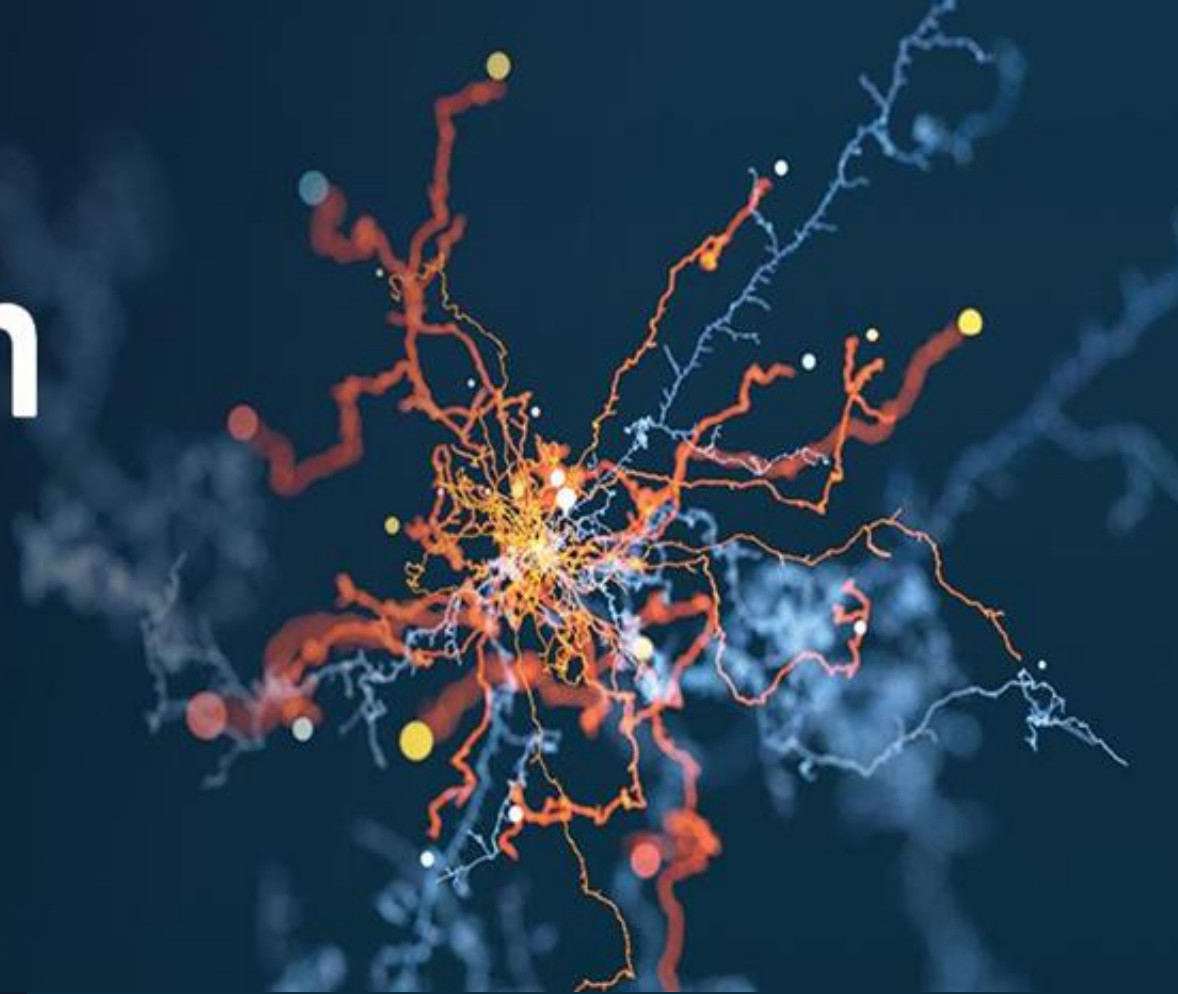




# FHIR<sup>®</sup> North

## Canada's FHIR Conference



CDS Hooks 2.0  
*Isaac Vetter, Epic*

# CDS HOOKS

Integrating decision support  
at the point of care



**Canada  
Health  
Infoway**

**Inforoute  
Santé du  
Canada**

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# Agenda

- Overview: What is CDS Hooks?
- How can CDS Services access data?
- CDS Hooks 2.0: new features
- What's next?
- Q&A

# CDS Service

A service that is:

invoked via a **hook**,

evaluates **its own logic** using FHIR data,

returns decision support via **cards**

# CDS Client

A CPOE or EHR or other clinical workflow system that:  
invokes CDS Service via a **hook**,  
**consumes** decision support,  
may provide SMART authorization and **FHIR server**



EHR Med Order

**Rx** Toprol XL  
50 mg daily

**information card**

\$45 per month  
(patient pays \$7)

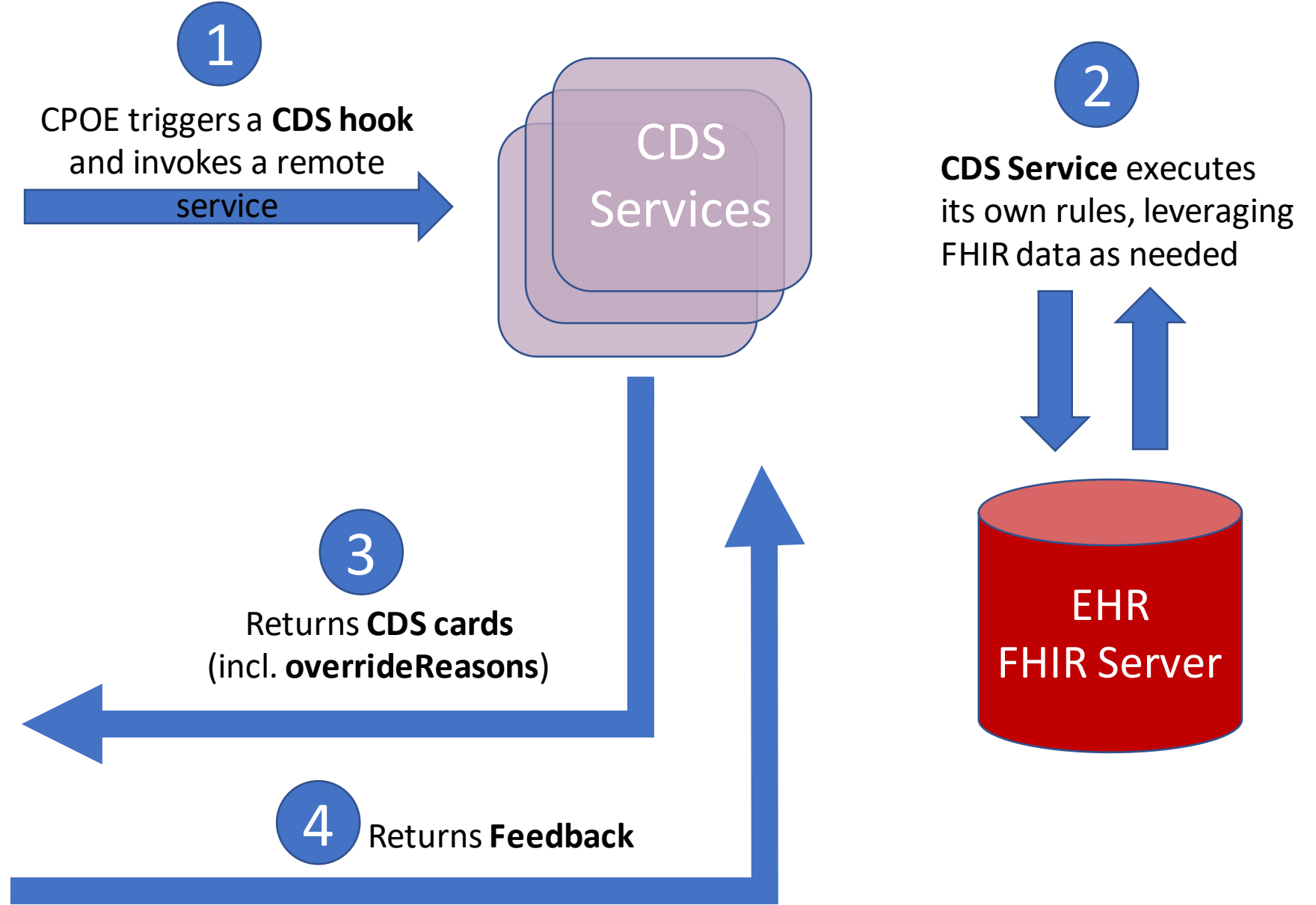
**suggestion card**

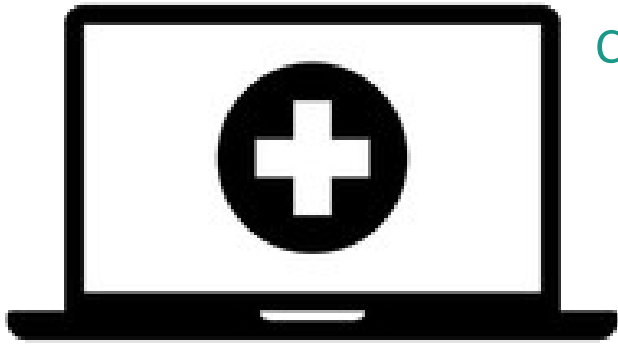
Try HCTZ as first-line  
due to patient age (71)

**Switch to HCTZ**

**smart app link card**

Managing hypertension?  
[Launch JNC 8 Rx Pro](#)





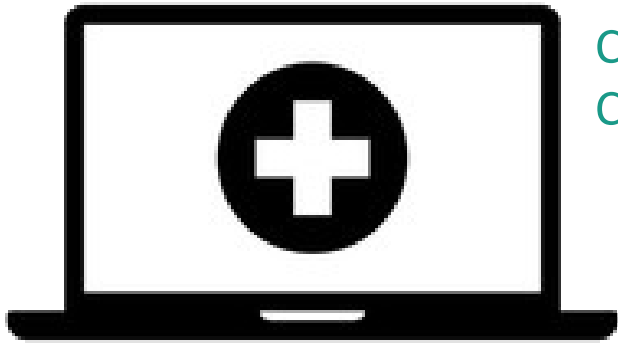
CDS Client

CDS Service



POST <https://example.com/cds-services/example-service>

```
{  
  "hook": "patient-view",  
  "fhirServer": "https://fhir.example.com",  
  "context": {  
    "userId": "Practitioner/789"  
    "patientId": "123",  
    "encounterId": "456",  
  },  
},
```

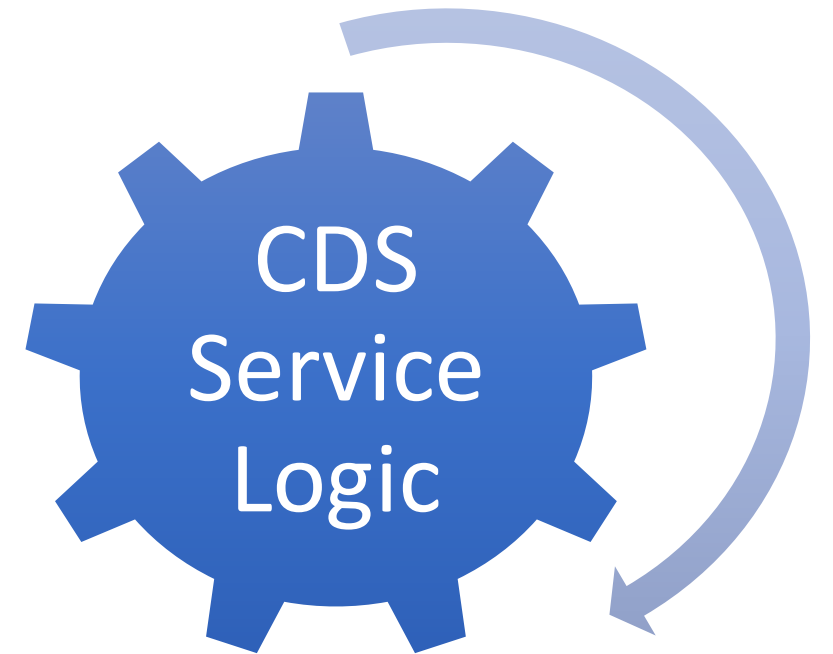


CDS  
Client

CDS Service



POST <https://example.com/cds-services/example-service>





EHR

CDS Service



POST <https://example.com/cds-services/example-service>

HTTP 1.1/ 200 OK

```
{
  "cards": [
    {
      "summary": "Example card",
      "indicator": "info",
      "source": {
        "label": "Demo CDS Service"
      }
    }
  ]
}
```

# Cards

## Medication Alert

Source: RxCheck



### lisinopril 5 mg tablet

- This medication is not recommended for Black or African American patients.

*82% of providers selected this recommendation.*

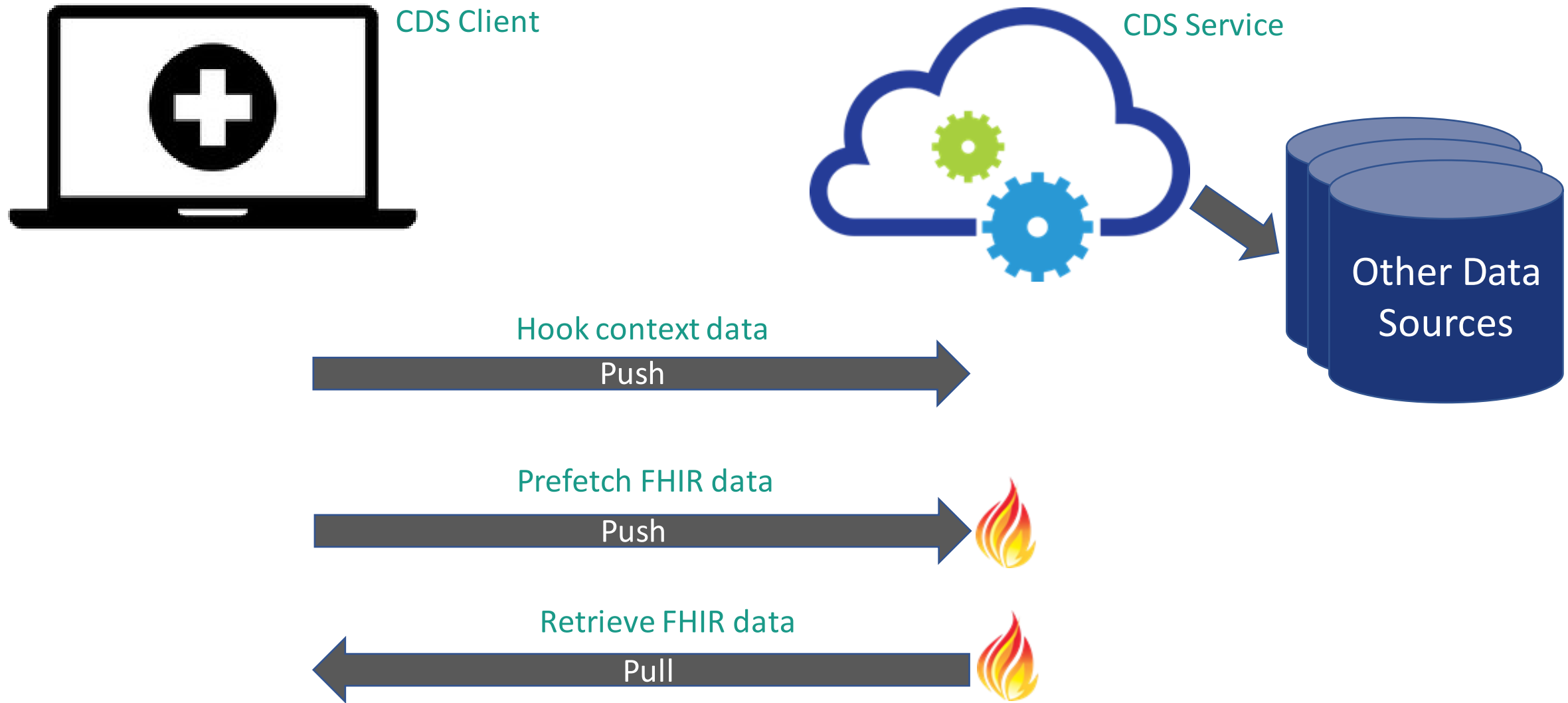
[Switch to amiloride 5 mg-hydrochlorothiazide 50 mg tablet](#)

[Medication Review](#)

- A CDS Service can return any number of cards
- The Client renders each card as it sees fit
- Each card must have:
  - A concise summary (140 characters)
  - An indicator noting the importance of the card
  - Information on the organization or data set that is the source of the card's data

any combination of information, suggestions, and links

# Data Access available to a CDS Service



# Hook Context Data

- Data specific to a hook
- Data that all CDS Services using that hook would use
- Can be FHIR data (or references to FHIR data) but not always
- Every hook defines its own context

## Example: patient-view hook

Field	Optionality	Prefetch Token?	Type	Description
userId	REQUIRED	Yes	string	The FHIR resource type + id of the current user eg: <code>Practitioner/1</code> or <code>Patient/2</code>
patientId	REQUIRED	Yes	string	The FHIR Patient.id of the current patient in context
encounterId	OPTIONAL	Yes	string	The FHIR Encounter.id of the current encounter in context

# Prefetch Data

- Always FHIR data
- Data specific to a given CDS Service
- Clients are not required to honor prefetch requests from CDS Services
- Expressed as FHIR read/search queries

## Example prefetch templates

Prefetch Template	Description
<code>Patient/ {{context.patientId}} </code>	The current FHIR Patient
<code>metadata</code>	The FHIR server's CapabilityStatement

2.0

# CDS HOOKS™

## 📘 2.0 Release

This is the current published release of the CDS Hooks specification. All stable releases are available at <https://cds-hooks.hl7.org/>.

## Table of contents

Overview

Conformance La

Use of JSON

CDS Hooks Anator

CDS Services

CDS Clients

Cards

Discovery

HTTP Request

Response

# CDS Hooks 2.0 Highlights



- Override reasons
  - clinician can override a card



- Feedback service
  - tell the cds service what happened with its suggestion
  - (fka: analytics endpoint)



- Refinements to CDS Hooks response
  - recommended and modular suggestions
  - card topics



# Override Reasons

arrive with the card



```
{
```

```
  "overrideReasons": [{  
  
    "code": "reason-code-provided-by-service",  
  
    "system": "http://example.org/cds-services/fhir/CodeSystem/override-reasons",  
  
    "display": "Patient requested Brand Product"  
  },  
  
  {  
  
    "code": "12354",  
  
    "system": "http://example.org/cds-services/fhir/CodeSystem/override-reasons",  
  
    "display": "Contraindicated"  
  }  
}]
```

# Public Sandbox

## Dismissing Cards & Adding Override Reasons

**Cost: \$5.47. Save \$0.73 with a generic medication.**

Source: *CMS Public Use Files*

Change to generic

Dismiss



Override: Patient Requested Brand Product

Override: Generic Drug Out of Stock or Unavailable



# Feedback Service

occurs later

POST <https://{baseUrl}/cds-services/{service.id}/feedback>



```
{  
  "feedback": [{  
    "card": "`card.uuid` from CDS Hooks response",  
    "outcome": "accepted",  
    "acceptedSuggestions": [{ "id": "`card.suggestion.uuid` from CDS Hooks response" }],  
    "outcomeTimestamp": "iso timestamp in UTC when action was taken on card"  
  }]  
}
```

**CDS Hooks**

Overview

Specification ^

[Current \(draft\)](#)

[1.0 \(external link\)](#)

Hooks ^

[new-hook-template](#)

[patient-view 5](#)

[medication-prescribe 0](#)

[order-dispatch 0](#)

[order-review 0](#)

[order-select 1](#)

[order-sign 1](#)

[appointment-book 1](#)

[encounter-start 1](#)

[encounter-discharge 1](#)

Quick Start


Cheat Sheet

Best Practices

Examples

## Hook Maturity Model

The intent of the CDS Hooks Maturity Model is to attain broad community engagement and consensus, before a hook is labeled as mature, that the hook is necessary, implementable, and worthwhile to the CDS Services and CDS Clients that would reasonably be expected to use it. Implementer feedback should drive the maturity of new hooks. Diverse participation in open developer forums and events, such as HL7 FHIR Connectathons, is necessary to achieve significant implementer feedback. The below criteria will be evaluated with these goals in mind.

1 Hook maturity | 3 - Considered 

The Hook maturity levels use the term CDS Client to generically refer to the clinical workflow system in which a CDS Services returned cards are displayed.

Maturity Level	Maturity title	Requirements
0	Draft	Hook is defined according to the <a href="#">hook definition format</a> .
1	Submitted	<i>The above, and ...</i> Hook definition is written up as a <a href="#">github pull request</a> using the <a href="#">Hook template</a> and community feedback is solicited on the <a href="#">zulip CDS Hooks stream</a> .



# What's next for CDS Hooks?

- Evaluate interest for January Connectathon
- Evaluate hook maturity



# Call to action

## Share

- Share your experience with different hooks!
- Document your support
  - <https://github.com/cds-hooks/docs/wiki/CDS-Hooks-Availability>
- Socialize your implementation projects

## Participate

- Connectathon participation!
  - Need broader participation from community.

## Contribute

- Sandbox maintainer
  - <https://github.com/cds-hooks/sandbox>

## Advance

- Pilot CDS Hooks

[Randomized Controlled Trial](#) > [J Am Med Inform Assoc. 2022 Aug 16;29\(9\):1461-1470.](#)

doi: [10.1093/jamia/ocac085](#).

## Using CDS Hooks to increase SMART on FHIR app utilization: a cluster-randomized trial

Keaton L Morgan <sup>1 2</sup>, Polina V Kukhareva <sup>1</sup>, Phillip B Warner <sup>1</sup>, Jonah Wilkof <sup>3</sup>, Meir Snyder <sup>3</sup>, Devin Horton <sup>4</sup>, Troy Madsen <sup>2</sup>, Joseph Habboushe <sup>3</sup>, Kensaku Kawamoto <sup>1</sup>

Affiliations [+ expand](#)

PMID: [35641136](#) PMCID: [PMC9382378](#) (available on 2023-05-31) DOI: [10.1093/jamia/ocac085](#)

### Abstract

**Objective:** HL7 SMART on FHIR apps have the potential to improve healthcare delivery and EHR usability, but providers must be aware of the apps and use them for these potential benefits to be

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#### PAGE NAVIGATION

CDS HOOKS

**What questions do you  
have?**