



FHIR – The Future of Interoperability. Now

CDS Hooks: Integrating Decision Support at the Point of Care (Part 1)

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HL7 DCSIO



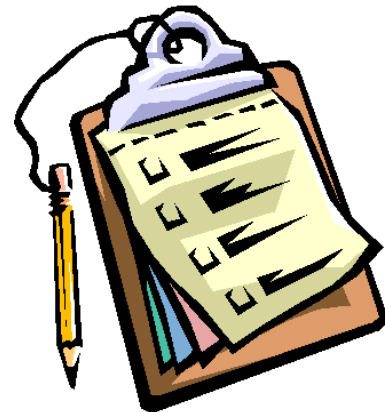
HL7[®]
International





Agenda – April 18 - 10:25 - 10:50 am

- Session Structure
- Part 1
 - The FHIR Toolbox: FHIR Core Spec & IGs + ...
 - Scenarios for the FHIR Toolbox
 - Individual Patient: CDS-hooks / Smart-on-FHIR
 - Intro to CDS Hooks
- Part 2
 - Discussion Zone: Example Scenarios
 - Recommended Tools / Reading
 - Questions/Answers



FHIR Tool Box

Domain/Country
Specific Content,
Behavior and
Terminology

example: US CORE

FHIR Core
Spec

Implementation
Guides

SMART-on-FHIR

Syntax
Structure
API Methods

CDS-HOOKS

Bulk FHIR

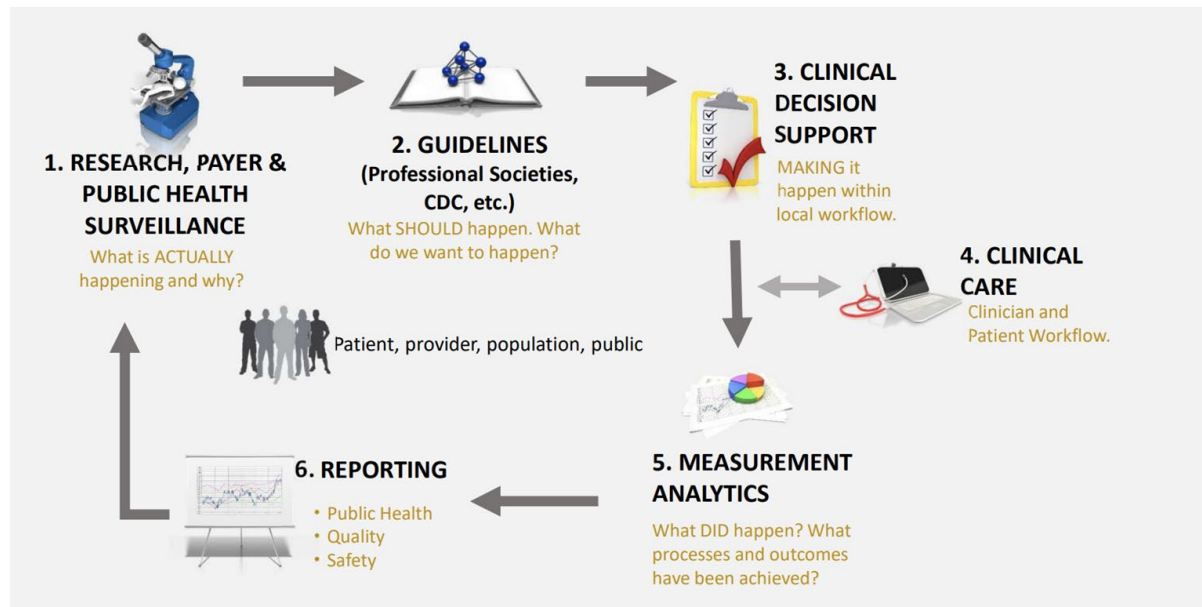
Today

April 20 8-8:45 am, here

The FHIR Toolbox

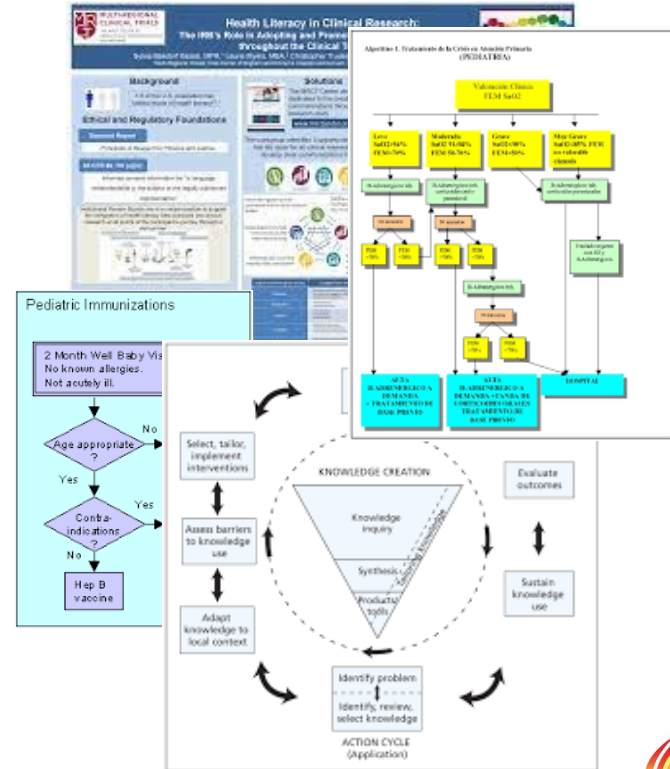
The stack of FHIR family tools from HL7 supporting a **learning health care system**

- HL7 FHIR Core Spec
- HL7 FHIR Base IGs
- HL7 FHIR IGs
- Smart-on-FHIR
- CDS-Hooks
- Bulk FHIR Data Access
- CQL



FHIR Tool Box: Knowledge

How can we apply medical knowledge in daily practice?
How can we overcome limitations of our EHRs and use/integrate other apps or services?
Which are the different scenarios?
Which FHIR tools apply?



Scenarios

When do we want to apply knowledge?

Individual Patient

(We are attending a patient, or the patient is using a patient portal)

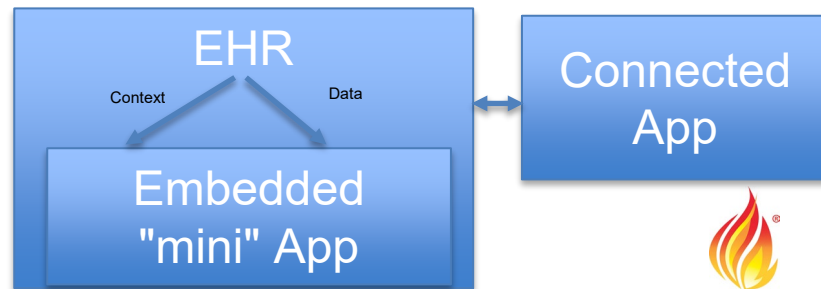
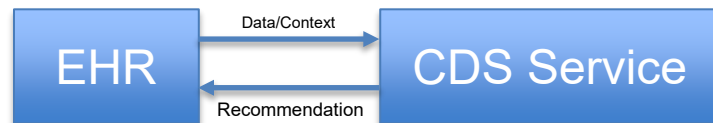
→ Independent Knowledge (CDS) Service

We want to provide any EHR with a service: given context and data, apply knowledge and recommend an action course

→ Embedded/Shared User Interface

We want to show information in a different way, integrated with the EHR/Patient Portal

CDS HOOKS™



Scenarios

When do we want to apply knowledge?

Population Health

We want to analyze data from a (big) set of patients

→ Data Extraction

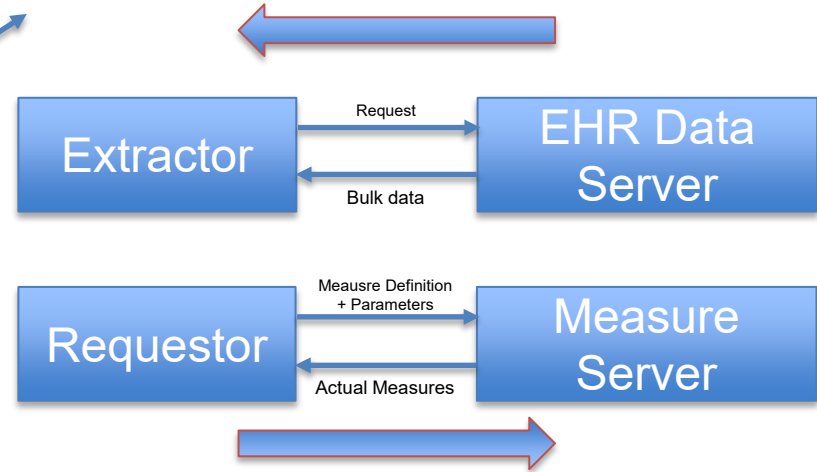
We want to extract data from the EHR for research, or apply discovery algorithms, or to calculate quality / clinical / epidemiological measures

→ Population Health Measures

We want to use a service to calculate measures on a given population -> (numerator / denominator)

FHIR BULK DATA

I ask for the data, and then process it



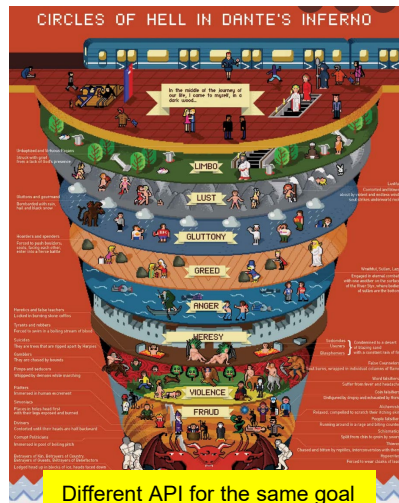
(I ask a FHIR Server to calculate)

CDS Services

What do we need?

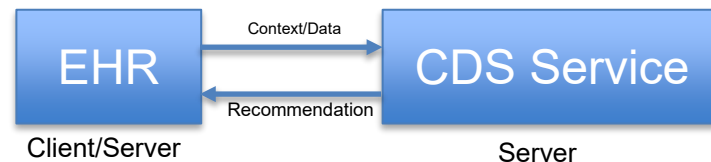
Problem?

- Different API for each CDS service
- A different API to access data for each EHR



Who is interested?

- EHR/LIS/RIS Vendors involving CDS
- CDS Providers



Service 1:"Easy call my API: <http://mycds.com/api>

Service 2:"Piece of cake: <http://miothercds.com>

Service 3:"1-2-3: Call my service with this
<http://mioothercds.com/api3method> and
it will return the recommendation

EHR 1:"Easy!: Call my server with <http://myehr.com/api1>

EHR 2:"Simple!: Call my server data

EHR 3:Easy: Call my service with this API :
<http://myehr/ProprietaryAPI/GetData?PatientId=200> and you
can get the patient information!



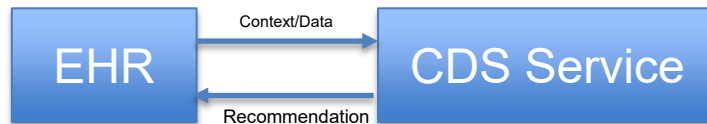
"REMOTE" CDS

Independent CDS Service

What do we need: **The same API!**

Remember that FHIR is leveraged to create...Standardized APIs!

- A way to **discover/register services**
- A framework for **authorization/authentication**
- A way to **describe the context** (What I am doing in my EHR that requires this service?)
- A way to **exchange clinical patient data** (medication, labs, vital signs, etc.)
- A way to **call the services**
- A way to **return the recommendations**



Note: it does not matter how the service implements 'knowledge'/'algorithms'
This API connects us to any service and allow us to leverage it



CDS HOOKS



HL7 Standard 1.0 (2019)

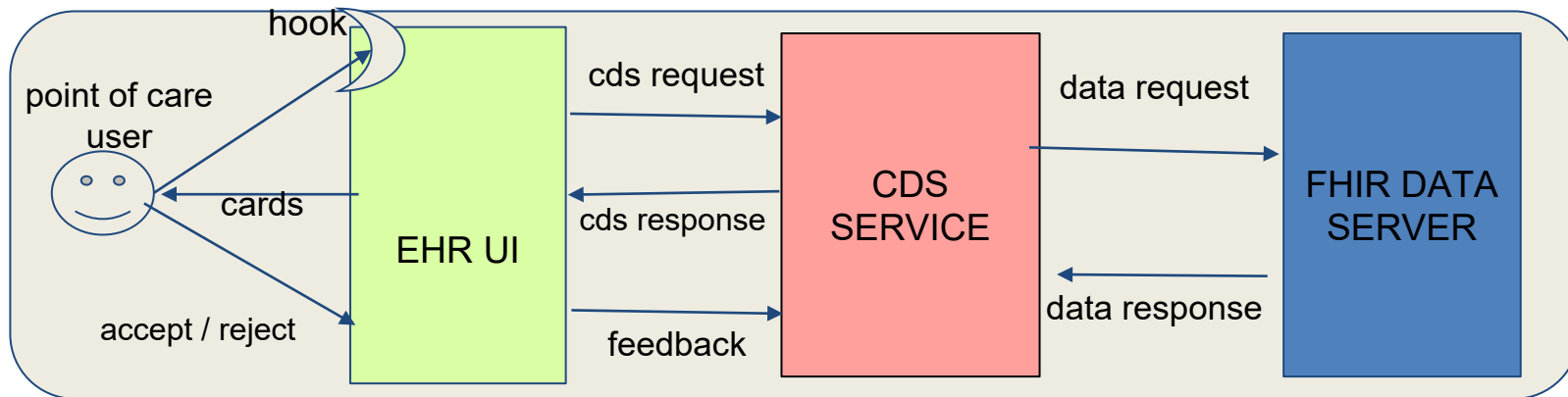
STU2 (08-23-2022)

<https://cds-hooks.hl7.org/2.0/>

Register/Discover Services	{cds_endpoint}/cds-services
Describe the context	hook ("Which part of the the clinical workflow?") patientId userId
Authenticate/Authorize	1- TLS cds_endpoint / 2- Signed JWT 3- Data Access Token
Clinical Data Exchange	Access to FHIR Resources + "Prefetch"
Return Recommendations	cards



CDS-Hooks in a nutshell



hook

What is the user doing in the EHR

cds request

Which user. which patient

Which service

Additional clinical or demographic data

FHIR data server and authentication

parameters

cds response : Set of cards

cards: source. information, recommendation (actions), smart app link

data request / response

FHIR resources required for service

feedback

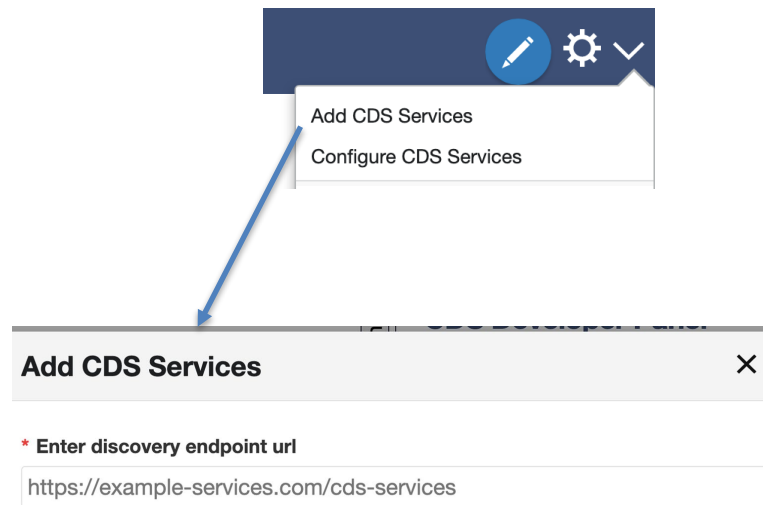
whether actions were accepted by user
reasons for override



1. Service Registration {cds_endpoint}

Register the '**discovery endpoint**' for the service in the EHR or sandbox
<https://sandbox.cds-hooks.org/>)

More details on Server Registration
<https://cds-hooks.hl7.org/2.0/#discovery>



Example: **<https://my-cds-company.com/cds-services>**



2. Describe the service /cds-services

The /cds-services method returns for each service the description, id, and parameters. optional: "prefetch" : a list of required resources so we do not need to get them from the FHIR Server

[id]: the service identifier {service.id}...and hook...?

```
"services": [  
  {  
    "name": "Demo CDS Hook UEHO",  
    "title": "Demo CDS Hook UEHO",  
    "id": "ueho - cds - hooks",  
    "description": "Cardiac Risk for a Patient",  
    "hook": "patient - view"  
  }  
]
```

Example
prefetch

```
"prefetch": { "patient":  
  "Patient/{{context.patientId}}", "observations":  
  "Observation?patient={{context.patientId}}" }
```



3. Which part of the workflow: [hook](#)

[hook](#)

When can I invoke this service from the EHR? What is the practitioner doing?

There is no 'closed' hook list
They are part of the community consensus, and have a life cycle.
There is a process, language and structure for their definition.

List in CDS Hooks 1.0

- patient-view
- medication-prescribe
- order-review
- order-select
- order-sign
- appointment-book
- encounter-start
- encounter-discharge



4. How to call the service?

POST to URL: `{cds_endpoint}/cds-services/{service.id}`

In the request body:

PARAMETER	REQUIRED	TYPE
hook	YES	string
hookInstance	YES	string
context	YES	object
fhirServer	NO	URL
fhirAuthorization	NO	object
prefetch	NO	object

```
{ "hookInstance"      : "d1577c69 - dfbe - 44ad - ba6d -  
3e05e953b2ea"      ,  
  "fhirServer"       : "http://myserver      - fhir.org"   , "hook"      :  
  "patient - view"   ,  
  "fhirAuthorization" :  
{ "access_token"      : "my - token"   ,  
  "token_type"       : "Bearer"      ,  
  "expires_in"      : 300            ,  
  "scope"           : "patient/Patient.read  
patient/Observation.read"          ,  
  "subject"         : "service client_id"  
},  
  "context"         : { "userId"      : "Practitioner/12821"  ,  
  "patientId"       : "1288992"    }  
}
```



5. Recommendation Type: cards

card

The service may return **one or more**
They can be purely informational, or
suggest actions on FHIR resources, or
even a link for a SMART app

They include a criticality **indicator**



Informational



suggestion



link

indicator



Informational



Warning



Critical



6. FHIR resources

(But not just ANY FHIR resource : constrained!)

Structure: FHIR Resources

Specific profile so we know what to expect on content/terminology

Which resources? Depends on what question you are asking and the needs of the CDS algorithm

Which content? It should be 'our' FHIR resources.

Example: "US CORE"

FHIR core

Patient.identifier: 0..*

Patient.name 0..*

Patient.gender:0..1

'Our' FHIR

Patient.identifier: 1..*

Patient.name: 1..*

Patient.gender: 1..*

Observation.code.system
=LOINC



Nice...but is it used?





Let 's go to Part 2!

- Discussion of Clinical Decision Support use cases with CDS-HOOKS