION

Empowering Healthcare Delivery Through Interoperable, EHR-Integrated Solutions

We put the right data, analytics, decision support, and workflow tools at your fingertips with interoperable applications built with **SMART on FHIR** and **CDS Hooks**.

Our Mission

Enable healthcare institutions, administrators, and providers to improve care and drive value by leveraging existing knowledge, data, and systems.



Implementations at Leading Healthcare Systems

We have proven implementations at premier healthcare systems — both customized solutions and ready-made applications — leveraging our leading expertise in EHR systems, new data standards and protocols, APIs, and programming languages.



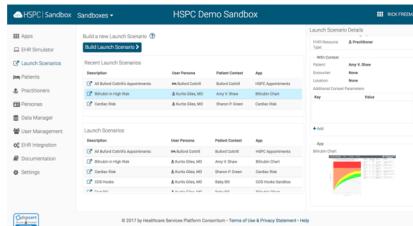
SMART on FHIR & CDS Hooks Portfolio



SMART Growth Chart



Bilirubin Risk Chart



HSPC Sandbox



BP Centiles

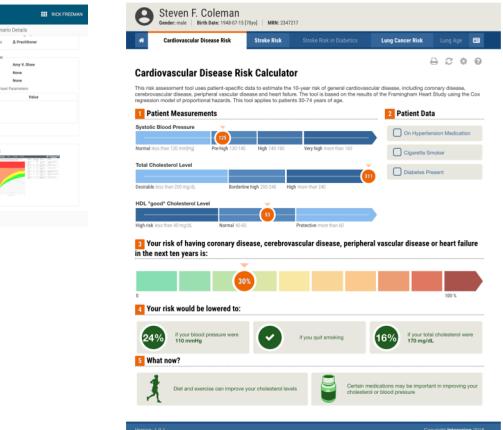
The INTEROPION Pediatric Dashboard provides a central hub for pediatric care, including links to the Pediatric Dashboard, Growth Chart, BP Centiles, Bilirubin Risk Chart, and Intake Forms, along with a Settings menu.



Pediatric Suite

The Duke PillBox interface allows users to manage medication lists and dosing schedules. It includes a medication list, a search bar for exercises, and a "LAUNCH PILLBOX" button.

Duke PillBox



Risk Calculators

This form is a patient consent document for a procedure or surgery. It includes sections for Print, Export, Language selection (English, Bulgarian, Chinese, German, Spanish, French, Portuguese, Russian), and Information about the procedure.

PATIENT CONSENT FOR PROCEDURE/SURGERY

PATIENT NAME: Aaron Alens
PROCEDURE/TEST NAME: Endovascular Aneurysm Repair
PROCEDURE NUMBER: 12345
PROCEDURE DATE: 07/18/18
PROCEDURE SIDE: Left Right Both Sides
NOTES:

My doctor has told me and I understand what procedures/surgery I am having done. I understand why I need it. I understand that there may be risks involved with the procedure/surgery, including the possibility of infection and complications from receiving blood or blood components, and that there is no guarantee of results. My doctor has explained to me the possible complications and the risks involved with the procedure/surgery. I can make instead of having this done (including choosing no treatment), and what can happen if I do not have the procedure/surgery. I understand that I may have to stay in the hospital if I have complications and that I may not expect, potentially resulting to permanent disability or death. My provider explained to me how he/have planned to perform the procedure/surgery and that I may have to stay in the hospital if complications occur. The procedure/surgery were explained to me:

- ▲ Bleeding ▲ Infection, with potential sepsis ▲ Failure of procedure ▲ Poor cosmetic result ▲ Nausea and/or vomiting ▲ Headache ▲ Limb swelling ▲ Permanent nerve damage, including spheno optic nerve injury ▲ Vascular injury, including embolism and/or thrombosis

If procedure/surgery will be used during this procedure/surgery to control my pain, I understand that this method may not relieve all of my pain. I understand that I may experience side effects such as nausea and decreased blood pressure. The most common side effects are nausea and vomiting. In rare cases, there can be dangerous side effects such as heart attack, stroke, and death. There is a small chance of permanent disability or death. Lastly, I may have pain or memory loss after the procedure/surgery, despite the procedure being successful.

I understand that the procedure/surgery may have educational or scientific value. The hospital may photograph, videotape, or record my procedure/surgery for educational, research, quality, and other healthcare operations purposes, and I consent to this.

I understand that blood, tissue or other samples removed during the procedure/surgery may be later disposed of by the medical facility. These materials also may be used by the medical facility, its affiliates, or for research purposes, unless I object in writing.

I have had the chance to ask questions about the risks, benefits, and alternatives to this procedure/surgery. I am happy with the answers I received. With this knowledge, I freely consent to this procedure/surgery.

DATE: 07/18/18 TIME: 10:23 SIGNATURE: _____ The patient's signature is required

I attest that I discussed all relevant aspects of this procedure/surgery with the patient, including the indications, risks, benefits, and alternatives, as well as the patient's preferences and informed wishes.

DATE: 07/18/18 TIME: 10:23 SIGNATURE: _____

SMART Consent Forms

Interopion: The leader in SMART on FHIR & CDS Hooks

- CTO is one of the inventors of the SMART on FHIR and CDS Hooks technologies
- Integral in effort to introduce SMART to HIT community at HIMSS 2014
- Built the SMART on FHIR Reference Implementation
- Built first SMART on FHIR Apps, first to take SMART Apps to production
- Longstanding relationships with all major EHR vendors around SMART on FHIR technology

What is SMART on FHIR, CDS Hooks, and why it matters to you.

SMART on FHIR

Addresses 2 Big Problems



Clinical Data Locked in Proprietary EHRs

- No access to discrete data
- No common data structure



Clinical Knowledge Shared as PDFs or in Medical Journals

- Not executable
- Not workflow integrated

Bilirubin Risk Management: Pre-SMART on FHIR

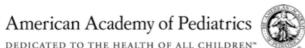
PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation
Pediatrics 2004;114:297
DOI: 10.1542/peds.114.1.297

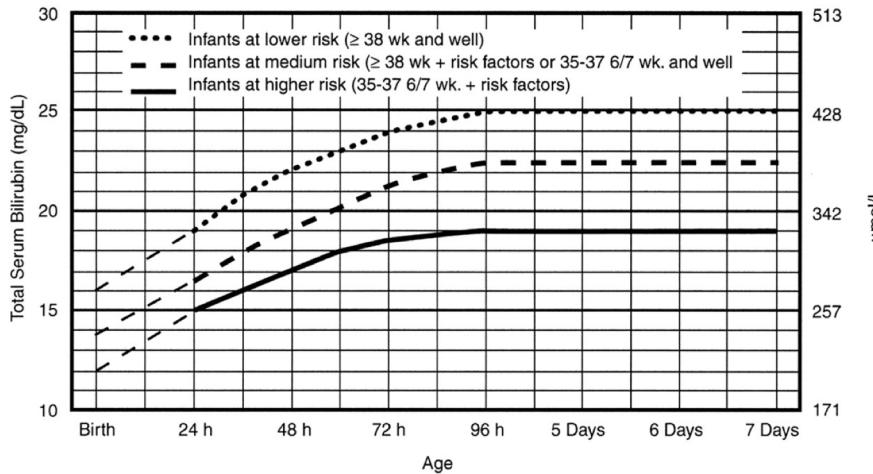
The online version of this article, along with updated information and services, is located on the World Wide Web at:
<http://pediatrics.aappublications.org/content/114/1/297.full.html>

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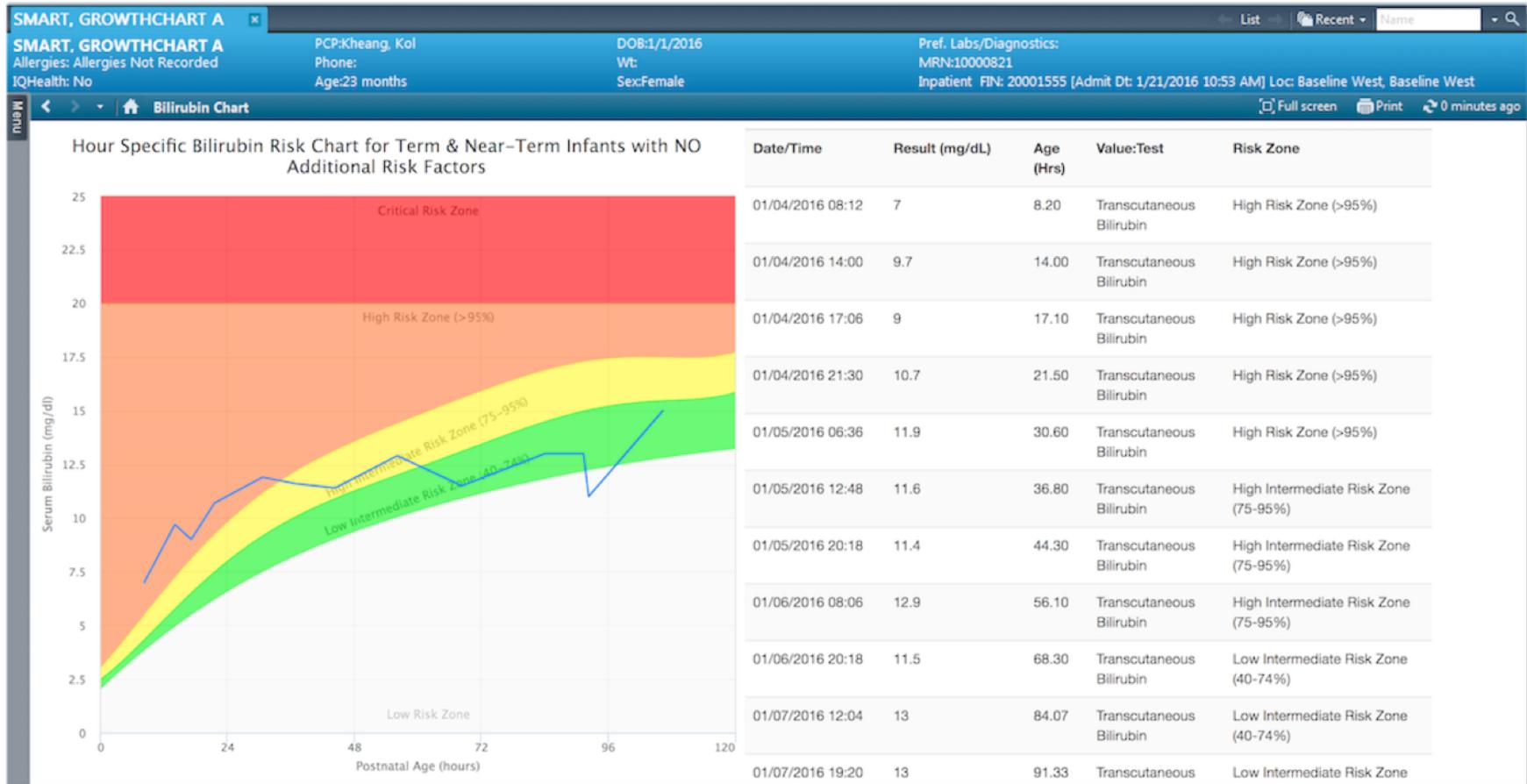
Downloaded from pediatrics.aappublications.org at LDS Hospital on February 6, 2014

Guidelines for exchange transfusion in infants 35 or more weeks' gestation. Note that these suggested levels represent a consensus of most of the committee but are based on limited evidence, and the levels shown are approximations.



- The dashed lines for the first 24 hours indicate uncertainty due to a wide range of clinical circumstances and a range of responses to phototherapy.
- Immediate exchange transfusion is recommended if infant shows signs of acute bilirubin encephalopathy (hypertonia, arching, retrocollis, opisthotonus, fever, high pitched cry) or if TSB is ≥ 25 mg/dL (85 $\mu\text{mol/L}$) above these lines.
- Risk factors - isoimmune hemolytic disease, G6PD deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis.
- Measure serum albumin and calculate B/A ratio (See legend)
- Use total bilirubin. Do not subtract direct reacting or conjugated bilirubin
- If infant is well and 35-37 6/7 wk (median risk) can individualize TSB levels for exchange based on actual gestational age.

SMART on FHIR: Bilirubin Risk Chart



Web-based Adherence Estimator

www.adherenceestimator.com

Adherence Estimator®

Home | About Us | Contact Us | Log In

Results

Patient name: [REDACTED]
Date taken: 2/6/2018
Patient's adherence score: 23
Likelihood for nonadherence: High

Likelihood for Nonadherence Key

8-36 High likelihood of nonadherence (less than 32% probability of adherence)
2-7 Medium likelihood of nonadherence (32%-75% probability of adherence)
0 Low likelihood of nonadherence (greater than 75% probability of adherence)

Results are based on patient responses to 3 statements about: **COMMITMENT** (belief that the medication is necessary), **CONCERN** (belief that the medication may do more harm than good), and **COST** (belief that the medication is not affordable). The response to each of these statements is assigned a score. Likelihood of nonadherence is based on the sum of these scores.

Likelihood of Nonadherence Across the 3 Domains

| COMMITMENT | MEDIUM | CONCERN | HIGH | COST | HIGH |
|---|--|---|------|--------------------------------------|------|
| Statement | Statement | Statement | | Statement | |
| I am convinced of the importance of my prescription medication. | I worry that my prescription medication will do more harm than good to me. | I feel financially burdened by my out-of-pocket expenses for my prescription medication. | | | |
| Patient's Response | Patient's Response | Patient's Response | | Patient's Response | |
| Disagree Somewhat | Agree Completely | Agree Completely | | Agree Completely | |
| Suggested Conversation | Suggested Conversation | Suggested Conversation | | Suggested Conversation | |
| Let your patient know that it's important to take steps to reach their A1C goals, which can help prevent or delay complications of diabetes later on. This may mean checking blood sugar often, eating healthier, exercising more, and taking diabetes medication as you've prescribed. | Remind your patient that taking medications as prescribed is an important way to manage any health condition. But when he or she has diabetes and other health conditions, such as high blood pressure or high cholesterol, taking medications may be even more important for staying healthy and preventing problems in the future. | Let your patient know that as time goes on, they may be paying too much for refills of diabetes medication if they do not ask you or his or her pharmacist about the most affordable choices. | | | |
| Information the Patient Received | Information the Patient Received | Information the Patient Received | | Information the Patient Received | |
| It's important to take steps to help reach your A1C goal, which can help prevent | Taking medicines as prescribed is an | Taking medicines as prescribed is an | | Taking medicines as prescribed is an | |

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SMART on FHIR: AE in Cerner

Smart, Hailey x

PCP:McCurdy, Michael
Allergies: calamine-diphenhydRAMINE topical, ciproflox... Phone:
IQHealth: No

DOB:12/2/2003
Wt:
Sex:Female

Pref. Labs/Diagnostics:
MRN:10002703
Inpatient FIN: 20003414 [Admit Dt: <No - Inpatient admit date>] Loc: 1N, Baseline East

Menu

Consent Forms
Medical Calculators
Blood Pressure Centiles v2
Adherence Estimator 
WF Dashboard
Histories
Medication List + Add
Clinical Notes + Add
Document Viewing + Add
Flowsheet
Diagnoses and Problems
Patient Information
SMART App Validator DSTU2

PCP:McCurdy, Michael
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Sex:Female

Pref. Labs/Diagnostics:
MRN:10002703
Inpatient FIN: 20003414 [Admit Dt: <No - Inpatient admit date>] Loc: 1N, Baseline East

Medication List

+ Add | Document Medication by Hx | Check Interactions | External Rx History | No Check | Full screen | Print | 2 minutes ago

View

Displayed: All Active Orders | All Active Medications

Show More Orders...

Reconciliation Status
Meds History Admission Discharge

| Order Name | Status | Details |
|---|------------|---|
| hydrochlorothiazide | Ordered | 25 mq = 1 tabs, Oral, Daily, first dose dttm: 09/28/17 9:08:00 PDT |
| lisinopril | Ordered | 5 mq = 1 tabs, Oral, Daily, first dose dttm: 09/28/17 9:08:00 PDT |
| cetirizine (Zyrtec) | Ordered | 10 mq = 1 tabs, Oral, Daily PRN for allergy symptoms, first dose dttm: 09/28/17 9:07:00 PDT |
| ezetimibe (Zetia) | Ordered | 10 mq = 1 tabs, Oral, Daily, first dose dttm: 09/28/17 9:07:00 PDT |
| codeine | Ordered | 30 mq, q6hr PRN for pain, first dose dttm: 09/28/17 9:06:00 PDT |
| paroxetine | Ordered | 20 mq = 1 tabs, Oral, Daily, first dose dttm: 09/28/17 9:05:00 PDT |
| simvastatin (simvasta...) | Prescribed | 10 mq = 1 tab(s), Oral, Once a day (at bedtime), # 90 tab(s), take daily |
| warfarin | Ordered | 1 mq = 1 tabs, Oral, Daily, first dose dttm: 09/14/17 9:00:00 PDT |
| atorvastatin (atorvastatin 80 mg or...) | Documented | 132 mg, Oral, PRN |
| furosemide (Lasix) | Documented | 80 mq, Oral, Daily, PRN, 80 mq, 1 tabs, Oral, Daily |
| furosemide (Lasix) | Documented | 80 mq, Oral, Daily, PRN, 80 mq, 1 tabs, Oral, Daily |

Orders For Signature

Diagnoses & Problems

Related Results

Dx Table Orders For Cosignature

SMART on FHIR: AE in Cerner

Smart, Hailey

Smart, Hailey

PCP: McCurdy, Michael

Allergies: calamine-diphenhydramine topical, ciprof... Phone:

IQHealth: No

DOB: 12/2/2003

Wt:

Sex: Female

Pref. Labs/Diagnostics:

MRN: 10002703

Inpatient FIN: 20003414 [Admit Dt: 6/22/2016 2:11 PM] Loc: 1N, Baseline East

Menu

Consent Forms

Medical Calculators

Blood Pressure Centiles v2

Adherence Estimator

Patient Information

Histories

Medication List + Add

Clinical Notes + Add

Document Viewing + Add

Flowsheet

Diagnoses and Problems

SMART App Validator DSTU2

Adherence Estimator

100%

HAILEY SMART  EXIT 

Adherence Estimator® Results

Patient Name: Hailey Smart Date Taken: Dec 07, 2017

Condition: Diabetes, Type 2 Medication: Aspirin 650 MG / butalbital 50 MG Oral Tablet

Patient's Adherence Score: 9 Likelihood for Nonadherence: ! HIGH

Likelihood of Nonadherence Across the 3 Domains

| COST | COMMITMENT | CONCERN |
|---|--|--|
| <p>Statement I feel financially burdened by my out-of-pocket expenses for my prescription medication</p> <p>Patient Response Agree completely</p> | <p>Statement I am convinced of the importance of my prescription medication</p> <p>Patient Response Agree somewhat</p> | <p>Statement I worry that my prescription medication will do more harm than good to me</p> <p>Patient Response Disagree completely</p> |

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Study: Predicting CVD in HIV Patients

CE: Satish ED: Sushma Op: nvs HJR: LWW_HJR_200632



Lippincott
Williams & Wilkins



Original Scientific Papers

Predicting the risk of cardiovascular disease in HIV-infected patients: the Data collection on Adverse Effects of Anti-HIV Drugs Study

Nina Friis-Møller^a, Rodolphe Thiébaut^b, Peter Reiss^d, Rainer Weber^e, Antonella D'Arminio Monforte^f, Stephane De Wit^g, Wafaai El-Sadr^h, Eric Fontas^c, Signe Worm^a, Ole Kirk^a, Andrew Phillipsⁱ, Caroline A. Sabin^j, Jens D. Lundgren^a and Matthew G. Law^j; for the DAD study group

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Received 7 September 2009 Accepted 9 November 2009

Almo HIV-infected patients receiving combination antiretroviral therapy may experience metabolic complications, potentially increasing their risk of cardiovascular diseases (CVDs). Furthermore, exposure to some antiretroviral drugs seem to be independently associated with increased CVD risk. We aimed to develop cardiovascular risk-assessment models tailored to HIV-infected patients.

Methods and results Prospective multinational cohort study. The data set included 22 625 HIV-infected patients from 20 countries in Europe and Australia who were free of CVD at entry into the Data collection on Adverse Effects of Anti-HIV Drugs Study. Using cross-validation methods, separate models were developed to predict the risk of myocardial infarction, coronary heart disease, and a composite CVD endpoint. Model performance was compared with the Framingham score. The models included age, sex, systolic blood pressure, smoking status, family history of CVD, diabetes, total cholesterol, HDL cholesterol and indinavir, lopinavir/r and abacavir exposure. The models performed well with area under the receiver operator curve statistics of 0.783 (range 0.642–0.820) for myocardial infarction, 0.776 (0.670–0.818) for coronary heart disease and 0.789 (0.695–0.824) for CVD. The models estimated more accurately the outcomes in the subgroups than the Framingham score.

Conclusion Risk equations developed from a population of HIV-infected patients, incorporating routinely collected cardiovascular risk parameters and exposure to individual antiretroviral therapy drugs, might be more useful in estimating CVD risk in HIV-infected persons than conventional risk prediction models. *Eur J Cardiovasc Prev Rehabil* 00:000–000

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European Journal of Cardiovascular Prevention and Rehabilitation 2010, 00:000–000

Keywords: antiretroviral drugs, cardiovascular risk, HIV, prediction model

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Introduction

Evidence from the Data collection on Adverse Effects of Anti-HIV Drugs Study(DAD) and other studies has established that exposure to certain antiretroviral drugs

DOI: 10.1097/HJ.0b013e328336150

The risk of CVD, CHD or MI are estimated as:

$$1 - \exp^{(-H^*t)} ; \text{ where}$$

$$H = \exp^{\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6} \\ + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9 + \beta_{10} x_{10} + \beta_{11} x_{11} + \beta_{12} x_{12}$$

The values for beta and x for the three endpoints are summarised below:

| | CVD | CHD | MI | Covariate, x |
|--------------|---------|---------|---------|--|
| β_0 | -10.970 | -11.014 | -11.695 | |
| β_1 | 0.041 | 0 | 0.069 | Multiply by duration of indinavir in years |
| β_2 | 0.077 | 0.074 | 0.111 | Multiply by duration of lopinavir in years |
| β_3 | 0.489 | 0.547 | 0.715 | β value if receiving abacavir, 0 otherwise |
| β_4 | 0.530 | 0.563 | 0.660 | β value if male, 0 if female |
| β_5 | 0.348 | 0.342 | 0.291 | β value times age/5 |
| β_6 | 0.361 | 0.439 | 0 | β value if family CVD history, 0 otherwise |
| β_7 | 0.854 | 1.024 | 1.390 | β value if current smoker, 0 otherwise |
| β_8 | 0.238 | 0.481 | 0.697 | β value if ex-smoker, 0 otherwise |
| β_9 | 0.652 | 0.654 | 0.826 | β value if diabetes, 0 otherwise |
| β_{10} | 0.195 | 0.219 | 0.246 | multiply by cholesterol (mmol/l) |
| β_{11} | -0.402 | -0.518 | -0.415 | multiply by HDL (mmol/l) |
| β_{12} | 0.054 | 0.035 | 0.039 | multiply by systolic blood pressuer/10 |

CHD, coronary heart disease; CVD, coronary vascular disease; HDL, high-density lipoprotein; MI, myocardial infarction.

EHR Integrated CVD Risk Calculator

Steven F. Coleman
Gender: male | Birth Date: 1948-07-15 [69yo] | MRN: 2347217

Cardiac Risk for HIV patients

Cardiac Risk for HIV patients

This risk assessment tool uses patient-specific data to estimate the 10-year risk of cardiovascular disease (CVD), including coronary disease, cerebrovascular disease, peripheral vascular disease and heart failure, in patients with HIV. The tool is based on the results of the Data collection on Adverse Effects of Anti-HIV Drugs Study (DAD) using Poisson regression models. This tool applies to patients 30-74 years of age.

1 Patient Measurements

Systolic Blood Pressure
125
Normal less than 120 mm[Hg] Pre-high 120-140 High 140-160 Very high more than 160

Total Cholesterol Level
200
Desirable less than 200 mg/dL Borderline high 200-240 High more than 240

HDL "good" Cholesterol Level
53
High risk less than 40 mg/dL Normal 40-60 Protective more than 60

2 Patient Data

Diabetes Present
 Family History of CVD
Smoking history
Current Former Never
Ever received indinavir (yrs)
Currently Previously Never
Ever received lopinavir (yrs)
Currently Previously Never
 Currently receiving abacavir (yrs)

3 Your risk of having CVD in the next 10 years is:

15.2%
0 100 %

4 Your risk would be lowered to:

if your blood pressure were 110 mmHg
if you quit smoking
if your total cholesterol were 170 mg/dL

5 What now?

Diet and exercise can improve your cholesterol levels
Certain medications may be important in improving your cholesterol or blood pressure

Version: 1.0.4 Copyright Interopion 2018

SMART on FHIR Overview



- Standardizes how health related data is structured and how it's accessed
- Created to address the short-comings of HL7 v2 & v3
- Emerging support by most major HIT vendors/providers
- Standardizes workflow integration and data access security
- Inspired by the emergence of the Apple and Android App Ecosystem
- Emerging support by most major HIT vendors/providers

Standardized Data + EHR Workflow Integration

Brings App Store Ecosystem Model to HIT



Cerner | code Start Coding About App Gallery Submit an App FAQs

App gallery

Browse currently validated applications and connect with developers

 Explore Apps

Healthcare is better together.

The App Orchard is where developers can learn about Epic's APIs and list their apps for Epic community members to explore and access.

-  **Marketplace for apps**
Access a marketplace of apps for reporting, visualizations, content, and more.
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Get documentation for Epic's APIs, including examples and a testing sandbox.
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Find Apps by: Allscripts Products Category Description

Practice Management

Show all Apps

Sign up to learn more about what you can do with the App Orchard including available APIs and other services.

Learn More

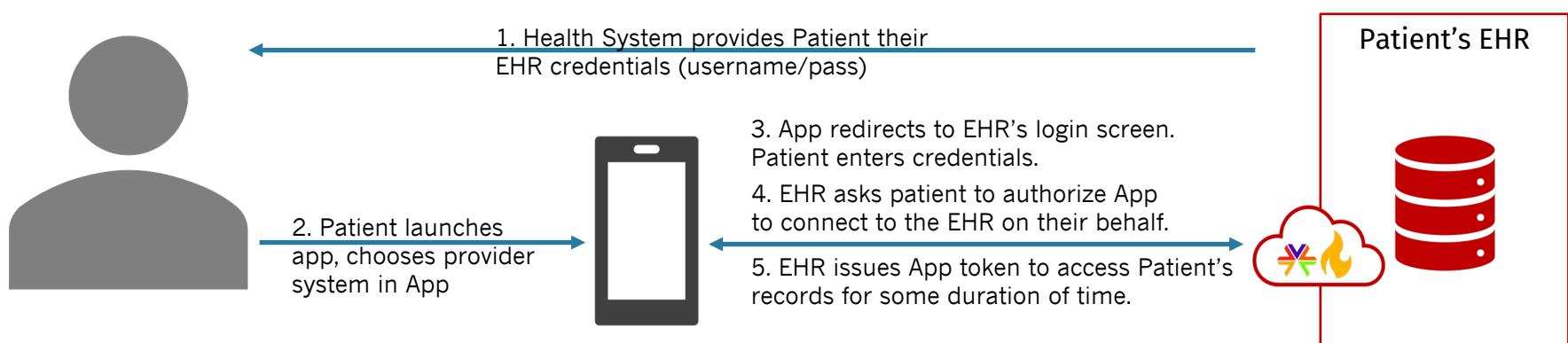
Looking for Apps?

Explore App Orchard's selection of apps.

Go to Explore Apps

Patient Facing SMART on FHIR Apps

Step 1: Patient authorizes App to access records on their behalf.

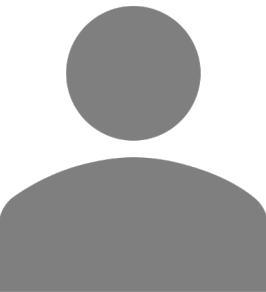


Step 2: App Accesses Patient's EHR Records Automatically

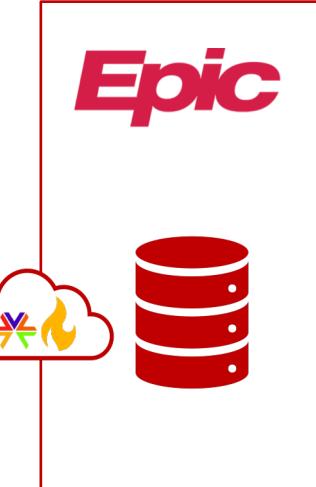
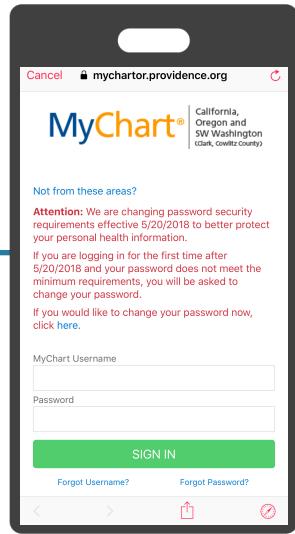
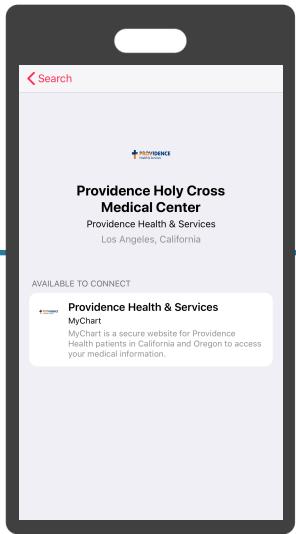
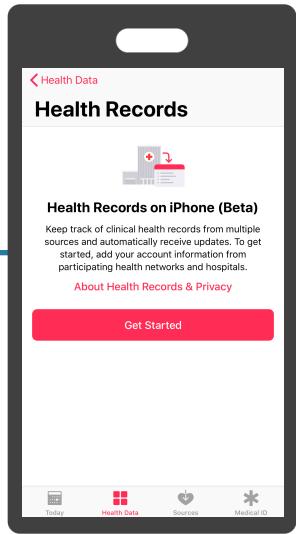


How Health Records gets FHIR Data

1. Health System provides Patient their EHR credentials (username/pass)



2. Patient opens Apple Health app



3. Patient chooses Health Provider

5. EHR issues App token to access Patient's records for some duration of time.

4. Redirects to EHR's login screen. Patient enters credentials.

SMART on FHIR Supports Many App Types



Why CDS Hooks

Standard to invoke decision support from within a clinician's EHR workflow.

Limitations of SMART on FHIR

1. EHR User Launch (passive)
 - User proactively launches app
2. Limited Workflow Integration
 - Not bi-directional (i.e. a SMART app cannot provide context back to the EHR)



CDS Hooks Enables

1. Event Driven Launch
 - Launches based on clinical and user events
2. Expands workflow integration
 - Enables bi-directional communication back to the EHR (e.g. recommend dosing, alternate drug, etc.)

CDS Hooks: What's a hook?

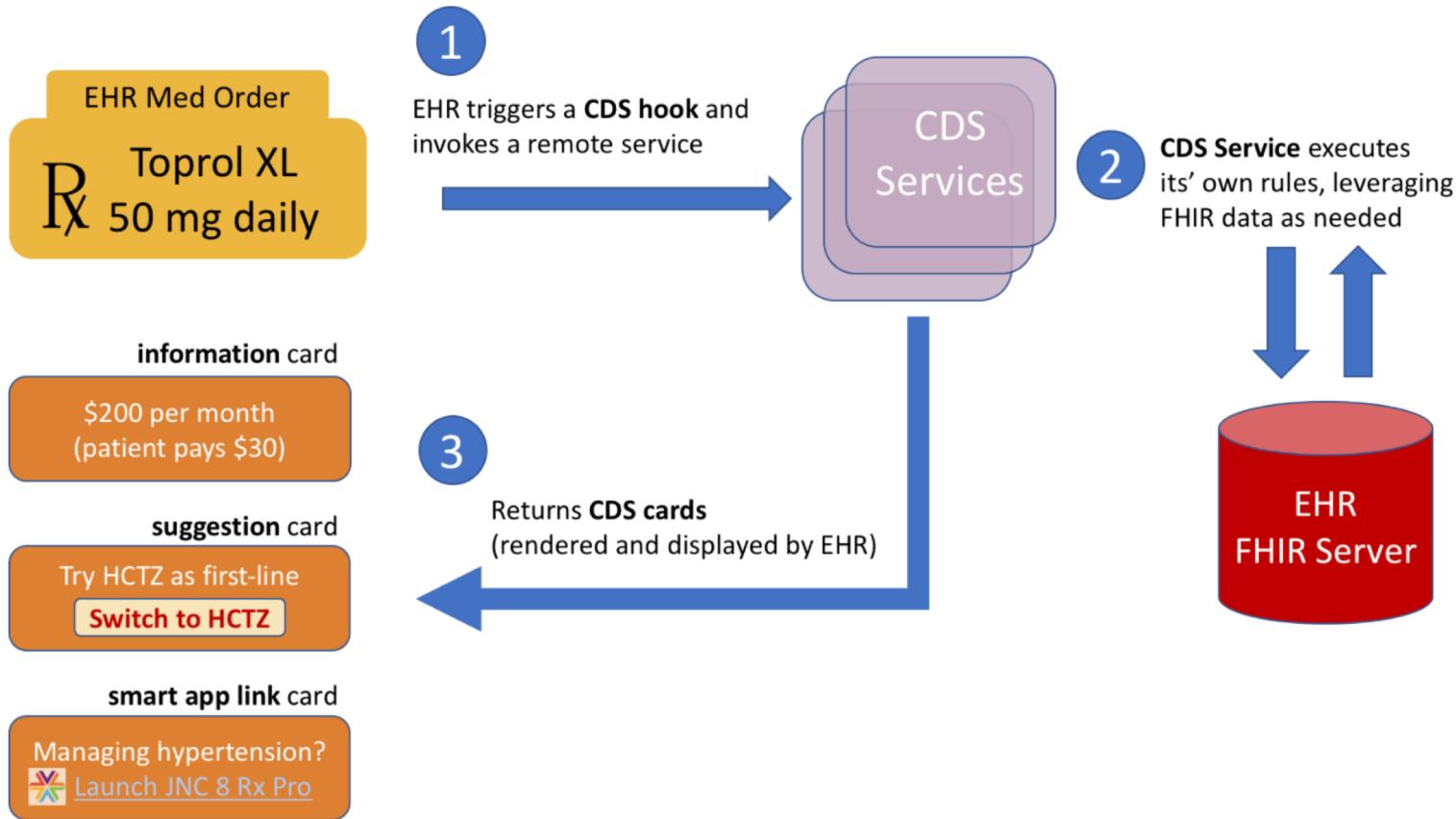
Currently

- Limited EHR User Interface based events
 - Patient View
 - Medication Prescribe
 - Order Review

Future

- Expanded EHR UI based events
- Data driven events such as lab results
- Clinical events such as ADT

CDS Hooks Overview



CDS Hooks Use Case: Bilirubin Risk Chart

SMART, GROWTHCHART A SMART, GROWTHCHART A PCP:Kheang, Kol Allergies: Allergies Not Recorded IQHealth: No DOB:1/1/2016 Phone: Age:23 months Wt: Sex:Female Pref. Labs/Diagnostics: MRN:10000821 Inpatient FIN: 20001555 [Admit Dt: 1/21/2016 10:53 AM] Loc: Baseline West, Baseline West

Bilirubin Chart

Hour Specific Bilirubin Risk Chart for Term & Near-Term Infants with NO Additional Risk Factors

Serum Bilirubin (mg/dl)

Postnatal Age (hours)

Date/Time

Re

Critical Risk Zone

High Risk Zone (>95%)

Low Intermediate Risk Zone (75-95%)

Low Risk Zone

Bilirubin Levels Exceed Threshold

Source: Intermountain Healthcare

Intermountain Healthcare

Bilirubin levels are exceeding risk levels. Intervention is necessary.

HSPC Bilirubin Risk Chart

Order Bilirubin Lab

Source: Intermountain Healthcare

Intermountain Healthcare

Bilirubin levels have not been measured. Order a bilirubin lab.

CDS Hooks Sandbox

Patient View Rx View Change Patient

Context Toggle

**Policy is a major factor in the adoption of
SMART on FHIR**

21st Century Cures Act

All EHRs need to make digital health data more accessible, the act states **open APIs** will be necessary for EHR system certification

APIs are sets of requirements that govern how one application can communicate and interact with another

An **open API** (often referred to as a public API) is a publicly available application programming interface that provides developers with programmatic access to a proprietary software application or web services

The Affordable Care Act: MU3

**Eligible Professional
Medicaid EHR Incentive Program
Stage 3 Objectives and Measures
Objective 5 of 8**
Updated: August 2017

Patient Electronic Access to Health Information

| Objective | Measures | Exclusions |
|-----------|---|------------|
| | <p>The EP provides patients (or patient-authorized representative) with timely electronic access to their health information and patient-specific education.</p> <p>EPs must satisfy both measures in order to meet this objective:</p> <ul style="list-style-type: none">Measure 1: For more than 80 percent of all unique patients seen by the EP:<ol style="list-style-type: none">1) The patient (or the patient-authorized representative) is provided timely access to view online, download, and transmit his or her health information; and2) The provider ensures the patient's health information is available for the patient (or patient-authorized representative) to access using any application of their choice that is configured to meet the technical specifications of the Application Programming Interface (API) in the provider's CEHRT.Measure 2: The EP must use clinically relevant information from CEHRT to identify patient-specific educational resources and provide electronic access to those materials to more than 35 percent of unique patients seen by the EP during the EHR reporting period. <p>Measure 1 and Measure 2: A provider may exclude the measures if one of the following applies:</p> <ul style="list-style-type: none">An EP may exclude from the measure if they have no office visits during the EHR reporting period.Any EP that conducts 50 percent or more of his or her patient encounters in a county that does not have 50 percent or more of its housing units with 4Mbps broadband availability according to the latest information available from the FCC on the first day of the EHR reporting period may exclude the measure. | |

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Definition of Terms

API or Application Programming Interface – A set of programming protocols established for multiple purposes. APIs may be enabled by a provider or provider organization to provide the patient with access to their health information through a third-party application with more flexibility than is often found in many current “patient portals.”

Provide Access – When a patient possesses all of the necessary information needed to view, download, or transmit their information. This could include providing patients with instructions on how to access

1

ACA Meaningful Use Stage 3 (MU3)

Objective 5 of MU3: Patient's health information is available for the patient to access using any application of their choice via an API.

MU3 Common Clinical Dataset

The patient's clinical data required to be made available as part of MU3 Object 5 is called the Common Clinical Dataset

- Patient Demographics
- Smoking Status
- Problems
- Medications
- Medication Allergies
- Labs
- Vitals
- Procedures
- Immunizations
- Care Team
- Implanted Devices IDs
- Goals
- Health Concerns
- Assessments & Plan of treatment

World's Leading EHRs choose SMART on FHIR for MU3



Apple chooses SMART on FHIR

Starting in iOS 11.3, iPhone users can connect to their healthcare provider and download their health records to Apple [Health Records](#).

MU3 goes into effect January 1, 2019

SMART on FHIR Availability

| EHR Vendor | US Hospitals | Currently SoF Enabled | SoF Enabled by 1/1/2019 |
|------------|--------------|-----------------------|-------------------------|
| Epic | 997 | 501 | 947 |
| Cerner | 994 | 656 | 944 |

Epic

- All health systems using Epic have the FHIR/SMART functionality available to them
- Over 50% of the EPIC hospitals have turned on the functionality
- Expecting close to 100% to have turned on the functionality by 1/1/2019 (MU3 deadline)

Cerner

- FHIR/SMART API available to all US-based Cerner clients
- 66% of all Cerner clients have implemented the FHIR/SMART API
- Majority of Cerner hospitals are expected to implement the API by the mandatory MU3 attestation period starting 1/1/2019



Apple's Health Records Timeline

- iOS 11.3 - March 28, 2018
 - Apple releases beta version of **Health Records** in iOS 11.3
 - Limited to 12 Health Systems participating in beta
 - Using SMART on FHIR, user logs into their health system's EHR through the Health Records iOS app
 - User authorizes Apple to download their MU3 health data to Health Records
 - Data is not stored centrally, only encrypted locally to the iOS device
 - Apple does NOT allow third party apps access to the data
- iOS 11.4 – May 29, 2018
 - Apple supports additional health systems (over 500 hospitals in the US)
- iOS 12 – September 17, 2018
 - Apple will allow iOS users to authorize 3rd Party Apps to access their data in Health Records

Our Projections of CDS Hooks Availability

- Epic – Q3/Q4 2018
- Cerner – Q4 2018
- Allscripts
 - Touchworks Q4 2018
 - Professional Q4 2018
 - Sunrise TBD (possibly Q1 2019)

Let's imagine what's possible.

Insurers/Payers

- Prior Auth - process of getting permission before a procedure
- Formulary Management
- Medication and Care Pricing
- Patient Eligibility
- Medication reconciliation reporting
- Master member index
- Administrative workflow integration to advise (pre-admit, admit, discharge)
- Enable Payer's data accessible as a SMART on FHIR platform.
- Patients could access their data from their insurer similar to how they can from their Providers (e.g. using Apple Health Records)
- Enable third parties to integrate and access the Payer's data
- Quality Metrics
 - HEDIS measurements



Use Cases for Life Sciences & Pharmaceuticals

- Medication Adherence
- Patient Drug Indication
- Data and Workflow Integrated Clinical Trials
- Symptom/Adverse Event Tracking (Patient, Caregiver, and Clinician)
- EHR Integrated Educational Resources
- Context aware decision support
 - Dosing Calculators,
- Patient Engagement/Therapy Specific mobile resources
- Prior Authorization/Testing requirements



Population Health

- Regional/national tracking of guideline adherence to opioid protocols across entire nation
- Disease outbreak detection and tracking
- Enable researchers with realtime access to population level health data



Others Segments

SMART on FHIR will eventually integrate all segments of the continuum of care.

- Pharmacy
- Labs
- HIEs
- Etc.



What will you build?



(Interopion can help)