Clinicians Not Burned Out - but on FHIR®

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This Hands-On Session

• **Goals**
  - Learn ClinFHIR tool
  - Explore FHIR resources and their relationships
  - Introduce scenario modeling

• **Set-up**
  - Recommend Chrome Browser
  - If you have numeric keypad CTRL-+/- zooms in and out
    - Use this if some items are off the screen or hard to read.
    - (On some laptops you can use CTRL-FCN to access the numeric keypad overlay)
  - Keep a notepad handy to jot down information

• **Open ClinFHIR.com**
Getting to Know the ClinFHIR.com Main Page

Main modules (open in new tab)  Experimental modules (open in new tab)

**Patient Viewer**
Display resources for a specific patient, using a number of different views such as a list by resource type, json & tree views, encounters by condition, numeric Observation charting and graphical relationship views.
There is also the option to add a new patient, and to create sample data for that patient.

**Server Query**
Supports ad hoc queries against any FHIR server. Includes a simple query builder. The response can be displayed as json or as a Tree view, and FHIR Inspector is supported.

**Scenario Builder**
The Scenario Builder is used to join together the resources needed to represent a specific clinical scenario. It can use Core Resource types, Profiles and Logical models as it does this. The intention is to help people understand how resources can tell a clinical story, and to validate that the resource types available (including profiles) are sufficient.
Note that the builder still has issues with more complex resource types - this is a work in progress.

**Logical Modeler**
The Logical modeler allows the creation of a model that represents a particular interoperability requirement in a format that is easy to use. It uses FHIR datatypes, and can be based on an existing resource type or completely ‘ad hoc’. It is intended to act as a ‘bridge’ between Modeler and User, and can act as the basis for the generation of the profiling components required by FHIR.

**Implementation Guide Browser**

**Extension Definition Builder**
Views and builds extension definitions. These can be defined and applied to the Logical Model, which will allow them to be included in the generated Profiles.

**CodeSystem builder**
The CodeSystem defines a set of Concepts from which a ValueSet provides possible values for a resource element. The actual ‘binding’ between CodeSystem and element is done by the ValueSet. This component allows you to build (and edit) a CodeSystem, and optionally builds the ValueSet as well.

**ValueSet explorer**
Lets you view existing ValueSets. The builder works best with SNOMED (at the moment), ValueSets are stored on the Terminology Server.

Current servers

<table>
<thead>
<tr>
<th>Edit</th>
<th>Data Server</th>
<th>Public HAPI STU3 server</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Conformance Server</td>
<td>Public HAPI STU3 server</td>
</tr>
<tr>
<td></td>
<td>Terminology Server</td>
<td>Public HAPI STU3 server</td>
</tr>
</tbody>
</table>

Add Server
Set all the same as the Data Server

FHIR Links (open in new tab)

- STU-3 (R3) Specification
- STU-2 Specification
- FHIR wiki
- FHIR org
- Clinicians Workshop

clinFHIR Videos (open in new tab)

- Scenario Builder
- Adding structured data
- Logical Modeler
- Logical Modeler and Scenario Builder
- RESTful query tool

Note that some of these videos may describe earlier versions, so may not completely match the current functionality.

Other links

- SNOMED browser
Same ClinFHIR Main Page – Zoomed in.

### Main modules (open in new tab)

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<thead>
<tr>
<th>Module</th>
<th>Description</th>
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<td>Supports ad hoc queries against any FHIR server. Includes a simple query builder. The response can be displayed as JSON or a tree view, and FHIRPath is supported.</td>
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<tr>
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<td>The Scenario Builder is used to join together the resources needed to represent a specific clinical scenario. It can use Core Resource types, Profiles and Logical models as it does this. The intention is to use the data from the Patient Viewer and Conformance server.</td>
</tr>
</tbody>
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### Experimental modules (open in new tab)

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient resources</td>
<td>Patient resources are stored on the Data Server. The server should support the Patient/$everything operation.</td>
</tr>
<tr>
<td>Can access</td>
<td>Can access any compliant FHIR server (must expose a Capability Statement)</td>
</tr>
</tbody>
</table>

### Current servers

<table>
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</tr>
<tr>
<td>Terminology Server</td>
<td>Ontoserver (terminology)</td>
</tr>
</tbody>
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### FHIR Links (open in new tab)

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<td>STU-3 (R3) Specification</td>
<td>Hay on FHIR</td>
</tr>
<tr>
<td>STU-2 Specification</td>
<td>FHIR Chat</td>
</tr>
<tr>
<td>FHIR wiki</td>
<td>Clinicians Workshop</td>
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</tbody>
</table>
User Settings
Modules

ClinFHIR Modules
- Patient Viewer
- Server Query
- Scenario Builder
- Logical Modeler
- Implementation Guide Browser
- Extension Definition Builder
- Code System Builder
- Value Set Explorer

Each opens in new tab
Server Selection

Server Query
- Supports ad hoc queries against any FHIR server. Includes a simple query builder. The response can be displayed as JSON or a Tree view, and FHIMPath is supported.
- Can access any compliant FHIR server (must expose a Capability Statement)
- Can create a simple scenario
- Add structured data to a scenario
- Create a Document

Scenario Builder
- The Scenario Builder is used to join together the resources needed to represent a specific clinical scenario. It can use Core Resource types, Profiles and Logical models as it does this
- The intention is to help people understand how resources can tell a clinical story, and to validate that the resource types available (including profiles) are sufficient.
- Note that the builder still has issues with more complex resource types - this is a work in progress.

Logical Modeler
- The Logical modeler allows the creation of a model that represents a particular interoperability requirement in a format that is easy to use. It uses FHIR data types, and can be based on an existing resource type or completely ‘ad hoc’. It is intended to act as a ‘bridge’ between Modeler and User, and can act as the basis for the generation of the profile components required by FireIt
- Can create an Information Model
- Create a Resources Model

Implementation Guide Browser
- The Implementation guide, profiles and Extension Definitions are on the Conformance Server, the terminology resources (eg ValueSets) are on the Terminology Server.
- Create an Information Model
- Create a Resources Model

Extension Definition builder
- Views and builds extension definitions. These can be defined and applied to the Logical Model, which will allow them to be included in the generated Profile
- Extension definitions are saved on the Conformance Server

CodeSystem builder
- The CodeSystem defines a set of Concepts from which a ValueSet provides possible values for a resource element. The actual ‘binding’ between CodeSystem and element is done by the ValueSet. This component allows you to build (and edit) a CodeSystem, and optionally builds the ValueSet as well.
- CodeSystems are saved on the Terminology Server.

ValueSet explorer
- Lets you view existing ValueSets. The builder works best with SNOMED (at the moment)
Server Selection

Setting FHIR Servers

- **Data Server**
  *Where your information is stored*

- **Conformance Server**
  *Enforces conformance to FHIR spec*

- **Terminology Server**
  *Vocabulary source*

Follow recommendations during tutorial
Useful FHIR Links

Useful Links
- R4 Specification
- STU-2 Specification
- FHIR wiki
- Hay on FHIR
- FHIR Chat
- FHIR.org
- Clinicians Workshop

Subject to change
ClinFHIR Videos

Scenario Builder

Adding structured data

Logical Modeller

Logical Modeller and Scenario Builder

RESTful query tool

Subject to version variations
Task – Recap

• Open clinfhir.com
• Set up an account – DO NOT REUSE AN OLD PW
• Set up your servers –
  • Data Server – Public HAPI STU3
  • Conformance – Public HAPI STU3
  • Terminology – Ontoserver (Terminology)
Step 1 - Create A User Account
Create User Account

WARNING!!
This is an UNSECURED server! Use a dummy password!

When you login the first time this becomes your user name and password. You may need to pick a different user name if it's already in use.
Step 2 - Server Selection
Open Patient Viewer module
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Patient Viewer

Please select a patient using the 'Select Patient' button at the upper right

If you want to add a new patient, then click the 'Select Patient' button, and in the modal dialog that appears, there's a link to add a new patient.
Selecting a Patient

[Image of a search interface for selecting a patient, with options to search for patients by ID or identifier, and a list of patient names and identifiers for selection.]
Task – Select and View Patient

• Go to Patient Viewer Module
• Enter “Hanley” in Patient Search
• Select “Hanley Strappman” patient
• Explore patient’s FHIR resources
Patient Viewer – Resource Explorer
Patient Viewer – Resource Reference Graph

Scroll to zoom graph
Click and drag to move
Ok – Hang on!
Here we go!!!!
The Scenario Builder

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Create a simple scenario
Adding structured data to a scenario
Create a Document

STU-2 Specific
FHIR wiki

ClinFHIR Videos
Scenario Builder
Adding structured data to a scenario
Logical Models
Adding Structured Data

https://fhirblog.com/adding-structured-data-to-a-scenario/

Time Check – set working time....
### Scenario Builder Module

**Main modules (open in new tab)**

**Patient Viewer**
Display resources for a specific patient, using a number of different views such as a list by resource type, JSON & tree views, encounters by condition, numeric Observation charting and graphical relationship views. There is also the option to add a new patient, and to create sample data for that patient.

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- Conformance Server: Public HAPI STU3 server
- Terminology Server: Public HAPI STU3 server

**Add Server**
- Set all the same as the Data Server

**FHIR Links (open in new tab)**
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- FHIR wiki
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- Scenario Builder
- Adding structured data
- Logical Modeller
- Logical Modeller and Scenario Builder
- RESTful query tool

**Other links**
- SNOMED browser
Create New Scenario

To edit a scenario, you can either:
- Click the 'New Scenario' link to the left to create a new Set
- Select the Library of scenarios ('View Library' link to the upper right) and download one to edit or view
Note: Scenarios are saved locally and need to be posted to a server in order to be shared. Stay tuned!
Task – Create a Patient (15 min)

• Use Scenario Builder module to create your own patient
  • Include a name, gender and birthdate
  • Record patient name and id on your note to find it later
• Validate your resource instance
• Update (POST) the resource to the data server
• Confirm that your patient is on the data server using the Patient Viewer module and the patient id
Link to FHIR Spec
Add HumanName property to Patient.name

Use: Usual

Forename: Joseph
Middle: AMIA
Surname: A

Save
1. Select data element
2. Look at value set
3. Delete element
4. Validate resource
Validate Resource

1. Confirm valid resource
2. Validate all resources & Post resource to server
3. Resource id of resource on the server
Create FHIR Condition Instance
Task – Create a Condition (15 min)

• Use Scenario Builder module to create your own condition
  • SNOMED Code and link to your patient
  • E.g. Diabetes mellitus type 2 (SCTID 44054006)
• Validate your resource instance
• Update (POST) the resource to the data server
• Confirm that your patient is on the data server using the Patient Viewer module and the patient id
• Add additional conditions if you are done early
SNOMED Coded Condition Concept
Enter search term
Explore Value Set

Display ValueSet: condition-code

Includes

Excludes

http://snomed.info/sct

Filters

<table>
<thead>
<tr>
<th>Property</th>
<th>Operation</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>concept</td>
<td>404694003</td>
<td>404694003</td>
</tr>
</tbody>
</table>

http://snomed.info/sct

Concepts

<table>
<thead>
<tr>
<th>Code</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>160246001</td>
<td>No current problems or disability</td>
</tr>
</tbody>
</table>

http://fhirtest.uhn.ca/baseDatos/3/

Limitations

Define concepts are not recursive

SNOMED Concepts
<table>
<thead>
<tr>
<th>Type</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition</td>
<td>Hypertension</td>
</tr>
<tr>
<td>Patient</td>
<td>Joseph AMIA001</td>
</tr>
</tbody>
</table>

**Structure & Reference**

- **Condition**
  - Hypertension

**Current resource views**

- CodeableConcept
  - **ValueSet Binding (example)**
    - http://hl7.org/fhir/ValueSet/condition-code

**Changes**

- Identification of the condition, problem or diagnosis.

**Toggle Input Mode**

- [ResourceType]: "Condition",
  - "status": "generated",
  - "id": "c-f1896562317256",
  - "category": ["Patient/c-f1896562317256"
  - "coding": ["problem-list-item"
  - "system": "http://hl7.org/fhir/condition-category"
1. Select **subject[x]** data element
2. Appropriate data types
3. Available datatypes in this scenario
Note: ClinFHIR automatically links new resources to existing patient resource when appropriate.
Note: Use the validation warnings/errors to correct your resource, then update the server.
View Resource Graph of Scenario
Task - Create other resources for Problem List

• Use Scenario Builder module to create another condition
  • SNOMED Code and link to your patient
  • E.g. Asthma
• Add a Practitioner resource
• Add an Encounter resource
• Add a List resource
Task – Add conditions to Problem List

• Use Scenario Builder module to create another condition
  • SNOMED Code and link to your patient
  • E.g. Asthma
• Add a Practitioner resource
• Add an Encounter resource
• Add a List resource
Add HgbA1c Observation
Bonus Round – Even if you don't get here, you can still play the game at home.
Task – Create an Observation (15min)

• Use Scenario Builder module to create your own Observation
  • Try Fasting Blood Glucose, Height, Weight and BMI
• Use FHIR Spec, Google or LOINC Browser to find LOINC concept code
• Validate your resource instance
• Update (POST) the resource to the data server
• Confirm that your patient is on the data server using the Patient Viewer module and the patient id
• Additional task – add additional observations
Use Value Set Expand to find code
HgbA1c

Observation.cf-1509584468402

Describes what was observed. Sometimes this is called the observation "name".
Add a value to the observation
Validate and POST Observation

The information determined as a result of making the observation. If the information has a simple value.
How FHIR supports Care Plan Elements

Explore Bob Anyman
Care Plan Elements

• Care Plan (Complex Resource)
  • Care Team Resource
  • Conditions
    • Goals
      • Objectives
        • Activities (MedicationRequest, ProcedureRequest, ReferralRequest, etc.)
Care Plan Example