CDS Hooks and DynaMed: Integration and Interoperability

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What is DynaMed?

- High-quality suite of CDS services
  - Allows the clinician to search for any medical topic
  - Subjects are returned in a clean and concise format, and are updated on a regular basis
  - A quick search provides clinicians with best practice recommendations, diagnosis and management, and informative images (1)

- Has expanded to include Micromedex, Dynamic Health, and DynaMed Decisions (1)
Overview and Recommendations

Background

- Discoid lupus erythematosus is a chronic form of lupus erythematosus limited to the skin.
  - Cutaneous lupus erythematosus has distinct acute, subacute, and chronic subtypes.
  - Discoid lupus erythematosus is the most common form of chronic cutaneous lupus erythematosus.
- Discoid lupus erythematosus is characterized by purplish scaly papules and plaques that occur on sun-exposed areas and the hair-bearing scalp and may result in significant scarring and permanent hair loss.
- Systemic lupus erythematosus (SLE) is reported to develop in 12%-28% of patients with discoid lupus.
- Patients with SLE may have a 20%-25% lifetime risk of developing at least 1 classic discoid lesion.

Evaluation

- The typical discoid lesion starts as a well-demarcated purplish macule or papule with an adherent scale, often on the head or neck, and spreads centrifugally, gradually expanding into a discoid (coin-shaped) plaque.
- Adjacent plaques may coalesce into larger irregular plaques and the adherent scale may extend into dilated hair follicles causing follicular plugging.
Need: Integration of DynaMed Resources

At what points in their workflows do providers use DynaMed the most?

Can we prompt use of DynaMed resources in an intuitive, non-invasive way before providers realize they need them?
University of Utah CMIO Maia Hightower:

“The "coolest app in the world" may not be enough to overcome the barrier of logging out of Epic to use it. Our clinicians will use a clunky app that's integrated in the workflow over a sleek app outside of it.”

An HL7 published specification for clinical decision support. (3)

Hooks reach out to external CDS Services

CDS Services return cards to be displayed in the EHR

These can be:
- Information Cards
- Suggestion Cards
- SMART App link cards

Allows EHRs to invoke CDSs based on triggering events (hooks) that occur during the normal workflow
Example Hooks

patient-view
When a patient’s chart is opened

order-select
When a clinician selects one or more orders to place for a patient

order-sign
When a clinician is ready to sign one or more orders for a patient
Simple Workflow Example

1. EHR triggers a CDS hook and invokes a remote service.
2. CDS Service executes its own rules, leveraging FHIR data as needed.
3. Returns CDS cards (rendered and displayed by EHR).

EHR Med Order: Toprol XL 50 mg daily

- Information card: $200 per month (patient pays $30)
- Suggestion card: Try HCTZ as first-line, Switch to HCTZ
- Smart app link card: Managing hypertension? Launch JNC 8 Rx Pro

EHR FHIR Server

CDS Hooks (cds-hooks.org)
Market Analysis

Not only is the market for features such as CDS Hooks growing at a staggering pace; DynaMed’s main competitors are also working on CDS-Hooks-enabled applications.
Technology: Overview

- Connects CDS Clients (EHRs) to CDS Services (DynaMed)
- All data exchanged as JSON structures (4)
- Data is transmitted over HTTPS-secured channels (4)
- Communicating with a CDS Service happens in three phases: Discovery, Calling the CDS Service, and Service Response (4)
CDS Service developers provide an endpoint that allows the EHR to “discover” the service (4). This endpoint includes: a description of the service, if there is any data that needs to be prefetched, and when the service is to be called (4). The CDS Service responds with a list of services the application offers (4).
A CDS Client (EHR) posts a JSON document to the CDS Service to call it (4)

CDS Services require FHIR resources to compute the request – these resources can be obtained either by passing prefetch data from the EHR or via a secure bearer token passed by the EHR to the CDS Service (4)
Technology: Service Response

CDS Services respond with a 200 HTTP ("Success") message and a cards array (4)

Cards contain decision support information (4)
Adoption and EHR Support

• Epic currently supports order-sign, order-select, and patient-view hooks, but not encounter-start (as of July 2021)

• Epic supports user-specific profiles, and department-specific configurations

• Clean, non-intrusive format for informational hooks
DynaMed Use Case 1: Integrating Decisions

Could be triggered via the *encounter-start* or *patient-view* hook:

**Doe, Jane**  
MRN 78941456, Female

- Age: 64 years
- Weight: 180 lbs

**Chart Review**

- **Reason for Visit**
  
  High blood pressure follow-up. BP was elevated a month ago.

- **Chief Complaint**
  
  68 year old White Female with elevated blood pressures one month ago. Back for recheck and possible discussions about medications. She is interested in non-pharmacologic therapies.

- **Key Problems**
  
  - Overdue Breast Cancer Screening (last Mammogram April 4, 2013)
DynaMed Use Case 1: Integrating Decisions

1. Provider starts patient encounter

2. EHR triggers a CDS Hook to DynaMed Services

3. DynaMed Decisions pulls from the “Key Problems” row, which indicates the patient is overdue for breast cancer screening

CDS Card linking to Decisions breast cancer screening is returned to the EHR
A breast cancer screening is recommended.
Breast Cancer Screening

The tool is for people 35-74 years old with average risk for breast cancer who are considering mammogram screening.

It is not for people with new breast symptoms, high-risk genes for breast cancer, a history of breast cancer or chest radiation for childhood cancer, a high-risk family history, or who would decline treatment if cancer were found. People with a prior breast augmentation or mastectomy are not eligible to use the Breast Cancer Screening Consortium (BCSC) model.

Risk Model *: BCSC, Gail

Age *: [ ] years

Race/Ethnicity *:

Previous Breast Biopsy *:

Family History of Breast Cancer *: No, Yes, Unknown

* = required

View Assessment & Guidance
DynaMed Use Case 2: Medical Education

Could be triggered via various hooks, including patient-view:

Consider a target blood pressure of < 140/90 mm Hg for patients with low-to-moderate cardiovascular risk.
DynaMed Use Case 2: Medical Education

1. Various hooks – including “patient-view”

2. EHR triggers a CDS Hook to DynaMed Services

3. DynaMed “notices” a high blood pressure on the patient notes, and provides an informative recommendation with a direct link to more information

Card is returned to EHR with recommendation and more information
How To: Taking a Blood Pressure Measurement

Launch in Dynamic Health
Future Work

• CDS Hooks v.1.1 includes a Feedback feature
• This feature allows the CDS Service to gather data on what happened with its suggestion – how many times was the suggestion card accepted, vs. ignored, declined, or overridden?
• Continuous improvement is key!
Conclusion

• DynaMed has a vast array of always-current medical knowledge that can be used by the entire healthcare team
• CDS Hooks helps clinicians and patients both by providing DynaMed services at the point of care, without leaving the EHR
• The standard is supported by major EHR providers, and is quickly becoming integrated by competitors
• Early adoption of CDS Hooks will remove barriers between DynaMed and the EHR, and will be a benefit to EBSCO and DynaMed users both
References


