HL7® FHIR® DevDays 2020

HL7 FHIR

HL7 Da Vinci Project – Prior Authorization – Let's Build!!

Viet Nguyen, MD, Stratametrics LLC, Da Vinci Technical Director

HL7 FHIR DevDays 2020, Virtual Edition US, June 15–18, 2020 | @HL7 @FirelyTeam | #fhirdevdays | www.devdays.com/us

Agenda

- Brief introduction of the HL7 Da Vinci Project
- Da Vinci Use Cases
- Review of burden reduction implementation guides
- Review of reference implementations, codes and developer resources
- Hands-on session with sample code

Da Vinci 2020 Multi-Stakeholder Membership

PROVIDERS

AMA Medical Group
Cedars-Sinai
*RUSH
Sutter Health
MultiCare Connected Care
OHSU
Providence St. Joseph Health
Texas Health Resources
UNC Health Care
Weill Cornell Medicine

EHRs

*Pulse8
athenahealth
*Cerner
*Epic
healow | Insights

PAYERS

*Anthem
*BlueCross BlueShield Association
*Blue Cross of Idaho
Blue Cross Blue Shield Blue Care Network of Michigan
BlueCross BlueShield of Alabama
of Tennessee
*CAMBIA Health Solutions
*CMS
*Cigna
CVS Health
CENTENE Corporation
GUIDEWELL
*HCSC Health Care Service Corporation
*Humana
*Independence
*UnitedHealthcare

VENDORS

casenet
*cognosante
*edifecs
infor
InterSystems Health | Business | Government
juxly
mcg
*OPTUM
*surescripts
*ZeOmega

DEPLOYMENT

Availity
MiHIN Michigan Health Information Network Shared Services

INDUSTRY PARTNERS

HIMSS
*HL7 International
NCQA Measuring quality. Improving health care.

For current membership: http://www.hl7.org/about/davinci/members.cfm

*Indicates a founding member of the Da Vinci Project.
Organization shown in primary Da Vinci role, Many members participate across categories.

Da Vinci Project: Use Case

Quality Improvement

- Data Exchange for Quality Measures
- Gaps in Care & Information

Coverage / Burden Reduction

- Coverage Requirements Discovery
- Documentation Templates and Rules
- Prior-Authorization Support

Member Access

- Clinical Data Exchange
- Payer Data Exchange
- Payer Data Exchange: Formulary
- Payer Data Exchange: Directory
- Payer Coverage Decision Exchange
- Patient Cost Transparency

Process Improvement

- Risk Based Contract Member Identification
- Chronic Illness Documentation for Risk Adjustment

Clinical Data Exchange

- Payer Data Exchange
- Clinical Data Exchange
- Notifications
- Patient Data Exchange
- Performing Laboratory Reporting

Use Case HL7 Standards Progress

- Published
- Balloting
- Build
- Future

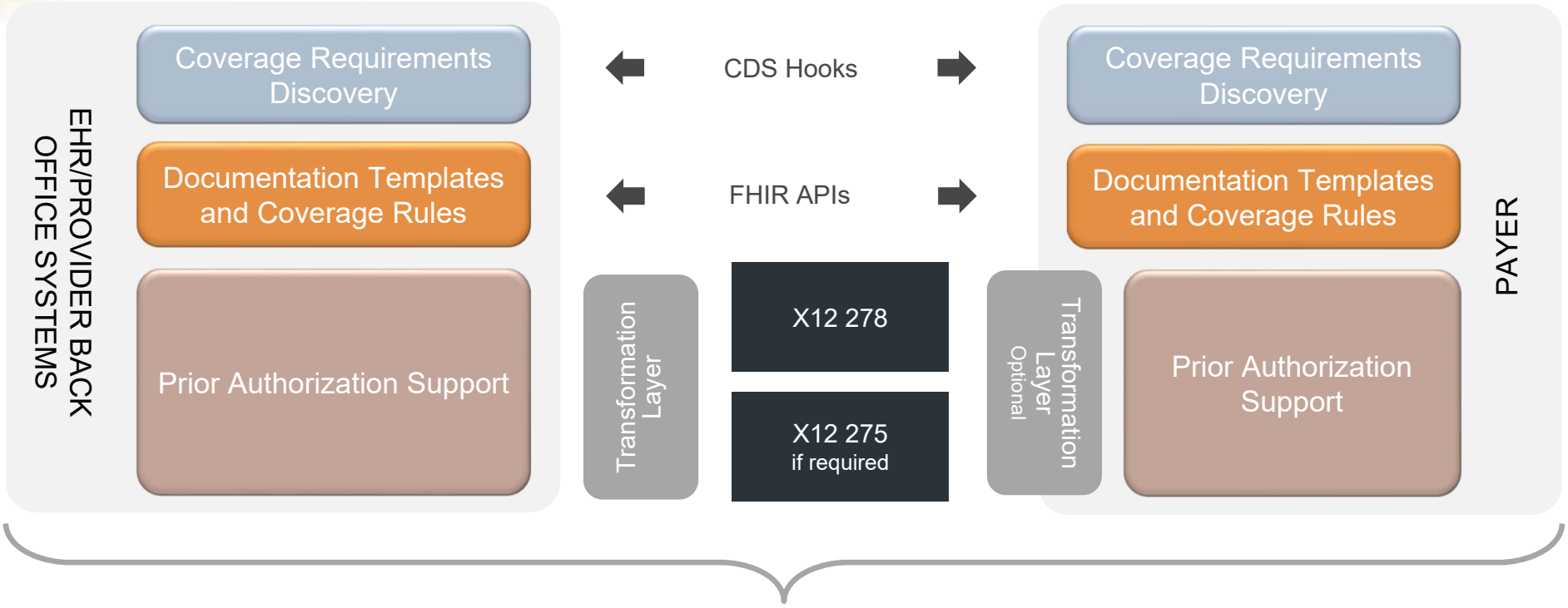
Da Vinci Project: Use Case Implementation Guides

IG	Status	# Times Tested
Quality Improvement		
Data Exchange for Quality Measures (DEQM)	STU 2 Publishing Q2 2020	8
Gaps in Care	Balloting Q3 2020	N/A
Coverage/ Burden Reduction		
Coverage Requirements Discovery (CRD)	STU 2 Publishing Q2 2020	8
Documentation Templates & Rules (DTR)	STU 1 Publishing Q2 2020	7
Prior Authorization Support (PAS)	STU 1 Publishing Q3 2020	5
Member Access		
Health Record Exchange Framework (HRex)	STU 1 Publishing Q2 2020	N/A
Clinical Data Exchange (CDex)	STU 1 Publishing Q3 2020	6
Payer Data Exchange (PDex)	STU 1 Publishing Q2 2020	6
Payer Data Exchange (PDex): Formulary	STU 1 Published Q1 2020	6

IG	Status	# Times Tested
Payer Data Exchange (PDex): Directory	STU 1 Publishing Q3 2020	5
Payer-Payer Coverage Decision Exchange	STU 1 Publishing Q3 2020	4
Patient Cost Transparency	Planning	N/A
Clinical Data Exchange		
Notifications	STU 1 Publishing Q2 2020	5
Patient Data Exchange	Planning	N/A
Performing Laboratory Reporting	Planning	N/A
Process Improvement		
Risk Based Contract Member Identification	STU 1 Publishing Q3 2020	3
Chronic Illness Documentation Risk Adjustment	Planning	N/A

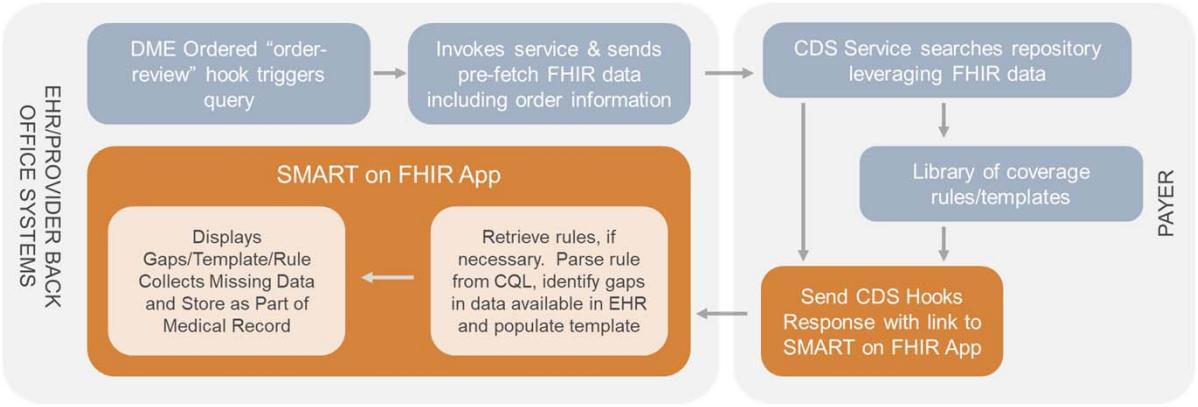
These implementation guides are all based on FHIR R4

Provider Burden Reduction



- Improve transparency
- Reduce effort for prior authorization
- Leverage available clinical content and increase automation

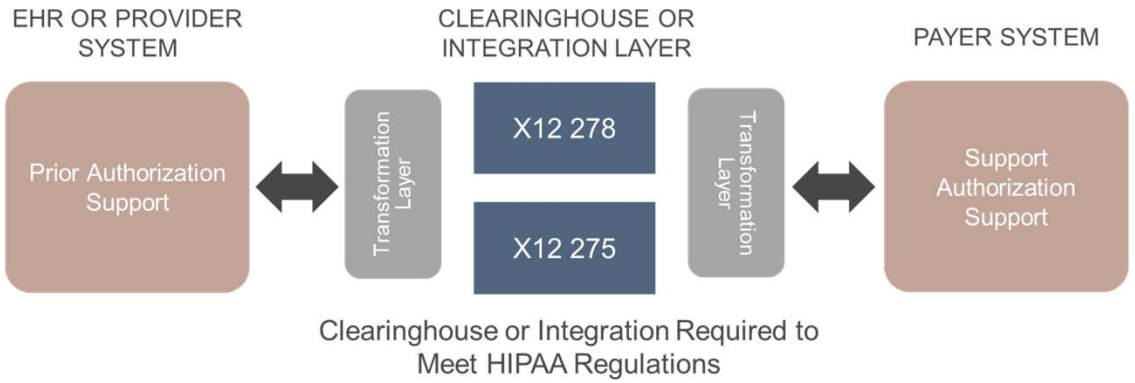
Coverage Requirements Discovery (CRD)/ Documentation Templates & Rules (DTR)



Benefits

- Takes guesswork out of patient specific coverage by sharing authorization or process requirements in workflow
- Improves transparency of patient and procedure specific rules to provider and patient
- Exposes information about patient benefits when care team is most likely with or near patient, so options can be discussed and decided upon

Prior Authorization Support



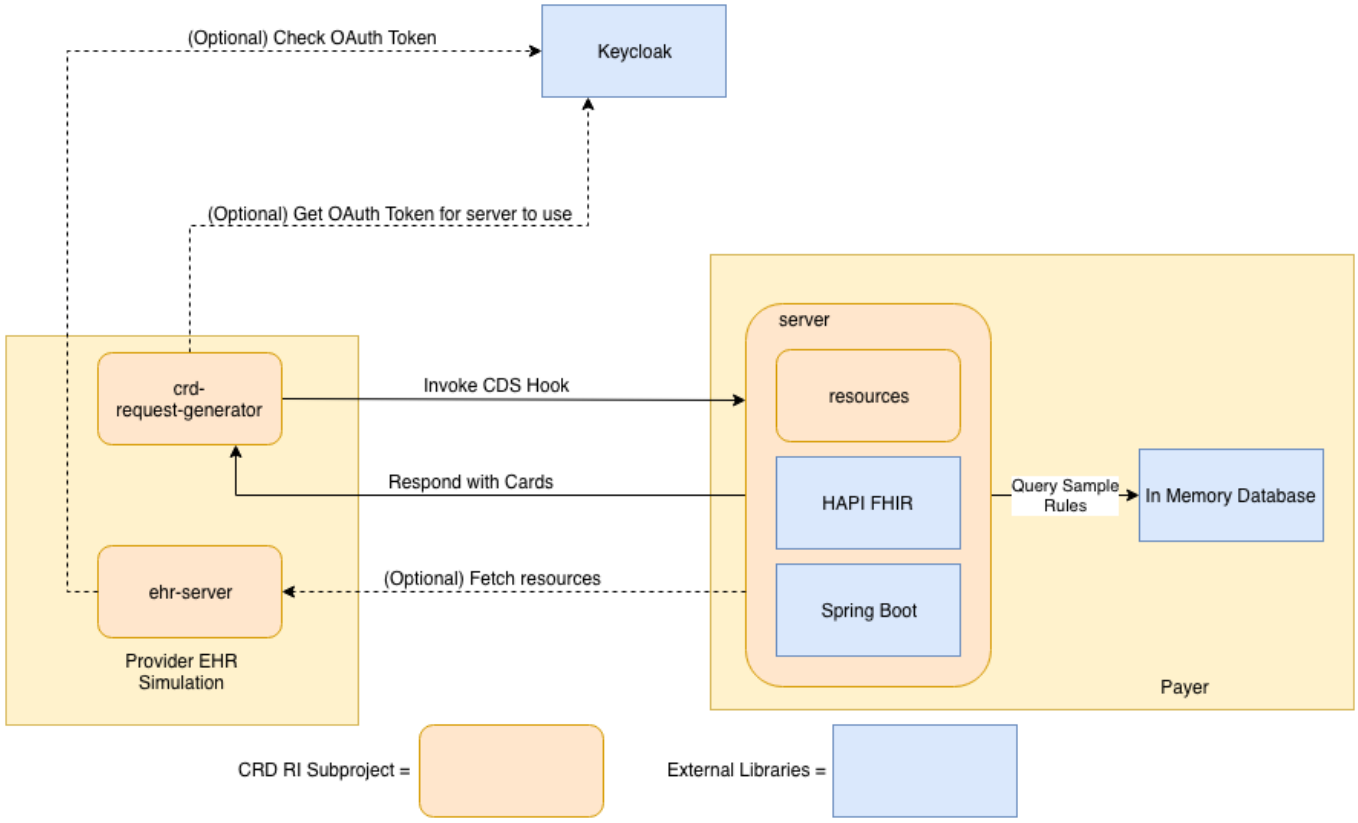
Benefits

- Reduces re-keying, duplicate entry of prior authorization data for provider team
- Creates possibility for automation of prior authorization if clinical data is present
- Improves quality of information shared by using FHIR standard
- Bridges emerging clinical data standards to existing HIPAA administrative standards

Coverage Requirements Discovery

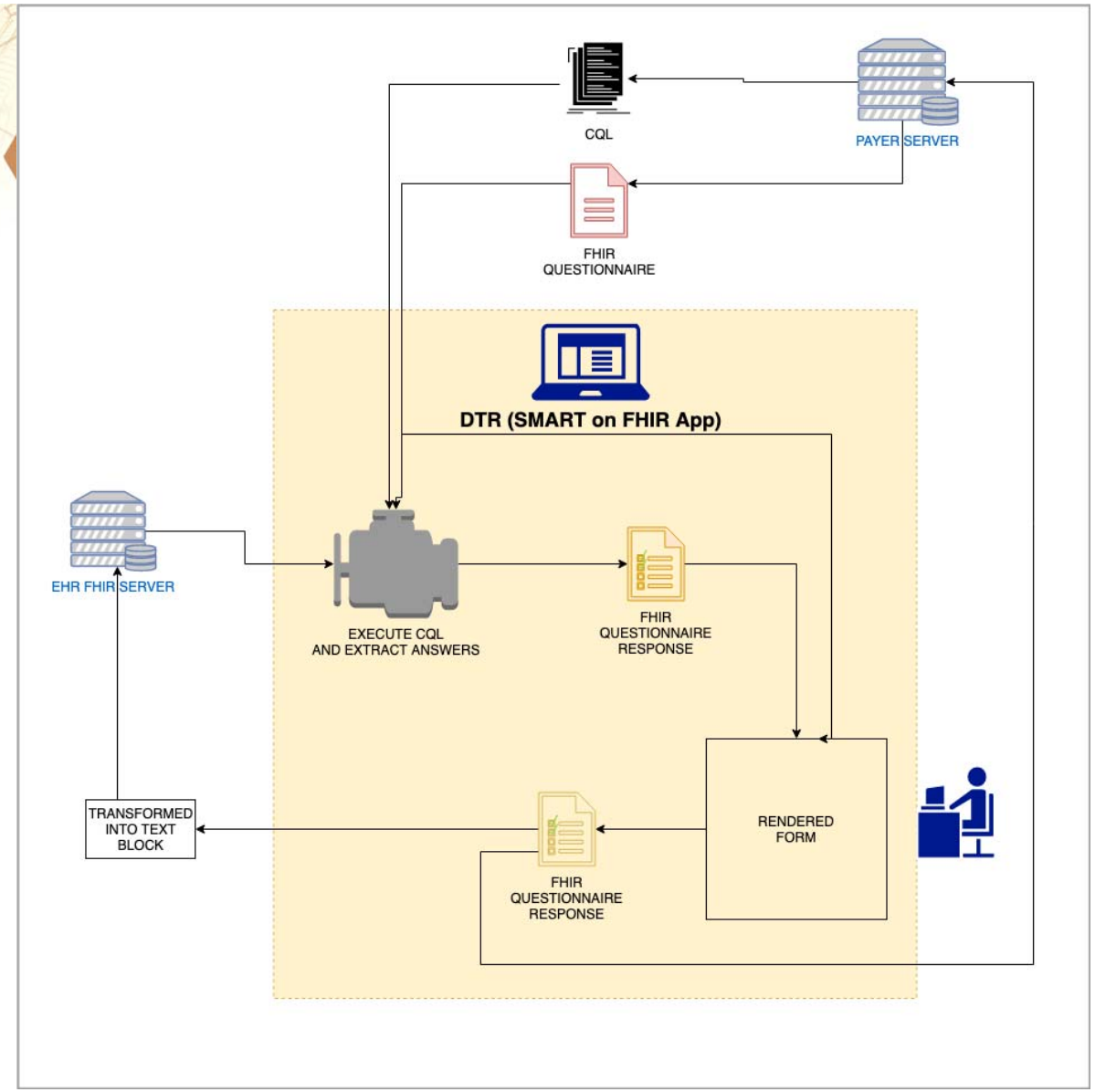
- Implementation Guide Tour - http://hl7.org/fhir/us/davinci-crd/2019May/
- Project Page and Artifacts - https://confluence.hl7.org/pages/viewpage.action?pageId=21857602
- Github Repository - https://github.com/HL7-DaVinci/CRD
- Connectathon 24 Track Page - https://confluence.hl7.org/pages/viewpage.action?pageId=80118301
- CRD-DTR Setup Video - https://youtu.be/OrRG3RhFbts
  - Set up environment with CDS and security service
- Status - STU2 Ballot completed, currently completing ballot reconciliation, and anticipated publishing in Q2 2020

Coverage Requirements Discovery Reference Implementation Architecture



Documentation Templates and Payer Rules

- Implementation Guide Tour - http://hl7.org/fhir/us/davinci-dtr/2019Sep/
- Project Page and Artifacts - https://confluence.hl7.org/pages/viewpage.action?pageId=21857604
- Github Repository - https://github.com/HL7-DaVinci/dtr
- Connectathon 24 Track Page - https://confluence.hl7.org/pages/viewpage.action?pageId=80118301
- CRD-DTR Setup Video - https://youtu.be/OrRG3RhFbts
- Status – STU1 Ballot completed, currently completing ballot reconciliation, and anticipated publishing in Q2 2020
- Additional examples anticipated – Durable medical equipment, specialty drug, specialty lab, diagnostic imaging


CQL
PAYER SERVER
FHIR
QUESTIONNAIRE
DTR (SMART on FHIR App)
EHR FHIR SERVER
EXECUTE CQL
AND EXTRACT ANSWERS
FHIR
QUESTIONNAIRE
RESPONSE
TRANSFORMED
INTO TEXT
BLOCK
FHIR
QUESTIONNAIRE
RESPONSE
RENDERED
FORM

Prior Authorization Support

- Implementation Guide Tour - http://hl7.org/fhir/us/davinci-pas/2019Sep/
- Project Page and Artifacts - https://confluence.hl7.org/display/DVP/Prior+Authorization+Support
- Github Repository - https://github.com/HL7-DaVinci/prior-auth
- Connectathon 24 Track Page - https://confluence.hl7.org/pages/viewpage.action?pageId=80118301
- CRD-DTR-PAS Setup Video - https://youtu.be/OrRG3RhFbts
- Status – STU1 Ballot completed, currently completing ballot reconciliation, and anticipated STU 1 Publishing Q3 2020

Let’s Build Options

- Option 1 – Connectathon Approach
- Follow instructions for CRD-DTR-PAS setup guide - Connectathon 24 Track Page - https://confluence.hl7.org/pages/viewpage.action?pageId=80118301

- Option 2 – Focus on DTR questionnaire, rendering and response

Option 2 – DTR App and Questionnaire

In scope

- Walk through of example FHIR Questionnaire
- Simple DTR App to render Questionnaire resource
- Prepopulate Questionnaire via FHIR queries instead of CQL
- Complete form and create QuestionnaireResponse resource

Out of scope

- CRD CDS Hooks query and response
- CDS Service/CQL
- Prior Authorization Support Claim/$submit operation

Option 2 – Exercise Artifacts

What is it?

- A simple JavaScript “app” (html file and client-side javascript file)

Technical requirements

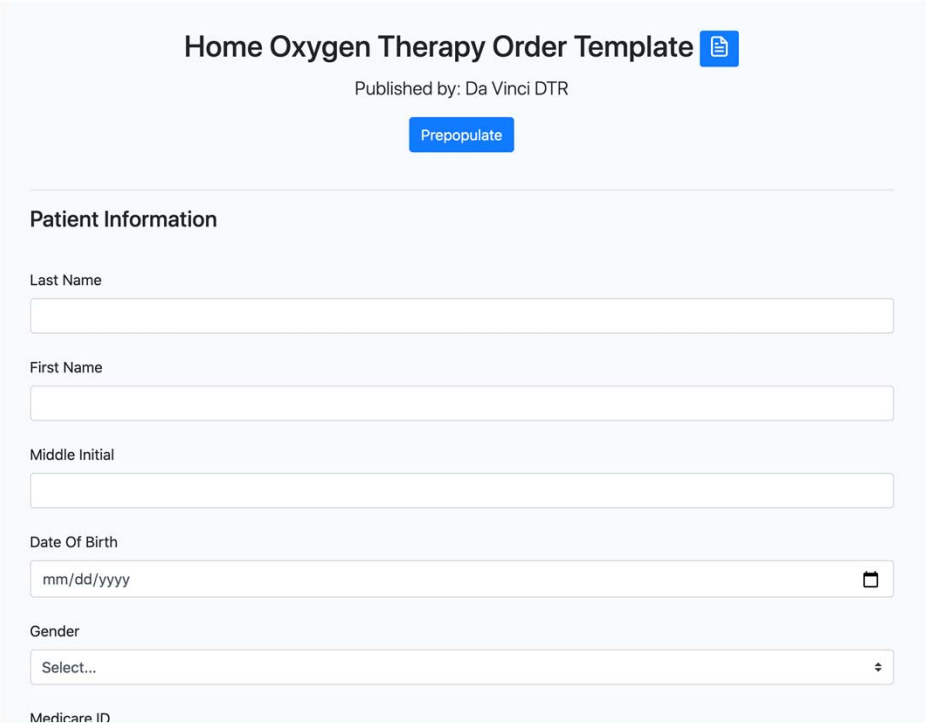
- Python 2 or 3
- Text editor

Where does it pull data from?

- A Logica sandbox
- https://api.logicahealth.org/devdays2020/open

Option 2 – Setup

1. Download file: *devdays-priorauth.zip*
   - Link to the zip file here
2. Double-click to unzip
3. Navigate terminal into folder
4. Start a Python simple server
   - Python 2: python -m SimpleHTTPServer
   - Python 3: python3 -m http.server
5. View the app at http://localhost:8000/



Option 2 – File Structure

css

bootstrap.css…… the base Bootstrap stylesheet

style.css…… styling specific to Bootstrap's "Checkout" example

js

script.js…… a client-side script which contains our JS code

index.html……our HTML page

response.json…… a template used to create a QuestionnaireResponse

Option 2 – Code walk-through

- Within our HTML file, we have a <script> tag linking a client-side javascript file (called script.js) within the js/ folder with this HTML file.

```
    <!-- Link to client-side script file -->
    <script type="application/javascript" src="js/script.js"></script>
</head>
```

- When the HTML file loads, we will use the onload event to call a function in the linked JavaScript file called render().

```
<!-- render() function is within client-side script file. Initiates the building of the form -->
<body onload="render()" class="bg-light">
```

Option 2 – Code walk-through

- In the render() function, we query our Questionnaire resource by ID from our data server (the Logica sandbox)

```
async function render(){
    //Query the sample questionnaire by ID
    let url = 'https://api.logicahealth.org/devdays2020/open/Questionnaire/q1'
    let questionnaire = await getResource(url);
```

- We're using the Fetch API to do this which returns a Promise object. To "await" our resource (the resolution of the promise) we must declare this as async function.

```
async function getResource(url){
    let r = await fetch(url);
    return await r.json();
}
```

Option 2 – Questionnaire Overview

- We are using a version of the “Home Oxygen Therapy Order Template” questionnaire which was originally created for the Da Vinci DTR project
  - https://github.com/HL7-DaVinci/dtr/blob/master/src/sample_questionnaire.json
- The demo app will show you the raw JSON for the Questionnaire resource by clicking on the file icon next to the title

- The questionnaire contains several clinical questions which will represent fields that could be prepopulated by CQL
  - Ex: Medicare ID, Oxygen Saturation
- It also contains purposefully non-clinical questions which require manual input
  - Ex: Name of Favorite Pet

Option 2 – The Questionnaire Resource

- Questions are stored in the resource as an “item” array.
- This array can be nested to represent question groups.
- Each item has a type
  - https://www.hl7.org/fhir/valueset-item-type.html
- This questionnaire also contains CQL extensions for each item which could be used to prepopulate the clinical questions.

Types used in this questionnaire:

- Group
  - Collection of questions
- String
  - Free-text response
- Choice
  - Drop-down selection
- Boolean
  - True/False
- Date

Option 2 – Form Building

- To render the form we loop through each of the items in the questionnaire and use a switch statement to send each to a specific function built to create the HTML elements required for that type.
  - Text input, drop-down, date input, etc.
- The “qbody” variable is the selected HTML container built to hold the body of the form.

```
group.item.forEach((question, i) => {
    qbody.append('br');
    let select;
    switch(question.type) {
        case 'string':
            handleString(qbody,question);
            break;
        case 'date':
            handleDate(qbody,question);
            break;
        case 'choice':
            handleChoice(qbody,question);
            break;
        case 'integer':
            handleInteger(qbody,question);
            break;
        case 'boolean':
            handleBoolean(qbody,question);
            break;
        case 'group':
            handleGroup(qbody,question);
            break;
        default:
            //Print other question types
            console.log(question);
    }
});
```

Option 2 – Form Building

- Each of these functions convert the linkId to a more HTML-friendly format (starts with a letter, contains no periods). These are converted back for the QuestionnaireResponse
  - Ex: “1.1” -> “q11”
- Each question gets an HTML label and either an <input> element (string, integer, boolean), or a <select> element (drop-down).
- These elements have classes, styling, IDs, values, and other fields required in HTML.

```
function handleChoice(qbody,question){
    let linkId = 'q' + question.linkId.split('.').join('');
    qbody.append('label').attr('for', linkId).text(question.text);
    select = qbody.append('select').attr('name',linkId).attr('id',linkId).attr('class','custom-select d-block w-100');
    select.append('option').attr('id',linkId + 'def').attr('value','default').attr('selected','selected').text('Select...');
    question.answerOption.forEach((option, i) => {
        select.append('option').attr('id',option.valueCoding.code).attr('value',option.valueCoding.code).text(option.valueCoding.display);
    });
}
```

Option 2 – Hard-coded Prepopulation

- As discussed previously, prior authentication depends on several moving pieces and the prepopulation of certain questionnaire fields would be done via CQL expressions.
- **This is out of scope for this demo**, but to simulate this prepopulation, we have hard-coded FHIR queries that parse the resources containing the data for these fields.
- The prepopulate() function contains these queries.

```
/*
 !!!HARD-CODED FHIR QUERIES FOR DEMO PURPOSES!!!
 Prepopulation would normally be a result of CQL queries from a CQL ruler server.
 In order to simulate that functionality while keeping in-scope of the demo, the
 queries below are pulling the needed resources for a sample patient and extracting
 their values.
*/
async function prepopulate(){
    let url = 'https://api.logicahealth.org/devdays2020/open/Patient/SMART-2347217'
    let p = await getResource(url);
    //Name
    d3.select('#q11').attr('value',p.name[0].family);
    d3.select('#q12').attr('value',p.name[0].given[0]);
    d3.select('#q13').attr('value',p.name[0].given[1]);
    //DOB
    d3.select('#q14').attr('value',p.birthDate);
    //Gender
```

Option 2 – The QuestionnaireResponse Resource

- A Questionnaire is a reference resource and is not tied to a specific patient.
- A QuestionnaireResponse is created to hold a specific patient's answers to the questionnaire.
- Each item in the questionnaire has a linkId which is used to pair the answer to the original question.
- If the linkId is for a "group" type item, it's items can be nested within the response as well.
- This mirrors the item structure of the questionnaire.

```
"linkId" : <string>,
"text" : <string>,
"answer" : [{
    "valueBoolean" : <boolean>,
    "valueInteger" : <integer>,
    "valueDate" : <date>,
    "valueString" : <string>,
    "valueCoding" : { Coding },
    "item" : [{ Content as for QuestionnaireResponse.item }]
}],
"item" : [{ Content as for QuestionnaireResponse.item }]
```

Option 2 – Response Building

- This demo creates a QuestionnaireResponse when the “submit” button is clicked. It does not send that response back to our data server (for obvious reasons), but displays it for you.
- The generateResponse() function pulls a JSON template and fills the values in as they are extracted from the HTML elements.

```
/*
Pulls values for the various questions in the form and inserts them into a JSON
QuestionnaireResponse template stored as "response.json". This response is then
shown in a modal window.
*/
async function generateResponse(){
    //Fetch the json template
    let response = await fetch('../response.json');
    let r = await response.json();
    r.item[0].item[0].answer[0].valueString = d3.select('#q11').node().value;
    r.item[0].item[1].answer[0].valueString = d3.select('#q12').node().value;
    r.item[0].item[2].answer[0].valueString = d3.select('#q13').node().value;
    r.item[0].item[3].answer[0].valueDate = d3.select('#q14').node().value;
    r.item[0].item[4].answer[0].valueCoding = {
        "system": "http://hl7.org/fhir/administrative-gender",
        "code": d3.select('#q15').node().value
    };
    r.item[0].item[5].answer[0].valueCoding = {
```

Option 2 – What Would Come Next?

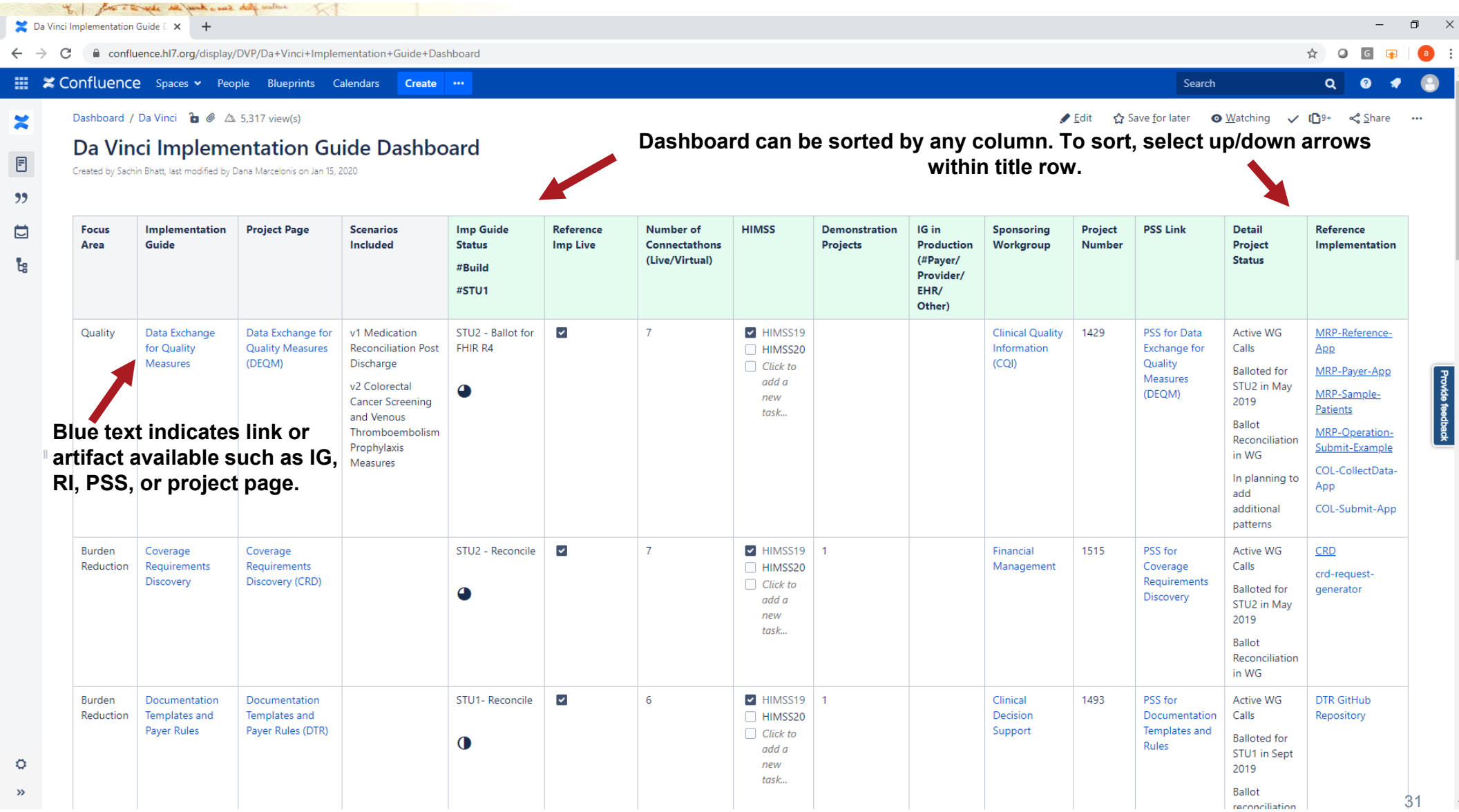
- The QuestionnaireResponse would be sent to a prior-auth endpoint which would then use the patient's CarePlan to determine whether or not the order is authorized for the patient.
- This response would be essentially "yes" or "no".

Online Resources

- FHIR Base Standard
  - http://hl7.org/fhir/
- HL7 Confluence Site
  - http://confluence.hl7.org/
- Logica Developer Sandbox
  - http://sandbox.logicahealth.org/
- Implementers' Forum
  - https://chat.fhir.org/
- HL7 Connectathons
  - https://confluence.hl7.org/display/FHIR/Connectathons
- Virtual Connectathon, May 13-15:
  - https://confluence.hl7.org/display/FHIR/2020-05+Connectathon+24

Da Vinci Resources

- Da Vinci Confluence Site
  - http://confluence.hl7.org/display/DVP/Da+Vinci
- Da Vinci Use Case Artifacts
  - https://confluence.hl7.org/display/DVP/Da+Vinci+Use+Cases
- Da Vinci Implementation Guide Dashboard
  - https://confluence.hl7.org/display/DVP/Da+Vinci+Implementation+Guide+Dashboard
- Da Vinci GitHub Repository
  - https://github.com/orgs/HL7-DaVinci/dashboard



Focus Area	Implementation Guide	Project Page	Scenarios Included	Imp Guide Status #Build #STU1	Reference Imp Live	Number of Connectathons (Live/Virtual)	HIMSS	Demonstration Projects	IG in Production (#Payer/ Provider/ EHR/ Other)	Sponsoring Workgroup	Project Number	PSS Link	Detail Project Status	Reference Implementation
Quality	Data Exchange for Quality Measures	Data Exchange for Quality Measures (DEQM)	v1 Medication Reconciliation Post Discharge v2 Colorectal Cancer Screening and Venous Thromboembolism Prophylaxis Measures	STU2 - Ballot for FHIR R4	☑	7	☑ HIMSS19 ☐ HIMSS20 ☐ *Click to add a new task...*			Clinical Quality Information (CQI)	1429	PSS for Data Exchange for Quality Measures (DEQM)	Active WG Calls Balloted for STU2 in May 2019 Ballot Reconciliation in WG In planning to add additional patterns	MRP-Reference-App MRP-Payer-App MRP-Sample-Patients MRP-Operation-Submit-Example COL-CollectData-App COL-Submit-App
Burden Reduction	Coverage Requirements Discovery	Coverage Requirements Discovery (CRD)		STU2 - Reconcile	☑	7	☑ HIMSS19 ☐ HIMSS20 ☐ *Click to add a new task...*	1		Financial Management	1515	PSS for Coverage Requirements Discovery	Active WG Calls Balloted for STU2 in May 2019 Ballot Reconciliation in WG	CRD crd-request-generator
Burden Reduction	Documentation Templates and Payer Rules	Documentation Templates and Payer Rules (DTR)		STU1- Reconcile	☑	6	☑ HIMSS19 ☐ HIMSS20 ☐ *Click to add a new task...*	1		Clinical Decision Support	1493	PSS for Documentation Templates and Rules	Active WG Calls Balloted for STU1 in Sept 2019 Ballot reconciliation	DTR GitHub Repository

Da Vinci Use Cases - Da Vinci - C

confluence.hl7.org/display/DVP/Da+Vinci+Use+Cases

Confluence Spaces People Blueprints Calendars Create ··· Search

Calendars

SPACE SHORTCUTS

Here you can add shortcut links to the most important content for your team or project. Configure sidebar.

PAGE TREE

- Da Vinci Welcome
- Da Vinci 2020 Calendar
- Da Vinci Implementation Guide Dashboard
- Da Vinci Steering Committee Members
- Da Vinci Operating Committee Members
- Da Vinci Clinical Advisory Council Members
- Da Vinci Connectathons
- **Da Vinci Use Cases**
  - Clinical Data Exchange (CDex)
  - Coverage Requirements Discovery (CRD)
  - Data Exchange for Quality Measures (DEQM
  - Documentation Templates and Payer Rules (
  - Gaps In Care & Information
  - Health Record Exchange Framework (HRex)
  - Notifications (formerly known as Alerts)
  - Payer Coverage Decision Exchange
  - Payer Data Exchange (PDex)
  - Prior Authorization Support
  - Risk Based Contract Member Identification
  - Da Vinci Conference Call Sign Up Instructio
  - Da Vinci Implementation Guide Credits
  - Use Case Technical Artifacts
  - HL7 Workgroup Participation Team
  - Da Vinci Use Case Project Management

Space tools

Dashboard / Da Vinci 7,519 view(s)

Edit Save for later Watching Share ···

Da Vinci Use Cases

Created by Dana Marcelonis, last modified on Mar 17, 2020

Active Use Cases

- Clinical Data Exchange (CDex)
- Coverage Requirements Discovery (CRD)
- Data Exchange for Quality Measures (DEQM)
- Documentation Templates and Payer Rules (DTR)
- Gaps In Care & Information
- Health Record Exchange Framework (HRex)
- Notifications (formerly known as Alerts)
- Payer Coverage Decision Exchange
- Payer Data Exchange (PDex)
- Prior Authorization Support
- Risk Based Contract Member Identification
- Da Vinci Conference Call Sign Up Instructions
- Da Vinci Implementation Guide Credits
- Use Case Technical Artifacts
- HL7 Workgroup Participation Team
- Da Vinci Use Case Project Management

Planned Use Cases

- Performing Laboratory Reporting
- Chronic Illness Documentation for Risk Adjustment
- Patient Cost Transparency
- Health Record Exchange: Patient Data Exchange

Da Vinci use cases are interrelated, currently with five categories that have emerged: Quality Improvement, Coverage/Burden Reduction, Member Access, Process Improvement, and Clinical Data Exchange. Early use cases create building blocks and a framework upon which incremental improvements and additional content can be added over time.

Da Vinci adopts existing and emerging standards with broad support to create viable solutions, such as FHIR as the core, NCQA HEDIS, CDS Hooks, and SMART on FHIR (layering in OAuth security). Existing profiles are adopted where possible (e.g., Argonaut, US-Core, QI-Core)

Weekly Meeting Schedule

Conference Call Sign Up

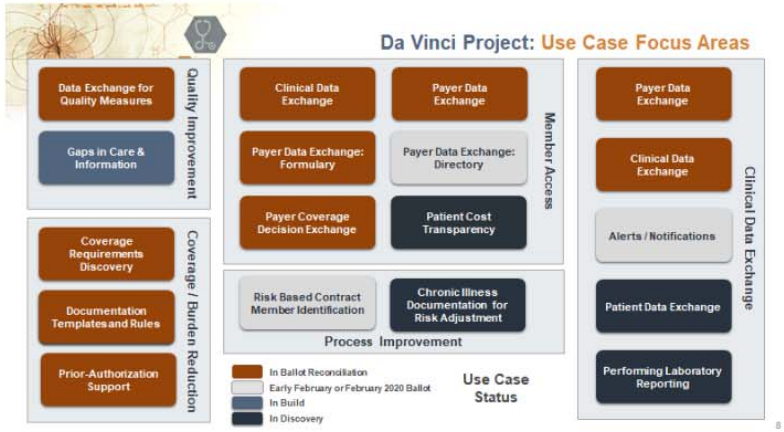
HL7 Conference Call Center

Da Vinci Conference Call Sign Up Instructions

Da Vinci Implementation Guide Dash

Use Case Overviews

Weekly Meeting Schedule



Use Case scope / overview slide deck.

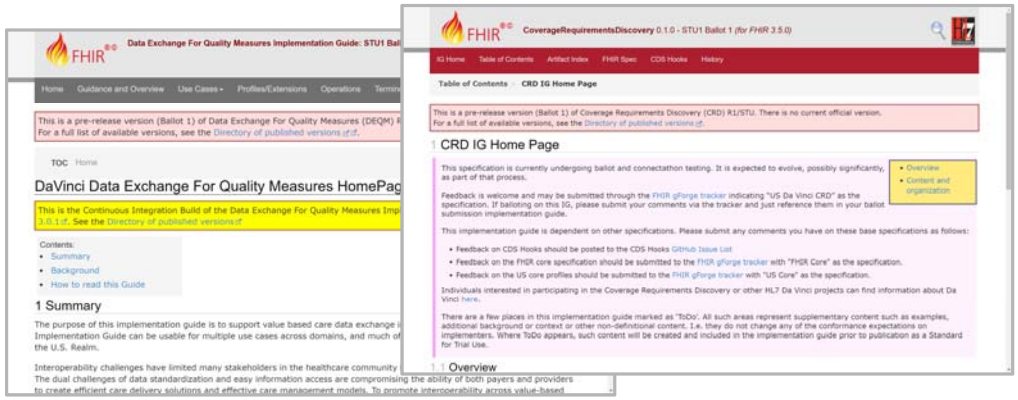
Summary of use case call schedule and meeting details. (*scroll down on Confluence page*)

Provide feedback

Follow Progress, Test, Implement

FIND

- Listserv Sign Up
- Background collateral
- Active Use Case content
- Implementation Guides
- Reference Implementations
- Calendar of Activities & Updates



RESOURCES

- HL7 Confluence Site - https://confluence.hl7.org/display/DVP/
- Where to find Da Vinci in Industry - https://confluence.hl7.org/display/DVP/Da+Vinci+2020+Calendar
- Use Case Summary and Links to Call In & Artifacts - https://confluence.hl7.org/display/DVP/Da+Vinci+Use+Cases
- Reference Implementation Code Repository - https://github.com/HL7-DaVinci
- FHIR Implementers Network – chat.fhir.org

Acknowledgements

Da Vinci Project Members

CMS for in-kind support

MITRE Corporation for
Implementation Guide and
Reference Implementation Development

Michael Watkins
PhD Candidate in Biomedical Informatics
University of Utah
For today's example code

THANK YOU!

Viet Nguyen, MD

vietnguyen@stratametrics.com

ORGANIZED BY

PARTNER

HOST SPONSOR