SMART

App Platform for Healthcare

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June 2017

chip

Boston Children's Hospital
Until every child is well™

KLAS Connected Apps Report

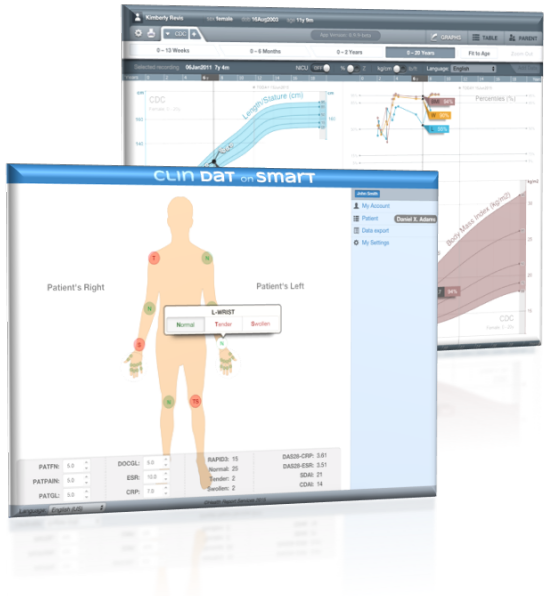
http://SmartHealthIT.org/apps-report

“… we had this wonderful population health tool, but we couldn’t get the [EHR] system to interface with it, so we had to enter information by hand. We just had to give up on that because we couldn’t physically keep up.”

- Physician, KLAS Interview

SMART Core Focus

Healthcare Apps



SMART:
UX Integration
Authorization
Single Sign-On
Clinical Data

Clinical Systems
(EHRs, Patient Portals, Data Warehouses)

Why SMART?

- Users:
  - App choice (substitutability)
- Developers:
  - Low barriers to entry (open standards, large community)
  - Single app can run in systems by different vendors
  - Single app can run in different contexts (e.g. EHR and Patient Portal)

Modern EHRs become a platform!

- User and Patient Management
- Workflow and core services
- Data persistence
- Regulatory compliance
- Apps

The SMART Platform

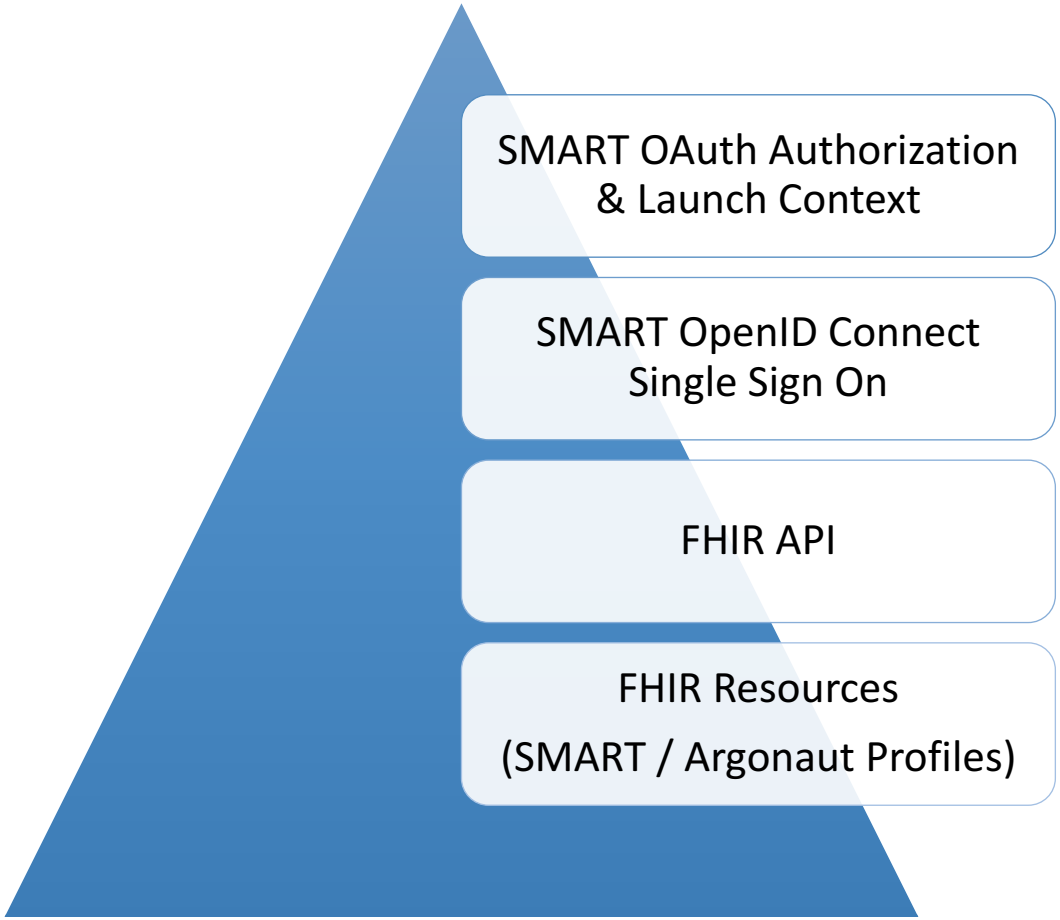
Standards based technology stack

Open source tools and resources

Industry support

Public app gallery

Standards based technology

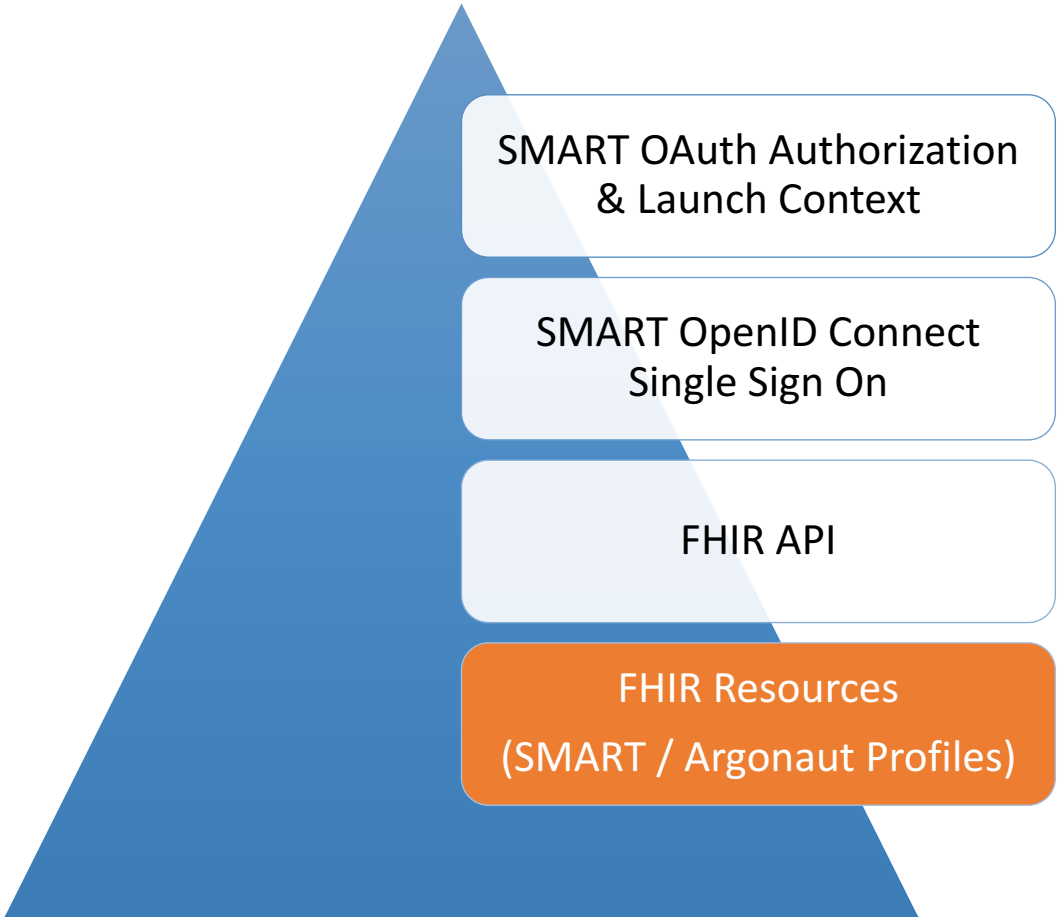


What is FHIR ?

New take on healthcare data standards focused on modern web standards and implementability

- Fast Healthcare Interoperability Resources
- Draft → Working Standard from HL7 (ready to use!)
- Licensed under Creative Commons - “No rights reserved”
- Clear and extensive documentation with examples
- Encourages the use of puns and poor clip art

Standards based technology



FHIR Resources

Data models representing discrete clinical and administrative units (patient, practitioner, allergy, medication order, etc.)

- Currently around 100 have been defined
- Each resource includes narrative text “lowest common denominator data exchange”
- Developer readable data format (JSON or XML)
- Can reference other resources by their URL (more on that later)
- Don’t include the kitchen sink

  “We only include data elements if we are confident that most normal implementations using that resource will make use of the element”

  – Grahame Grieve (FHIR Product Director)
- But, support extensions for faucets, etc.

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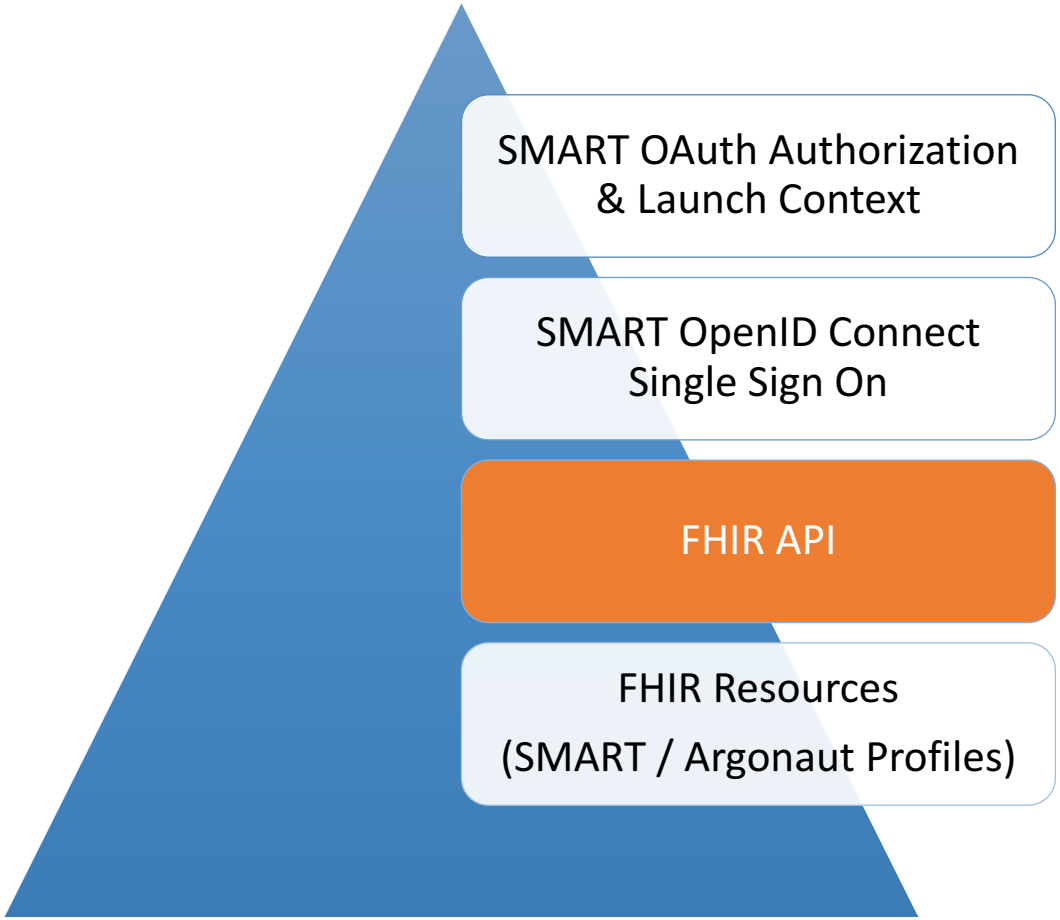
https://www.hl7.org/fhir/resourcelist.html

Patient Resource Example

```
{
  "resourceType": "Patient",
  "active": true,
  "name": [{
      "use": "official",
      "family": ["Coleman"],
      "given": ["Lisa","P."]
  }],
  "gender": "female",
  "birthDate": "1948-04-14"
  ...
}
```

Standards based technology



FHIR API

- Multiple reference implementations
- Based on Representational State Transfer (REST)
- Every FHIR Resource lives at a URL of the form:

http://fhir-open-api.smarthealthit.org/Patient/1032702

Server Resource Type Id

- Resources can have versions too (if the server supports it)!

http://server/Patient/123/_history/2

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https://www.hl7.org/fhir/http.html

FHIR Search API

- Each FHIR Resource defines a set of search parameters

Name	Type	Description	Paths
active	token	Whether the patient record is active	Patient.active
address	string	An address in any kind of address/part of the patient	Patient.address
address-city	string	A city specified in an address	Patient.address.city
address-	string	A country specified in an address	Patient.address.country

- These parameters can be passed in the URL to limit which Resources are returned by the server

http://fhir-open-api.smarthealthit.org/Patient?gender=male

- Resources are returned as a FHIR Bundle – an array of results with some metadata
  - The bundle may contain a subset of results with links to additional pages of resources (e.g. 1-50 of 300)

Other API Features

- Create, update and delete resources
  - Uses standard HTTP methods POST (create), PUT (update) and DELETE (logical delete)

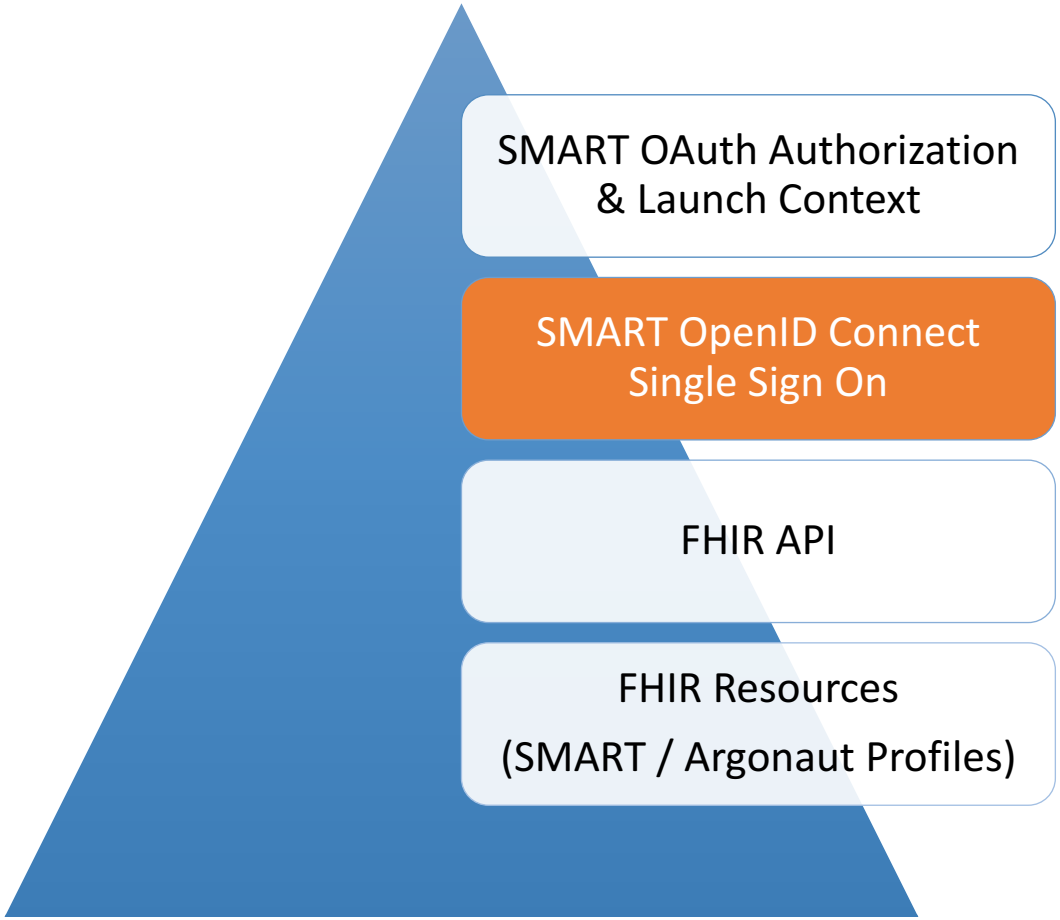
- JSON or XML

  http://fhir-open-api.smarthealthit.org/Patient/1032702?_format=xml

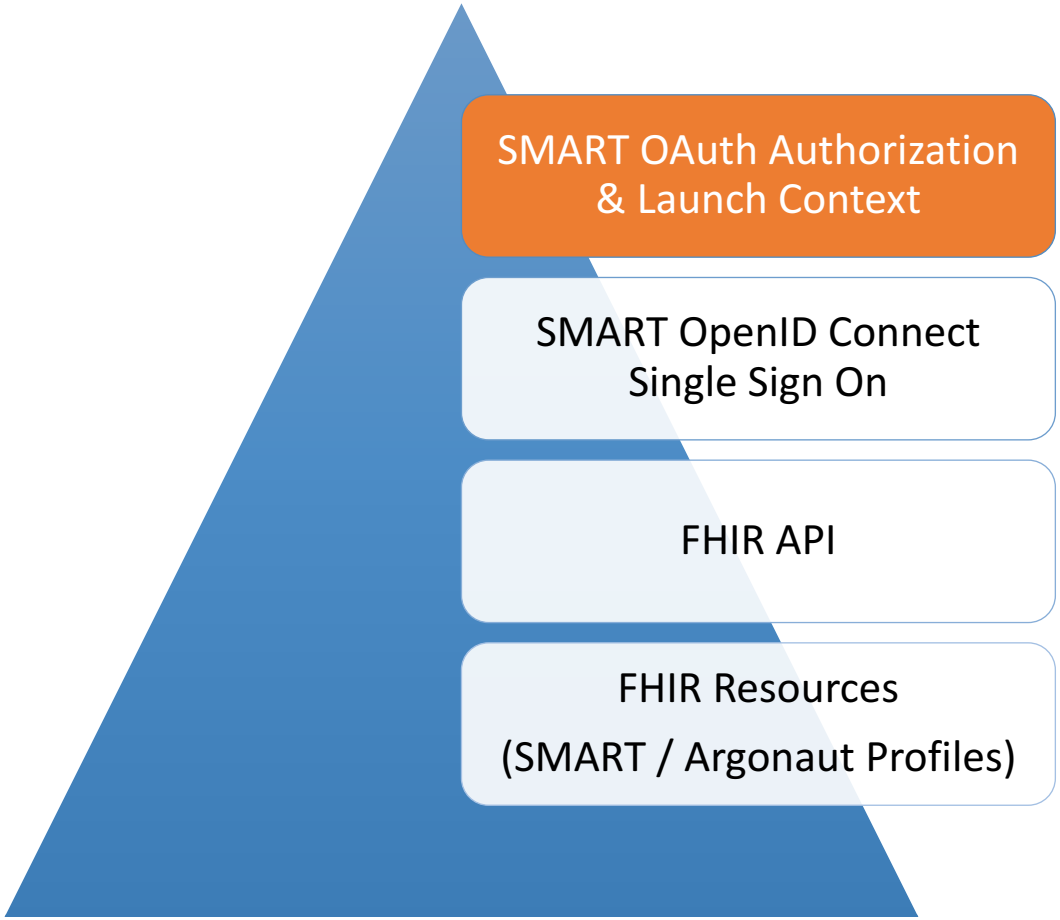
  http://fhir-open-api.smarthealthit.org/Patient/1032702?_format=json

- Conformance statements
- Terminology Bindings (required/extensible/preferred/example)
- Batch/Transaction
- Profiles

Standards based technology



Standards based technology



SMART Authorization

- Based on OAuth standard

- Two launch workflows
  - EHR/Portal Launch – user picks an app from within EHR (EHR can pass along context like encounter and patient)
  - Standalone Launch – user launches app and picks an EHR server (can run from mobile devices)

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http://docs.smarthealthit.org/authorization/

EHR Launch

App

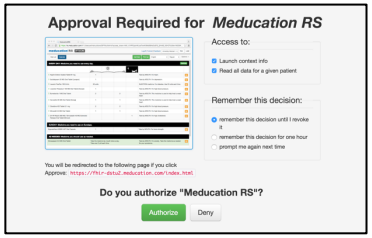
EHR

1. Choose App
(from registered apps)

1a. Launch information (server URL, token)

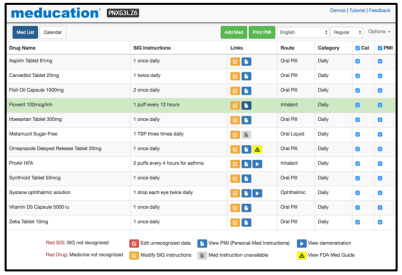
1b. Data access requested (scopes)

2. Authorize Access
(limited data)



2a. Auth token for data access / user identity /
context (current patient, encounter) /
extras (stylesheet, etc.)

3. Display Data



3a. FHIR API request (with auth token)

3b. FHIR resources

Standalone Launch

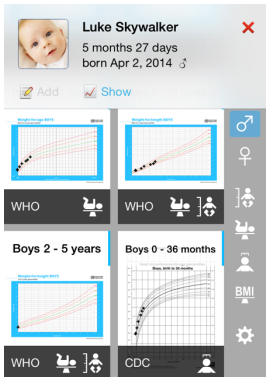
App

1. Choose EHR or Portal

1a. Data access requested (scopes)

2a. Auth token for data access / user identity / context (current patient, encounter) / extras (stylesheet, etc.)

3. Display Data

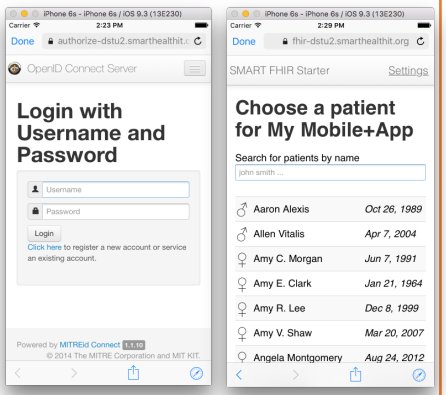


3a. FHIR API request (with auth token)

3b. FHIR resources

EHR

2. Log in, authorize access and choose a patient (if necessary)



SMART Authorization Scopes

- Scopes convey what access an app needs

- Examples:
  - Simple app: **patient/Patient.read, patient/Observation.read**
  - Complex app: **patient/*.read**
  - ePrescribing app: **patient/MedicationOrder.write**
  - Population heath app: **user/*.read**

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http://docs.smarthealthit.org/authorization/scopes-and-launch-context/

Open source development tools & resources

- Software Libraries
- Sandboxes for Development and Testing
- Sample Apps
- Tutorials & Tools

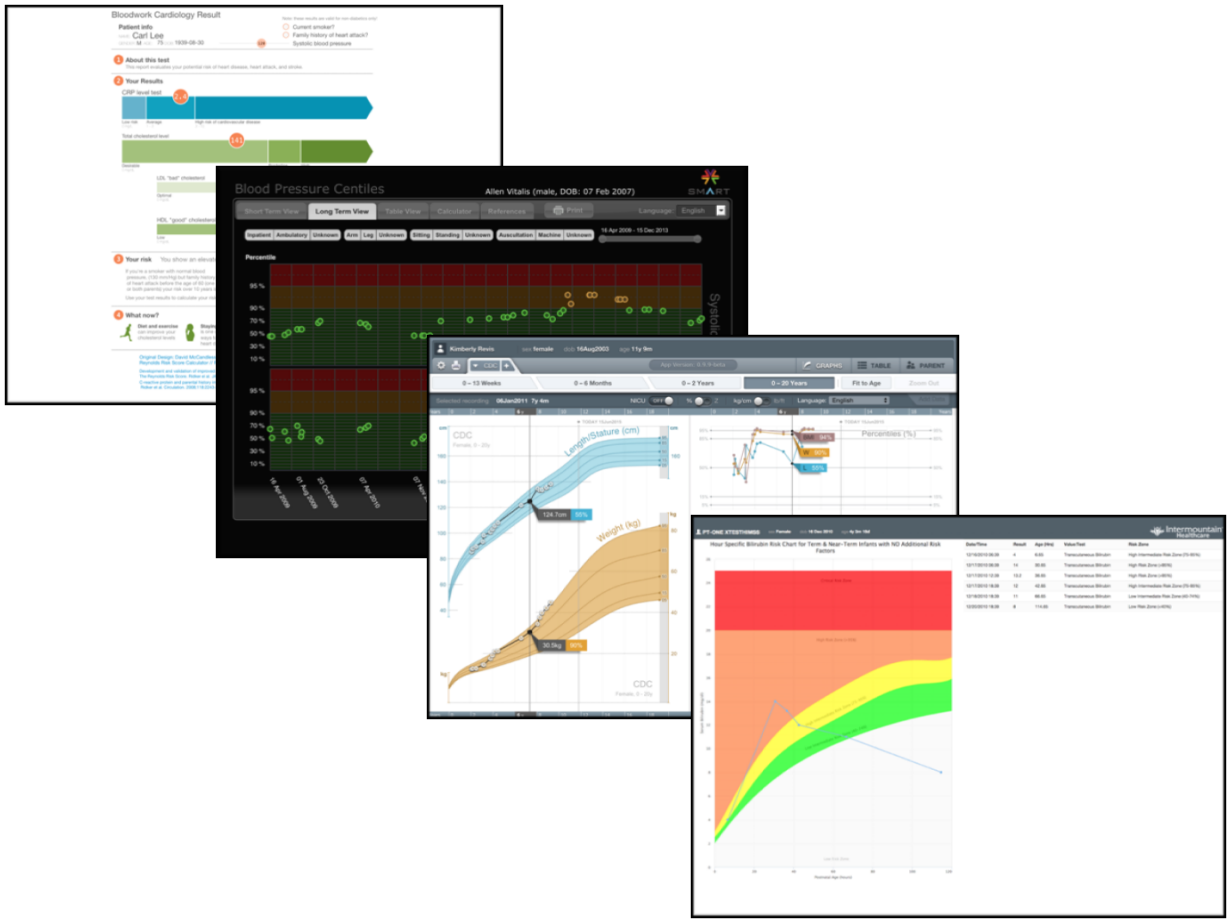
Software Libraries for Developers

Public Sandboxes for Testing

Sample Clinical Data

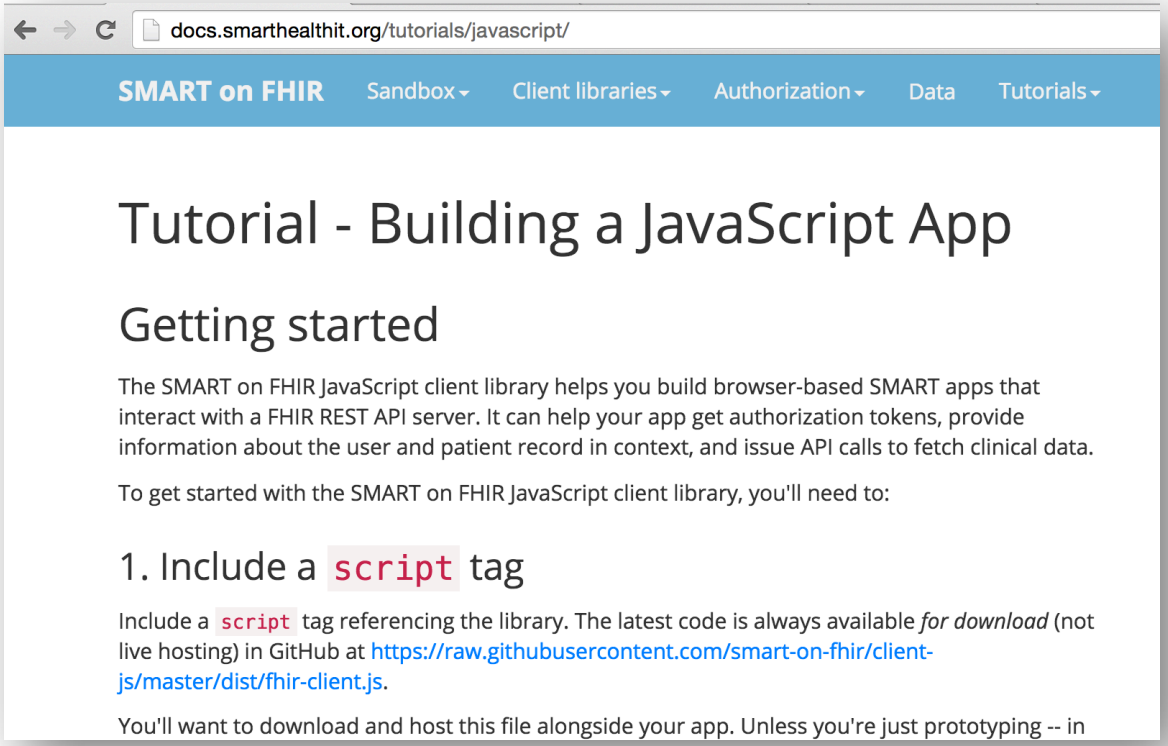
- Over 1,500 sample patients comprising 145,000 FHIR resources
- PRO data based on NHS pre and post surgery surveys
- De-identified longitudinal medical records

Open Source Sample Apps



Tools and Tutorials

http://docs.smarthealthit.org



Industry support

- EHR Vendors
- Government
- Healthcare Institutions
- Extension of SMART

Argonaut Project

Group of EHR vendors and hospitals driving support for SMART and FHIR in the United States

- Argonaut Implementation Guide
  - Security and Authorization (SMART)
  - Data element query of the ONC Common Clinical Data Set
  - Document query of static documents
  - US Provider Directory

- Next Steps
  - Implementation guide for scheduling clinical services
  - Implementation guide for CDS Hooks (including: launch an app from a CDS Hook response card)

NIH and ONC Launch the Sync for Science (S4S) Pilot: Enabling Individual Health Data Access and Donation

March 21, 2016, 11:46 am / Jon White, M.D. / Deputy National Coordinator, Office of the National Coordinator for Health IT,
Josephine Briggs, M.D. / Interim Director, Precision Medicine Initiative Cohort Program, and
Josh Mandel, M.D. / Research Scientist, Harvard Medical School Department of Biomedical Informatics

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S4S pilots are coming!

On February 25, 2016, the National Institutes of Health (NIH), in collaboration with the Office of the National Coordinator for Health IT (ONC), announced the launch of Sync for Science (S4S), a pilot to allow individuals to access their health data and send it to researchers in support of the goals of the Precision Medicine Initiative (PMI). Individual data donation will be a key component of the PMI Cohort Program, which aims to enroll more than one million U.S. participants who will volunteer to donate health data about themselves for precision medicine research. ONC, NIH, and the Harvard Medical School Department of Biomedical Informatics will coordinate the implementation of the S4S pilot in collaboration with EHR developers who have committed to participate: Allscripts, athenahealth, Cerner, drchrono, Epic, and McKesson.

S4S pilot developers will implement a consistent, standards-based workflow, building on open specifications including Health Level 7's Fast Healthcare Interoperability Resources (FHIR®) and OAuth. Once developed and implemented, this functionality will allow individuals to connect a research app to their electronic health data, facilitating individual data donation for research and leveraging patients' access

https://www.healthit.gov/buzz-blog/health-innovation/nih-and-onc-launch-the-sync-for-science-pilot/
https://www.youtube.com/watch?v=0FeQHlpIIXk&feature=youtu.be

Sync for Science http://syncfor.science

Goal: helping patients share EHR data with 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: Deploying to ~10 provider sites and testing with real patients 2017

Healthcare Institutions

"On October 9, 2015 I successfully logged into our production system for the first time to view *real patient data* in a FHIR app! I'd love to share screenshots with you, but they contain *real patient data*, so I can't! Let me say that again: *real patient data*, via FHIR, within Maestro Care, our Epic-based EHR."

Ricky Bloomfield Jr, MD

Director of Mobile Technology Strategy

http://www.rickybloomfield.com/2015/10/dukes-on-fhir-for-real-this-time.html

CDS Hooks http://cds-hooks.org

Make it easy to incorporate external advice into clinical workflows

- Approach: Use FHIR and SMART-defined API calls ("hooks”)
- Collaborators: athenahealth Allscripts, Cerner, and Epic participating in Connectathon tracks.
- Response types (“CDS Cards”):
  - Information (direct display to clinician)
  - Suggestion (proposed action to impact workflow)
  - App link (SMART app that’s relevant now)

CDS Hooks

CDS Hooks specification is a “work in progress”

- Argonaut project for 2017
  - EHR adoption / security model / app integration
- Alignment with HL7 CDS Working Group
- New hook definitions and use cases
- Performance assessment
- Asynchronous delivery

Public app gallery

- SMART App Gallery offer a single place to find and learn about SMART and FHIR apps
- Vendor and license neutral
  - Not restricted to a single EHR platform
  - Hosts commercial and open source apps
- Many ways to navigate apps
- Many ways to learn about apps

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

https://www.healthit.gov/buzz-blog/from-the-onc-desk/foundation-discovering-clinical-health-applications/

SMART App Gallery

https://**apps**.SmartHealthIT.org

Meducation and the SMART Platform

Background

- Trying to work with hospitals for years, but blocked by EHR integration challenges
- Difficult to find supportive web services and workflow integration points
- Security challenges (authorization, authentication)

What Changed:

- Major EMR vendors supporting FHIR and SMART apps

Result

- Integrations in progress across multiple hospital systems and clinics
- Integrations with Cerner, Epic, Athena

"Without the SMART platform and EHR vendors' adoption of SMART on FHIR, we would be years away from bringing the benefits of Meducation to patients. --- **Now we're there!"** Lori McLean, CEO Polyglot