

# Tutorial: Create an Implementation Guide with FHIR Shorthand

Mark Kramer and Chris Moesel, MITRE Corporation



HL7 FHIR DevDays 2021, Virtual Edition, June 7–10, 2021 | @HL7 | @FirelyTeam | #fhirdevdays | [www.devdays.com](http://www.devdays.com)

ORGANIZED BY



PARTNER



## Mark Kramer

- Chief Engineer, MITRE Health Innovation Center

## Chris Moesel

- Principal Software Systems Engineer



# MITRE

Not-for-profit R&D institution working in the public interest and funded by the US government



mCODE<sup>™</sup>



**Clinical**  
**Quality**  
**Language**

**Sho<sup>®</sup>rt** <sup>™</sup>

# FHIR Shorthand at DevDays

## 1. Introduction to FHIR Shorthand (this session)

- Advantages of FSH
- Basic FSH grammar
- Experiment using FSH Online

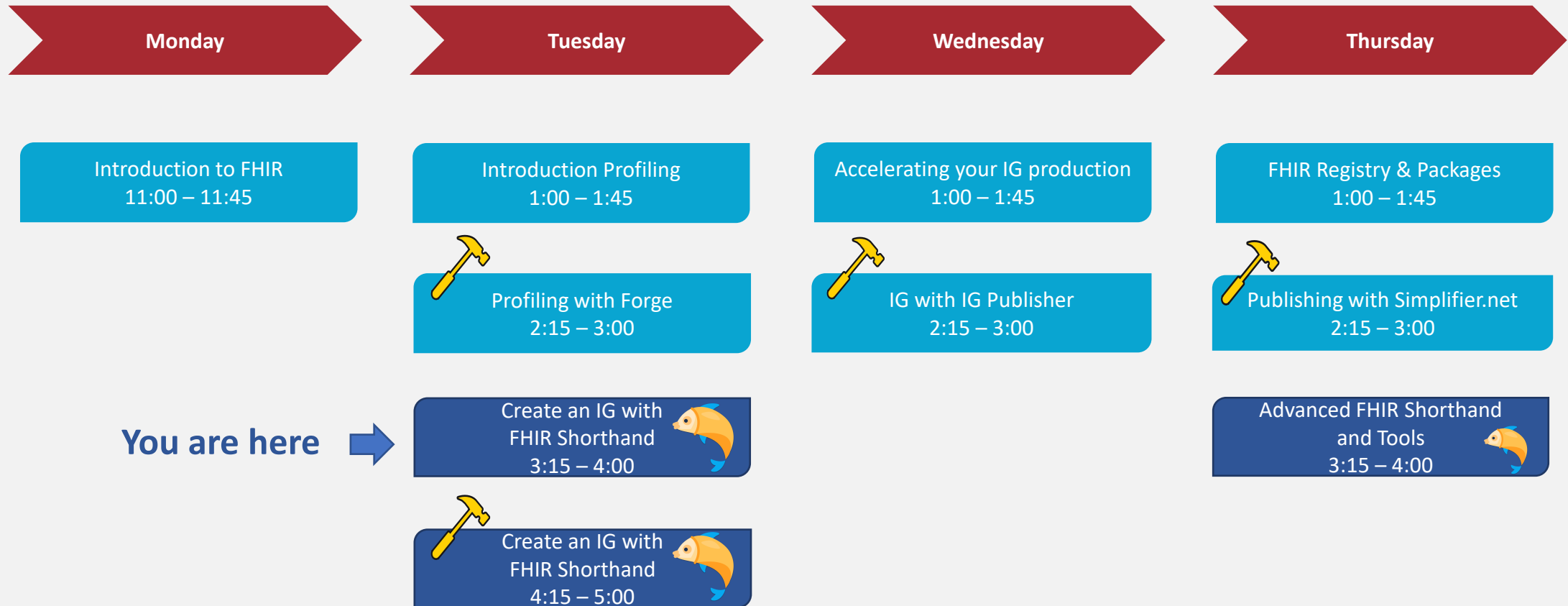
## 2. **Let's Build with FSH (next up @ 4:15 Eastern US time today)**

- Creating Implementation Guides
- Converting an existing IG to FSH

## 3. **Advanced FHIR Shorthand and Tools (Thursday @ 3:15 Eastern US)**

- Fabulous FSH 2.0 features

# Track overview: Let's Build a FHIR specification





# FSH Background



# FHIR Profiles and Implementation Guides

- Base FHIR does not provide the specifics required to implement most exchanges
- **Profiles** are FHIR's way to provide additional details
  - A FHIR profile specifies acceptable codes, extensions, restrictions on data types, and more
- Profiles are collected into **Implementation Guides (IGs)** that describe national standards or complete use cases
- Implementers use IGs to create actual APIs

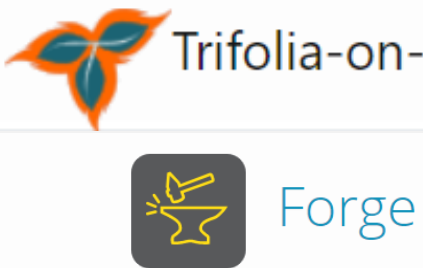
# Profiling Approaches



## Hand-Editing



## User Interfaces



**Profile on Patient<sup>(5)</sup>: PatienNL**

Properties Narrative Element Tree Element Grid Xml

Edit the meta properties of the selected resource or component.


**URL**

**Resource ID**


**Name**

**Description**

## Command-Driven



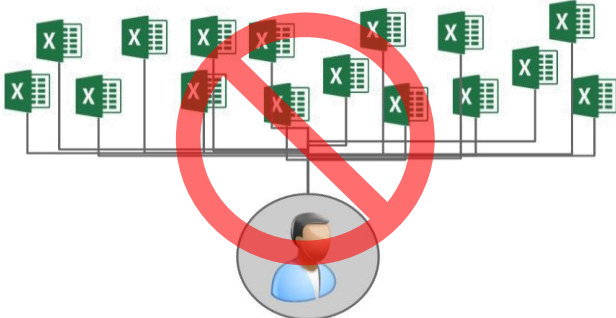
MAKE ME A SANDWICH.



OKAY.

Profile: MyPatient  
 Parent: Patient  
 \* name 1..\* MS

## Spreadsheets



## Advantages of FHIR Shorthand Profiling Language

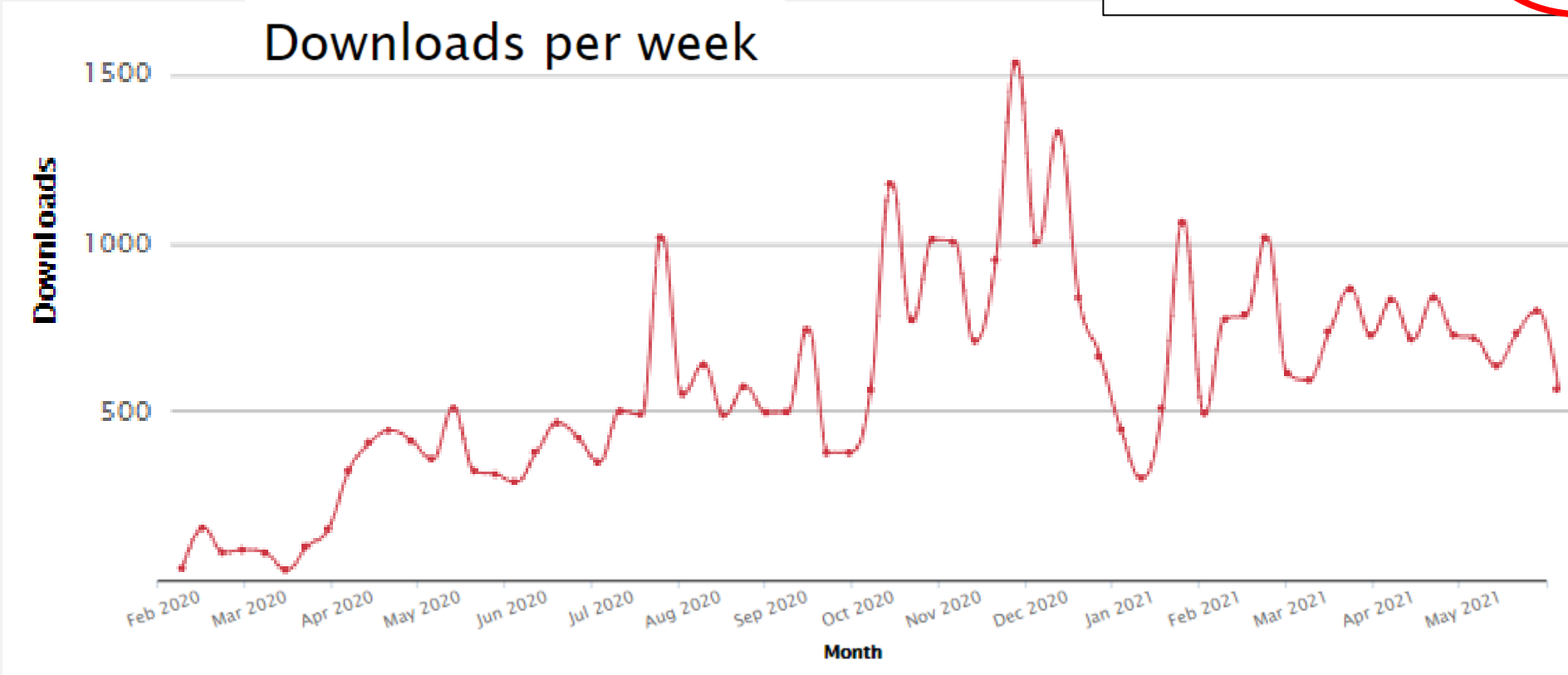
- Concise, readable, understandable
- Rapid changes via text operations: copy, paste, search, and replace
- Perfect for source code control (branching, merging, diffs)
- Error checking and incorporation of best practices
- Complete: FSH does *everything* you can do by manually editing
  - Profiles, extensions, value sets, code systems, invariants, mappings
  - Resources and logical models (NEW!)
- HL7 Standard and integrated with HL7 FHIR IG Publisher



# FSH Consumption

Total number of downloads between 2020-02-12 and 2021-05-27:


package	downloads
fsh-sushi	39,685





# FSH Finder













































## 100+ Implementation Guides






















































































- US
- New Zealand
- Switzerland
- Belgium
- Denmark
- Sweden
- WHO
- DaVinci
- Covid SANER, Logica
- CARIN Blue Button
- SMART Vaccine Credential

FSH Finder 

This is a list of GitHub repositories that contain FSH code. Please see the [README](#) for more details on how this works. Last refreshed about 6 hours ago.

Note: you can mouse over the FSH  icons to see which branches in the repository support SUSH == 1.0. The badge is dimmed  if FSH is not supported on said branch.

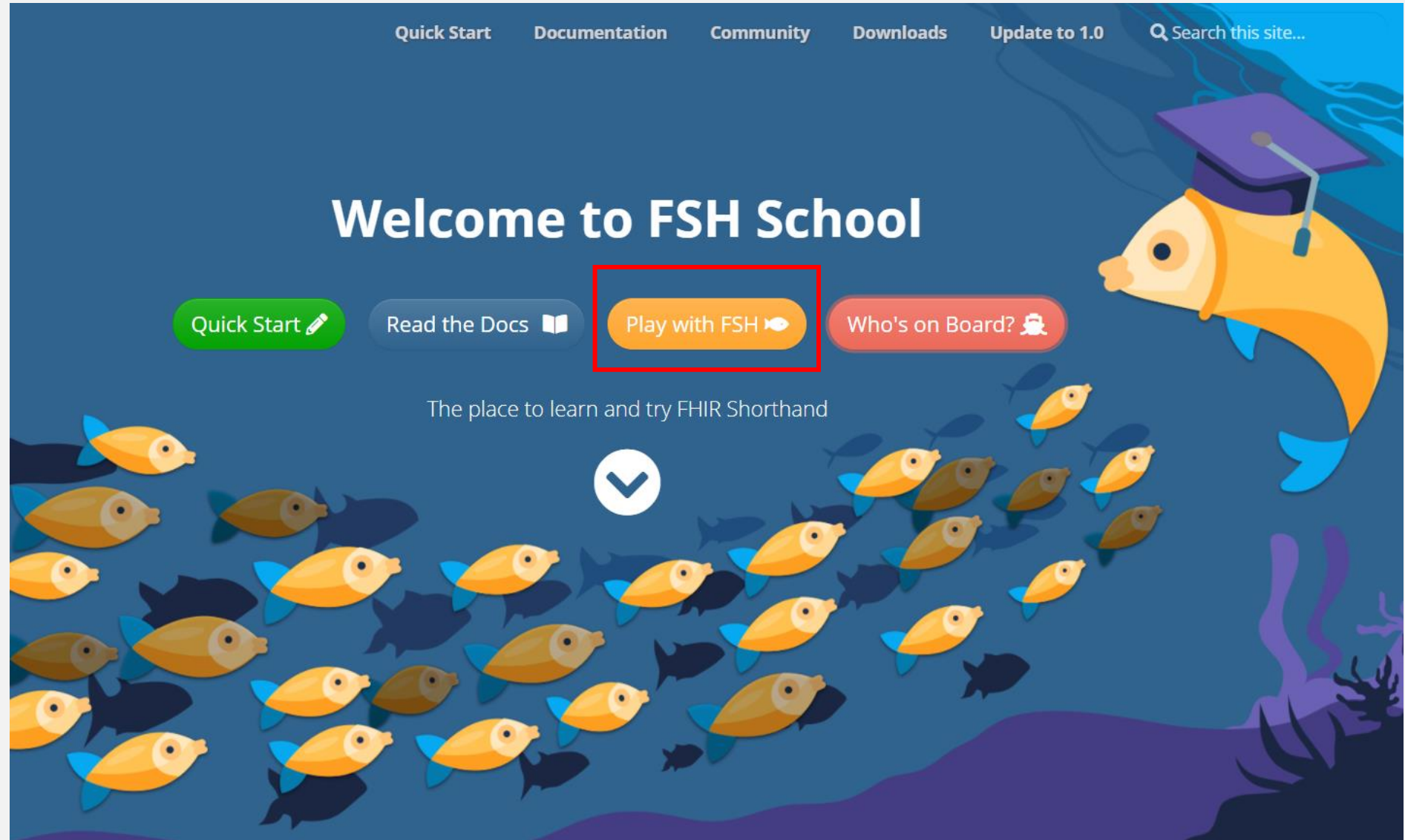
#	Implementation Guide	FSH Version	FSH Profile	FSH Instance	FSH Extension	FSH ValueSet	FSH CodeSystem
1	CIR Immunisation API O <a href="#">daniel-brown / CIR-immunization</a> updated about 11 hours ago [CI build]						
2	New Zealand HPI Implementation Guide O <a href="#">HL7NZ / hpi</a> updated about 15 hours ago [CI build]						
3	Mobile access to Health Documents (MHD) O <a href="#">hl7 / mhd</a> updated about 17 hours ago [CI build]						
4	HL7 FHIR Implementation Guide: Clinical Genomics Reporting Release 1   STU1 O <a href="#">HL7 / genomics-reporting</a> updated about 20 hours ago [CI build]						
5	SPL Mapping FHIR Implementation Guide O <a href="#">HL7 / fhir-spl</a> updated about 21 hours ago [CI build]						
6	pcsp O <a href="#">hl7.eu / pcsp</a> updated about 24 hours ago [CI build]						
7	dgc O <a href="#">dgaika7 / dgc</a> updated a day ago [CI build]						
8	Implementation Guide for faellesommunal informationsmodel O <a href="#">hl7sk / ikl-dk</a> updated a day ago [CI build]						
9	Radiation Dose Summary for Diagnostic Procedures on FHIR O <a href="#">HL7 / fhir-radiation-dose-summary</a> updated a day ago						
10	CH RAD-Order (R4) O <a href="#">HL7 / ch-rad-order</a> updated 2 days ago [CI build]						
11	di-orf O <a href="#">HL7ch / ch-orf</a> updated 2 days ago [CI build]						
12	ritv-medication-record O <a href="#">hl7.be / ritv-medication-record</a> updated 2 days ago [CI build]						
13	Catspacer Implementation Guide O <a href="#">spahemil / catspacer-fhir</a> updated 2 days ago [CI build]						
14	Basic AuditEvent Implementation Guide by John Moehrke O <a href="#">johnmoehrke / BasicAudit</a> updated 3 days ago [CI build]						
15	case-reporting-hiv-nv O <a href="#">spahemil / case-reporting-hiv-nv</a> updated 3 days ago						
16	SMART Health Cards: Vaccination & Testing Implementation Guide O <a href="#">hl7 / vaccine-credential</a> updated 5 days ago [CI build]						
17	KLFBMessaging O <a href="#">hl7sk / klfb-messaging</a> updated 6 days ago [CI build]						
18	New Zealand FHI IG O <a href="#">HL7NZ / fhi</a> updated 7 days ago [CI build]						
19	HL7® FHIR® New Zealand Base Implementation Guide O <a href="#">HL7NZ / nzbase</a> updated 7 days ago [CI build]						
20	empty-fhir-ig O <a href="#">spahemil / empty-fhir-ig</a> updated 7 days ago						
21	WHO Smart Vaccination Certificate O <a href="#">vstc-int / vstc</a> updated 7 days ago						
22	US Core Implementation Guide O <a href="#">HL7 / US-Core</a> updated 7 days ago [CI build]						
23	Da Vinci Prior Authorization Support (PAS) FHIR IG O <a href="#">HL7 / dvlm-pas</a> updated 7 days ago [CI build]						
24	minimal Common Oncology Data Elements (mCODE) Implementation Guide O <a href="#">HL7 / fhir-mcode</a> updated 9 days ago [CI build]						
25	Situational Awareness for Novel Epidemic Response O <a href="#">HL7 / fhir-saner</a> updated 10 days ago [CI build]						
26	ritv-inami O <a href="#">hl7.be / ritv-inami</a> updated 11 days ago [CI build]						
27	dgc O <a href="#">hl7.eu / dgc</a> updated 12 days ago [CI build]						
28	HL7 FHIR Implementation Guide: Standard Health Record (SHR) Adverse Events Release 1 - DAFT O <a href="#">standards4all / fhir-ae</a> updated 13 days ago [CI build]						
29	Patient Corrections Implementation Guide O <a href="#">HL7 / fhir-patient-correction</a> updated 13 days ago [CI build]						
30	智慧疫苗：疫苗接種和認證 O <a href="#">spahemil / vaccine-ig</a> updated 14 days ago [CI build]						
31	HL7 FHIR Implementation Guide - New Zealand Formulary/NZSLM IG O <a href="#">HL7NZ / nzf</a> updated 14 days ago [CI build]						
32	SMART Web Messaging Implementation Guide: STU1 O <a href="#">hl7sk / sm-web-messaging</a> updated 15 days ago [CI build]						

33	Carequality Subscription Implementation Guide for Push Notifications O <a href="#">DataFate / CEOSubscription</a> updated 15 days ago [CI build]						
34	manzana-ig O <a href="#">hl7.be / manzana-ig</a> updated 15 days ago [CI build]						
35	fhir-fairig O <a href="#">hl7 / fhir-fairig</a> updated 15 days ago [CI build]						
36	mCSD O <a href="#">HL7 / HL7mCSD</a> updated 16 days ago [CI build]						
37	Foodbar O <a href="#">hl7 / supplement-template</a> updated 17 days ago [CI build]						
38	HL7 FHIR Implementation Guide: DK Core O <a href="#">hl7sk / dk-core</a> updated 17 days ago [CI build]						
39	hiv-ig O <a href="#">spahemil / hiv-ig</a> updated 18 days ago [CI build]						
40	DRABT - CoRx Implementation Guide: Integrated Trial Matching for Cancer Patients and Providers O <a href="#">standards4all / fhir-pt</a> updated 20 days ago [CI build]						
41	CH eTOC (R4) O <a href="#">HL7ch / ch-etoc</a> updated 22 days ago [CI build]						
42	HL7 FHIR Implementation Guide: Profiles for ICSR Transfusion and Vaccination Adverse Event Detection and Reporting O <a href="#">HL7 / fhir-icse-reporting</a> updated 22 days ago [CI build]						
43	fhir-ips O <a href="#">HL7 / fhir-ips</a> updated 22 days ago [CI build]						
44	medTech IG O <a href="#">HL7NZ / medtech</a> updated 23 days ago [CI build]						
45	DK MedCom Core O <a href="#">hl7sk / dk-medcom</a> updated 23 days ago [CI build]						
46	Swedish Base Profiles Implementation Guide O <a href="#">HL7Sweden / baseprofiles</a> updated 23 days ago [CI build]						
47	Swedish Base Profiles Implementation Guide O <a href="#">dgaika7 / baseprofiles</a> updated 23 days ago [CI build]						



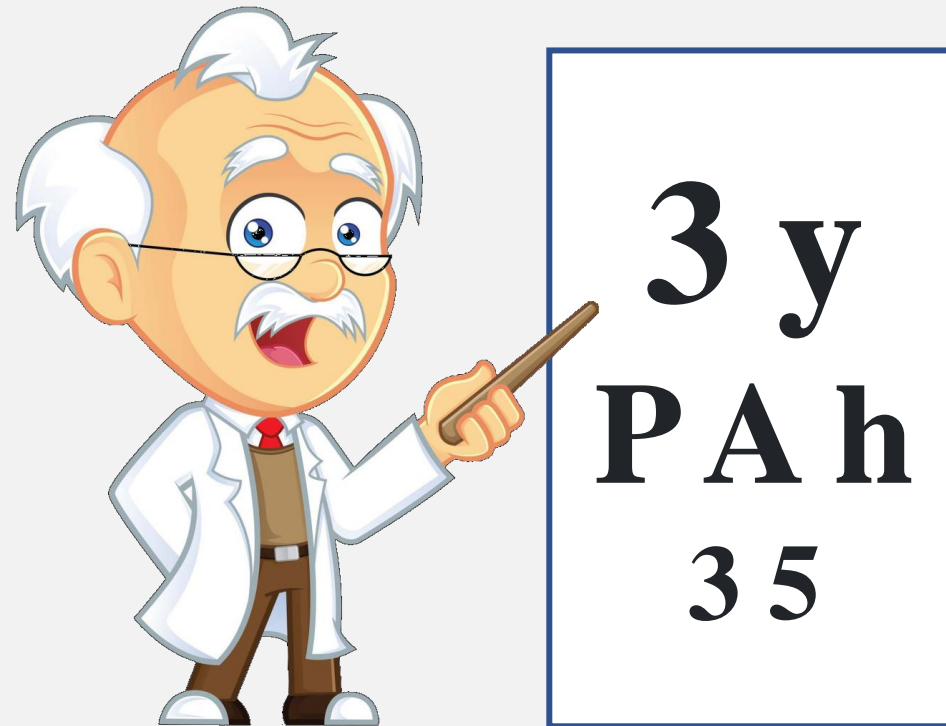
Let's Dive  
into FSH

Go to  
fshschool.org



**Follow along:**

**<https://bit.ly/3yPAh35>**



## Example: COVID-19 Diagnosis Profile

1. Base on Condition
2. Diagnosis code U07.1
3. Bind severity to a required value set
4. Require a Patient as subject

```
Profile: CovidDiagnosis
Parent: Condition
Description: "How to report COVID"
* code = $icd#U07.1
* severity from CovidSeverityVS (required)
* subject only Reference(Patient)
* subject 1..1

Alias: $icd = http://hl7.org/fhir/sid/icd-10-cm
```

# COVID-19 Severity Value Set

1. Start with the FHIR [condition-severity](#) value set

- Include these codes as defined in <http://snomed.info/sct>

Code	Display
<a href="#">24484000</a>	Severe
<a href="#">6736007</a>	Moderate
<a href="#">255604002</a>	Mild

2. Add SNOMED-CT code for "life threatening"

```

ValueSet: CovidSeverityVS
Description: "Values for COVID severity"
* include codes from valueset http://hl7.org/fhir/ValueSet/condition-severity
* include $sct#442452003 "Life threatening severity (qualifier value)"

Alias: $sct = http://snomed.info/sct
  
```

## Add an example of the profile:

1. Create an instance of CovidDiagnosis
2. Set the subject, code, and severity
3. Create the sample patient

```
Instance: DiagnosisExample
InstanceOf: CovidDiagnosis
Description: "Simple example"
* subject = Reference(JaneDoe)
* code = ICD10#U07.1
* severity = SCT#24484000 "Severe"

Instance: JaneDoe
InstanceOf: Patient
Description: "Minimal patient"
* name.family = "Doe"
* name.given = "Jane"
```



**FSH ONLINE**  
Powered by SUSHI v1.3.2 and GoFSH v1.1.0

[Back to School](#)

**Convert to JSON** ▶ ◀ **Convert to FSH**

**Configuration**

**FSH**

```
1 Profile: CovidDiagnosis
2 Parent: Condition
3 Description: "How to report COVID"
4 * code = $icd#U07.1
5 * severity from CovidSeverityVS (required)
6 * subject only Reference(Patient)
7 * subject 1..1
8
9 Alias: $icd = http://hl7.org/fhir/sid/icd-10-cm
10
11 ValueSet: CovidSeverityVS
12 Description: "Values for COVID severity"
13 * include codes from valueset http://hl7.org/fhir/ValueSet/cond
14 * include $sct#442452003 "Life threatening severity (qualifier
15
16 Alias: $sct = http://snomed.info/sct
17
18 Instance: DiagnosisExample
19 InstanceOf: CovidDiagnosis
20 * subject = Reference(JaneDoe)
21 * code = $icd#U07.1
22 * severity = $sct#24484000 "Severe"
23
24 Instance: JaneDoe
25 InstanceOf: Patient
26 * name.family = "Doe"
27 * name.given = "Jane"
28
29
```

**FHIR JSON: CovidDiagnosis**

```
1 {
2   "resourceType": "StructureDefinition",
3   "id": "CovidDiagnosis",
4   "extension": [
5     {
6       "url": "http://hl7.org/fhir/StructureDefinition/structure
7       "valueString": "Clinical.Summary"
8     },
9     {
10      "url": "http://hl7.org/fhir/StructureDefinition/structure
11      "valueCode": "patient"
12    }
13  ],
14  "url": "http://example.org/StructureDefinition/CovidDiagnosis
15  "version": "1.0.0",
16  "name": "CovidDiagnosis",
17  "status": "active",
18  "description": "How to report COVID",
19  "fhirVersion": "4.0.1",
20  "mapping": [
21    {
22      "identity": "workflow",
23      "uri": "http://hl7.org/fhir/workflow",
24      "name": "Workflow Pattern"
25    },
26    {
27      "identity": "sct-concept",
28      "uri": "http://snomed.info/conceptdomain",
29      "name": "SNOMED CT Concept Domain Binding"
30    }
31  ]
32 }
```

**FHIR JSON**

**+ New JSON Editor**

- StructureDefinitions
- CovidDiagnosis**
- ValueSets
- CovidSeverityVS
- Instances
- DiagnosisExample
- JaneDoe

**FHIR Artifacts**

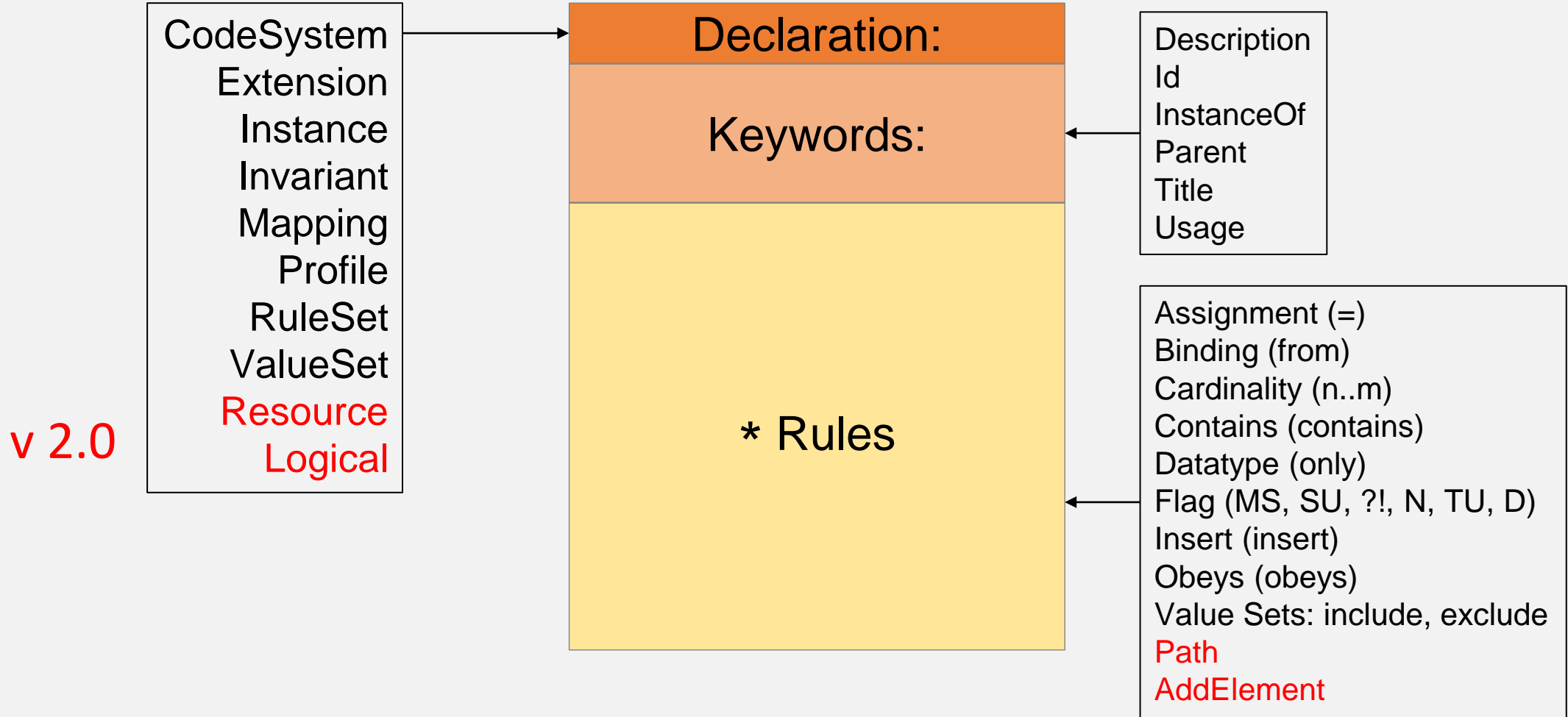
Console ✓ Success!

## Things to Remember

- Keywords: **Profile** and **Parent**
- Keywords: **Instance** and **InstanceOf**
- Codes: {code system}#{code}
- Assignments: \* <element> = {value}
- Binding rule: \* <coded element> **from** {value set} ({bindingstrength})
- Cardinality rule: \* <element> {min}..{max}
- Data Type rule: \* <element> **only** {datatype1} **or** {datatype2}...

Key:  
 {substitute}  
 <path>

# Anatomy of a FSH item:



# Automating Repeated Patterns with Rule Sets

- "Don't repeat yourself" principle
- Share best practices with others

```
RuleSet: CreateComponent(sliceName, min, max, code, short, definition)
* component contains {sliceName} {min}..{max} MS
* component[{sliceName}].code = {code}
* component[{sliceName}] ^short = {short}
* component[{sliceName}] ^definition = {definition}

RuleSet: ObservationComponentSlicingRules
* component ^slicing.discriminator.type = #pattern
* component ^slicing.discriminator.path = "code"
* component ^slicing.rules = #open
* component ^slicing.description = "Slice based on the component.code pattern"
```

## Applying Rule Sets ("insert" rules)

```
Profile: TumorSize
Parent: Observation
Id: tumor-size
Title: "Tumor Size"
Description: "Records the dimensions of a tumor"
* insert ObservationComponentSlicingRules
* insert CreateComponent(maxDimension, 1, 1, LNC#33728-7, "Maximum dimension of tumor",
"The longest tumor dimension")
* insert CreateComponent(otherDimension, 0, 2, LNC#33729-5, "Other tumor dimension",
"Additional tumor dimensions should be ordered from largest to smallest")
```

# Get or share FSH Examples

FSH ONLINE  
Powered by SUSHI v1.3.2 and GoFSH v1.1.0

FSH Examples

- > Aliases
- > Code Systems
- > Extensions
- > Instances
- > Invariants
- > Mappings
- > Paths
- > Profiles
- > Rule Sets
  - Parameterized
    - Create Observation Component
    - Set Extension Context
    - Set Short and Definition
    - Using Soft Indexing
  - Simple
  - Slicing
- > Rules
- > Value Sets

```

Create Observation Component
1 // @Name: Create Observation Component
2 // @Description: Create Observation components easily using RuleSets
3
4 RuleSet: CreateComponent(sliceName, min, max, code, short, definition)
5 * component contains {sliceName} {min}..{max} MS
6 * component[{sliceName}].code = {code}
7 * component[{sliceName}] ^short = {short}
8 * component[{sliceName}] ^definition = {definition}
9
10
11 Alias: LNC = http://loinc.org
12
13 // Put these rules into action
14 Profile: TumorSize
15 Parent: Observation
16 Id: tumor-size
17 Title: "Tumor Size"
18 Description: "Records the dimensions of a tumor"
19 * insert ObservationComponentSlicingRules
20 // Require 1 dimension; up to two additional dimensions are optional
21 * insert CreateComponent(maxDimension, 1, 1, LNC#33728-7, "Maximum dimension of tumor", "The longest
22 * insert CreateComponent(otherDimension, 0, 2, LNC#33729-5, "Other tumor dimension", "Additional tum
23
24
25 // Slice the component element on the component.code element
26 RuleSet: ObservationComponentSlicingRules
27 * component ^slicing.discriminator.type = #pattern
28 * component ^slicing.discriminator.path = "code"
29 * component ^slicing.rules = #open
30 * component ^slicing.description = "Slice based on the component.code pattern"
    
```

contribute your FSH examples at <https://github.com/FSHSchool/FSHOnline-Examples>

# Define an Extension

1. Create Extension
2. Constrain value[x] to CodeableConcept
3. Bind value[x] to a value set
4. Define the value set

```
Extension: ConditionCertainty
Description: "The certainty of diagnosis"
* value[x] only CodeableConcept
* value[x] from ConditionCertaintyVS

ValueSet: ConditionCertaintyVS
Description: "Degree of confidence the condition is present"
* $sct#415684004 "Suspected (qualifier value)"
* $sct#410592001 "Probably present (qualifier value)"
* $sct#41060500 "Confirmed present (qualifier value)"
```

## Add an Extension Context (optional)

- The preceding extension can only be applied to Conditions. The way to limit this is:

```
* ^context[0].type = #element
* ^context[0].expression = "Condition"
```

- This is hard to remember, so consider capturing in a reusable Rule Set:

```
RuleSet: ExtensionContext(path)
* ^context[+].type = #element
* ^context[=].expression = "{path}"
```

Note: You must copy the rule set into your project. FSH does not have libraries at the current time

- Then insert into the Extension definition:

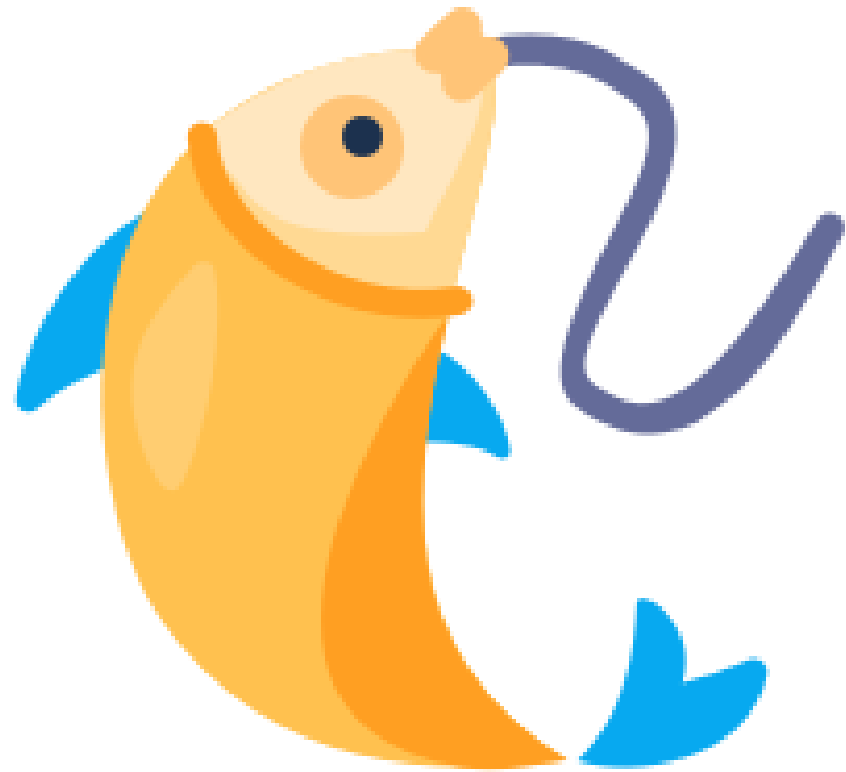
```
* insert ExtensionContext(Condition)
```



# Add the Extension to the CovidCondition Profile

1. Add the extension
2. Use the element name "certainty"
3. Set cardinality 0..1
4. Add "Must Support"

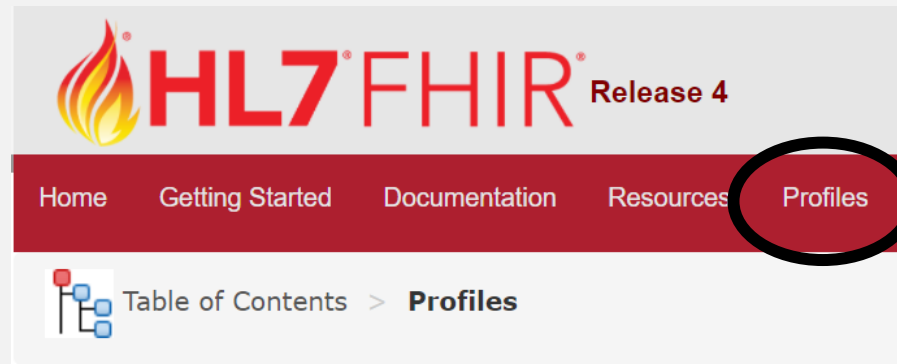
```
Profile: CovidDiagnosis
Parent: Condition
Description: "How to report COVID"
* code = $icd#U07.1
* severity from CovidSeverityVS (required)
* subject only Reference(Patient)
* extension contains ConditionCertainty named certainty 0..1 MS
```



Learn FSH  
using GoFSH

The screenshot displays the FSH ONLINE web application interface. At the top left, the logo for FSH ONLINE is shown, along with the text "Powered by SUSHI v1.3.2 and GoFSH v1.1.0". In the top right corner, there is a "Back to School" button. Below the header, there are two main buttons: "Convert to JSON" and "Convert to FSH". The "Convert to FSH" button is highlighted with a red rectangular box. To the right of these buttons is a "Configuration" button with a gear icon. The main workspace is split into two panes. The left pane is titled "FSH" and contains the text "1 Paste or edit FSH here...". The right pane is titled "FHIR JSON: Untitled" and contains the text "1 Paste or edit single FHIR JSON artifact here... Create additional FHIR JSON artifacts to the right." A large white text overlay is centered across both panes, reading "GoFSH converts FHIR JSON to FHIR Shorthand". On the right side of the workspace, there is a sidebar with a "+ New JSON Editor" button and a list of editors, including "Unknown Type" and "Untitled". At the bottom left of the interface, there is a "Console" button with an upward-pointing arrow.

## Try this: Convert Body Height Vital Signs Profile to FSH



- <https://www.hl7.org/fhir/bodyheight.profile.json>
  - Or Profiles: observation-bodyheight → JSON → Raw JSON
- **Copy and paste** into right pane of FSH Online
- Click **Convert to FSH**

# GoFSH Converted FHIR profile:

FSH	FHIR JSON: bodyheight
<pre> 1  Alias: \$vitalsigns = http://hl7.org/fhir/StructureDefinition/vitalsigns 2 3  Profile: observation-bodyheight 4  Parent: \$vitalsigns 5  Id: bodyheight 6  Title: "Observation Body Height Profile" 7  Description: "FHIR Body Height Profile" 8  * ^extension[0].url = "http://hl7.org/fhir/StructureDefinition/structurede 9  * ^extension[=].valueMarkdown = "#### Complete Summary of the Mandatory Re 10 * ^extension[+].url = "http://hl7.org/fhir/StructureDefinition/structurede 11 * ^extension[=].valueInteger = 5 12 * ^extension[+].url = "http://hl7.org/fhir/StructureDefinition/structur 13 * ^extension[=].valueCode = #oo 14 * ^extension[+].url = "http://hl7.org/fhir/StructureDefinition/structur 15 * ^extension[=].valueCode = #trial-use 16 * ^status = #draft 17 * ^experimental = false 18 * ^date = "2018-08-11" 19 * ^publisher = "Health Level Seven International (Orders and Observations 20 * ^contact.telecom.system = #url 21 * ^contact.telecom.value = "http://www.hl7.org/Special/committees/orders/i 22 * . 0..*" 23 * . ^short = "FHIR Body Height Profile" 24 * . ^definition = "This profile defines how to represent Body Height obser 25 * code ^short = "Body Height" 26 * code ^definition = "Body Height." 27 * code ^comment = "additional codes that translate or map to this code are 28 * code ^alias[0] = "Test" 29 * code ^alias[+] = "Name"           </pre>	<pre> 1 { 2   "resourceType" : "StructureDefinition", 3   "id" : "bodyheight", 4   "text" : { 5     "status" : "generated", 6     "div" : "&lt;div xmlns=\\"http://www.w3.org/1999/xhtml\"&gt;to do&lt;/div&gt;" 7   }, 8   "extension" : [{ 9     "url" : "http://hl7.org/fhir/StructureDefinition/structuredefinition-sum 10    "valueMarkdown" : "#### Complete Summary of the Mandatory Requirements\r 11  }, 12  { 13    "url" : "http://hl7.org/fhir/StructureDefinition/structuredefinition-fmm 14    "valueInteger" : 5 15  }, 16  { 17    "url" : "http://hl7.org/fhir/StructureDefinition/structuredefinition-wg" 18    "valueCode" : "oo" 19  }, 20  { 21    "url" : "http://hl7.org/fhir/StructureDefinition/structuredefinition-sta 22    "valueCode" : "trial-use" 23  }], 24  "url" : "http://hl7.org/fhir/StructureDefinition/bodyheight", 25  "version" : "4.0.1", 26  "name" : "observation-bodyheight", 27  "title" : "Observation Body Height Profile", 28  "status" : "draft", 29  "experimental" : false.           </pre>

## Additional Syntax:

- Caret (^) refers to metadata in the StructureDefinition

```
* ^experimental = false
* ^date = "2018-08-11"
* ^publisher = "Health Level Seven International (Orders and Observations Workgroup)"

* code ^short = "Body Height"
* code ^definition = "Body Height."
```

- [0], [+], [=] refer to first, next, same array elements


```
* ^extension[+].url = "http://hl7.org/fhir/StructureDefinition/structuredefinition-fmm"
* ^extension[=].valueInteger = 5
```

*(indicate the FHIR Maturity of this profile = 5 using extension on StructureDefinition)*


## FSH Resources and Tools

- [FSH Language Specification](#) -- HL7 FHIR Standard
- [SUSHI](#) -- compile FSH into FHIR Artifacts
- [FSH School](#) -- web site with documentation, tools, examples
- [FSH Online](#) -- interactive FHIR Shorthand with examples
- [GoFSH](#) -- convert existing implementation guides into FSH (beta)
- [FSH Finder](#) -- web crawler to find FSH projects
- [VS Code extension](#) -- code highlighter for VS Code editor
- [# shorthand](#) -- Zulip chat channel

# Language Reference: FHIR Shorthand IG



**FHIR Shorthand**  
1.1.0 - CI Build



[Home](#) | [Table of Contents](#) | [Overview](#) | [Language Reference](#) | [SUSHI](#) | [Downloads](#)

[Table of Contents](#) > **Language Reference**

FHIR Shorthand, published by HL7 International - FHIR Infrastructure Group. This is not an authorized publication; it is the continuous build for version 1.1.0. This version is based on the current content of <https://github.com/HL7/fhir-shorthand/> and changes regularly. See the [Directory of published versions](#)

## 3 Language Reference

This chapter contains the formal specification of the FHIR Shorthand (FSH) language. It is intended as a reference, not a tutorial.

In this specification, the key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" are to be interpreted as described in [RFC2119](#).

### 3.1 About the Specification

The FSH specification uses syntax expressions to illustrate the FSH language. While FSH has a formal grammar (see [Appendix](#)), most readers will find the syntax expressions more instructive.

Syntax expressions uses the following conventions:

Style	Explanation	Example
Code	Code fragments, such as FSH keywords, FSH statements, and FSH syntax expressions	* status = #open
{curly braces}	An item to be substituted in a syntax expression	{display string}
<datatype>	An element or path to an element with the given data type, to be substituted in the syntax expression	<CodeableConcept>
<i>italics</i>	An optional item in a syntax expression	"{string}"
ellipsis (...)	Indicates a pattern that can be repeated	{flag1} {flag2} {flag3} ...
<b>bold</b>	A directory path or file name	<b>example-1.fsh</b>
vertical bar	A choice of items or data types in the syntax	name id url

**Examples:**

- A FSH rule to assign the value of a Quantity:

```
* <Quantity> = {decimal or integer} '{UCUM unit}'
```

A FSH statement following this pattern would be written as:

- About the Specification
- FSH Foundations
- FSH Language Basics
- FSH Paths
- Rules for Profiles, Extensions, and Instances
- Defining Items
- Appendix: Abbreviations
- Appendix: Formal Grammar

<http://build.fhir.org/ig/HL7/fhir-shorthand/>



# Downloads → Quick Reference Card

FHIR Shorthand 1.0 Quick Reference: Syntax

Key to Expression Syntax	
{curly braces}	An item to be substituted
<angle brackets>	Path to an element of given data type
<i>Italics</i>	An optional item
<i>Italics</i>	An optional statement
ellipsis (...)	Indicates a pattern that can be repeated
vertical bar ( )	Indicates a choice of items or data types
<b>bold</b>	Default value

Notations and Special Values	
code	#(code)
Coding	{CodeSystem name id url version string} (code) " <i>display string</i> "
Cardinality	(min).. <i>(max)</i>   (min).. <i>(max)</i>
Quantity with units	{decimal or integer} "UCUM code"
Comments	// single line comment /* multi-line comment */
Flags	MS // must support TU // trial use SU // summary, I N // normative ? // modifier D // draft
Binding strengths	required  <i>extensible</i>  preferred example
Triple quote string	"""(string markdown)"""
References	Reference({Resource name id url}) Canonical({name id}  <i>version string</i> )

Paths	
Array element	<array element>[0-based index]
Reference	<Reference>{Resource Profile name id url}
Extension	<Extension>{extension name id url}
Sliced array	<array element>[slice-name]{ <i>reslice-name</i> }
Caret paths	<element of StructureDefinition> <element in Profile> ^<element in corresponding ElementDefinition>

Slicing Rubric	
* <array-path> ^slicing.discriminator.type = {#pattern} #value  #type  #profile  #extends	
* <array-path> ^slicing.discriminator.path = {FHIRPath string}	
* <array-path> ^slicing.rules = {#open  #closed  #openAtEnd}	
* <array-path> ^slicing.ordered = true false	
* <array-path> ^slicing.description = {string}	

Item	Keywords
Alias	Alias: {alias name} = {uri urn:oid} // alias name may begin with \$
Extension	Extension: {name} Parent: {Extension name id url} Id: {id} Title: {string} Description: {string or markdown}
Instance	InstanceOf: {Resource Profile name id url} Usage: {#example   #definition   #inline} Title: {string} Description: {string or markdown}
Invariant	Invariant: {id} Severity: {#error  #warning} Description: {string markdown} Expression: {FHIRPath string} XPath: {XPath expression string}
Mapping	Mapping: {id} Source: {Profile name id} Target: {Target specification uri} Id: {Target specification id} Title: {Target description string} Description: {string}
Profile	Profile: {name} Parent: {Resource Profile name id url} Id: {id} Title: {string} Description: {string or markdown}
RuleSet	RuleSet: {name}
Value Set and Code System	ValueSet: {name} or CodeSystem: {name} Id: {id} Title: {string} Description: {string or markdown}

Code System Rules	
Define local code	* {code} " <i>display string</i> " " <i>definition string</i> "

Get More Information	

FSH Specification FSH Chat FSH School HL7 Project Page

Value Set Rules	
Include single code	* include {Coding}
Exclude single code	* exclude {Coding}
Include entire code system	* include codes from system {CodeSystem name id url}
Exclude from value set	* include codes from valueset {ValueSet name id url}
Exclude from value set	* exclude codes from valueset {ValueSet name id url}
Filter syntax:	{property} {filter-operator} {value}
Include codes with filtering	* include codes from system {CodeSystem name id url} where {filter1} and {filter2} and ...
Exclude codes with filtering	* exclude codes from system {CodeSystem name id url} where {filter1} and {filter2} and ...

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FHIR Shorthand 1.0 Quick Reference: Examples

Notations and Special Values	
code	#confirmed
Coding and CodeableConcept	http://snomed.info/ct#363346000 "Malignant neoplastic disease (disorder)" ICD10CM#C004
Cardinality	0..1 1..1 2..* (two-sided) ..1 1.. 2.. (one-sided)
Comments	// end of line or single line /* This comment continues over multiple lines */
References	Reference(Patient) Reference(Patient or Practitioner) Canonical(MyPatient)

Paths	
Nested element	stage.assessment
Array element	name[0].given[1]
Choice [x] element	valueQuantity, valueReference
Reference choices	performer[Organization]
Extensions	extension[terminationReason] extension[http://hl7.org/fhir/StructureDefinition/location-distance]
Sliced arrays	component[DiastolicPressure]
Resliced arrays	component[RespiratoryScore][OneMinute]
StructureDefinition escape (caret syntax)	^abstract component[VariationCode] ^short

Slicing Rubric	
* component ^slicing.discriminator.type = #pattern	
* component ^slicing.discriminator.path = "code"	
* component ^slicing.rules = #open	
* component ^slicing.ordered = false	
* component ^slicing.description = "Slice on component.code"	

Code System Rule	
Local code definition	* #NED "No Evidence of Disease" "No physical evidence of disease on exam or imaging tests."

Item	Keywords
Alias	Alias: UCUM = http://unitsofmeasure.org Alias: race = urn:oid:2.16.840.1.113883.6.238 Alias: \$GenderIdentity = http://hl7.org/fhir/StructureDefinition/patient-genderidentity
Code system	CodeSystem: AJCC_FairUse Title: "AJCC Fair Use" Description: "A small subset of AJCC staging codes used for IG examples."
Extension	Extension: TreatmentTerminationReason Id: treatment-termination-reason Title: "Treatment Termination Reason" Description: "Reason for stopping a treatment."
Instance	Instance: TumorMarkerExample01 InstanceOf: TumorMarker Usage: #example Description: "Epidermal growth factor example."
Invariant	Invariant: us-core-8 Description: "Patient.name.given or Patient.name.family or both SHALL be present" Expression: "family.exists() or given.exists()" Severity: #error XPath: "f.given or f.family"
Mapping	Mapping: USCancerPatientToArgonaut Source: USCancerPatient Target: "http://unknown.org/Argonaut-DQ-DSTU2" Id: argonaut-dq-dstu2 Title: "Argonaut DSTU2"
Profile	Profile: USCancerPatientProfile Parent: USCancerPatientProfile Id: mcode-cancer-patient Title: "Cancer Patient" Description: "A patient diagnosed with cancer"
Rule set	RuleSet: ExperimentalProfileRules
Value set	ValueSet: AnatomicalOrientationVS Title: "Anatomical Orientation Value Set" Description: "Values for anatomical orientation."

Rules	
Assignment	* status = #arrived * code = SCT#18165001 "Jaundice (finding)" * onsetDateTime = "2019-04-02" * subject = Reference(EveAnyPerson) * valueQuantity = 2.5 "mm" * valueQuantity = UCUM#mm "millimeters"
Binding	* bodySite from CancerBodyLocationVS (preferred) * valueCodeableConcept from http://loinc.org/vs/LL1971-2 (required) * valueQuantity from LengthUnitsVS (extensible)
Cardinality	* severity 0..0 * subject 1..*
Contains (inline extension)	* extension contains treatmentIntent 0..1 MS and terminationReason 0..* MS
Contains (standalone extension)	* extension contains \$GenderIdentity named genderIdentity 0..1 MS and http://hl7.org/fhir/StructureDefinition/patient-disability named disability 0..1 MS
Contains (slicing)	* component contains GeneStudied 0..* MS and VariationCode 0..* and GenomicDNAChange 0..1
Flag	* deceased[x] MS ? SU * reasonCode and extension[terminationReason] MS
Insert	* insert USCoreTerminologyRuleSet
Mapping	* -> "Patient" * identifier.system -> "Patient.Identifier.system"
Obeys	* obeys us-core-6 and us-core-9 * name obeys us-core-8
Type	* value[x] only CodeableConcept * effective[x] only dateTime or Period * subject only Reference(CancerPatient) * asserter only Reference(Practitioner or Patient)

Value Set Rules	
Single code	* SCT#54102005 "G1 grade (finding)"
Exclude single code	* exclude SCT#12619005
All codes in system	* include codes from system HGVS
Filter Rules for SNOMED-CT (assumes code system aliased as 'SCT')	
Subsumption	* include codes from system SCT where concept is a #123037004 "Body Structure"
Exclude subsumption	* exclude codes from system SCT where concept is a #123037004 "Body Structure" * Secondary malignant neoplastic disease (disorder)

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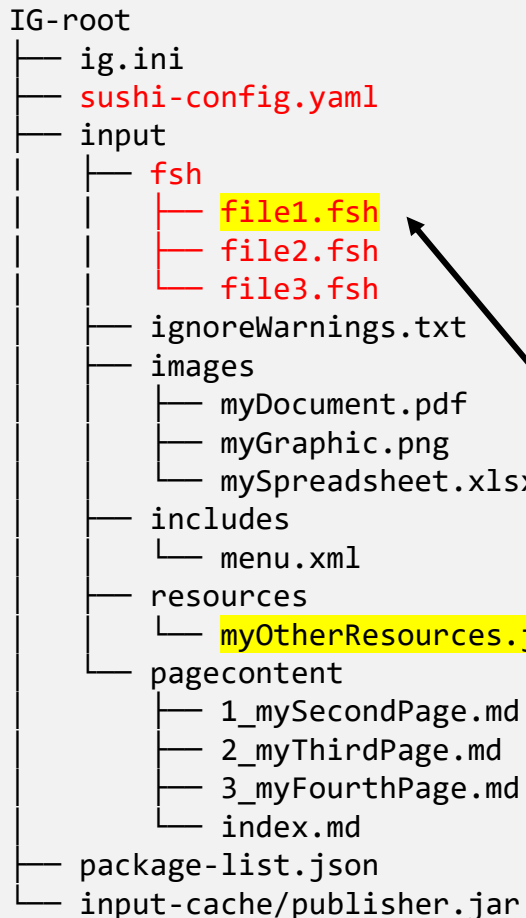
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Syntax

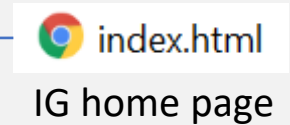
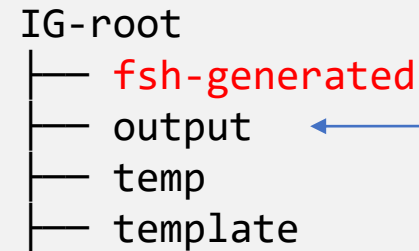
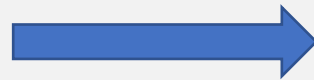
Examples

# Look Ahead to Let's Build (next session)

## Creating a FSH Implementation Guide



run HL7 IG publisher  
(runs SUSHI for you)



You can mix FSH with resources created by Trifolia or Forge

## Prepare for Let's Build (next session)

- Install **Node.js LTS** edition from <https://nodejs.org/>
- Install **SUSHI** and **GoFSH**
  - Open a terminal and run: `npm install -g fsh-sushi`
  - Open a terminal and run: `npm install -g gofsh`
- Install **VS Code** (if text editor is needed)
  - <https://code.visualstudio.com/download>

Questions?



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# Tutorial: Create an Implementation Guide with FHIR Shorthand

Mark Kramer and Chris Moesel, MITRE Corporation



HL7 FHIR DevDays 2021, Virtual Edition, June 7–10, 2021 | @HL7 | @FirelyTeam | #fhirdevdays | [www.devdays.com](http://www.devdays.com)

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## Mark Kramer

- Chief Engineer, MITRE Health Innovation Center

## Chris Moesel

- Principal Software Systems Engineer



# MITRE

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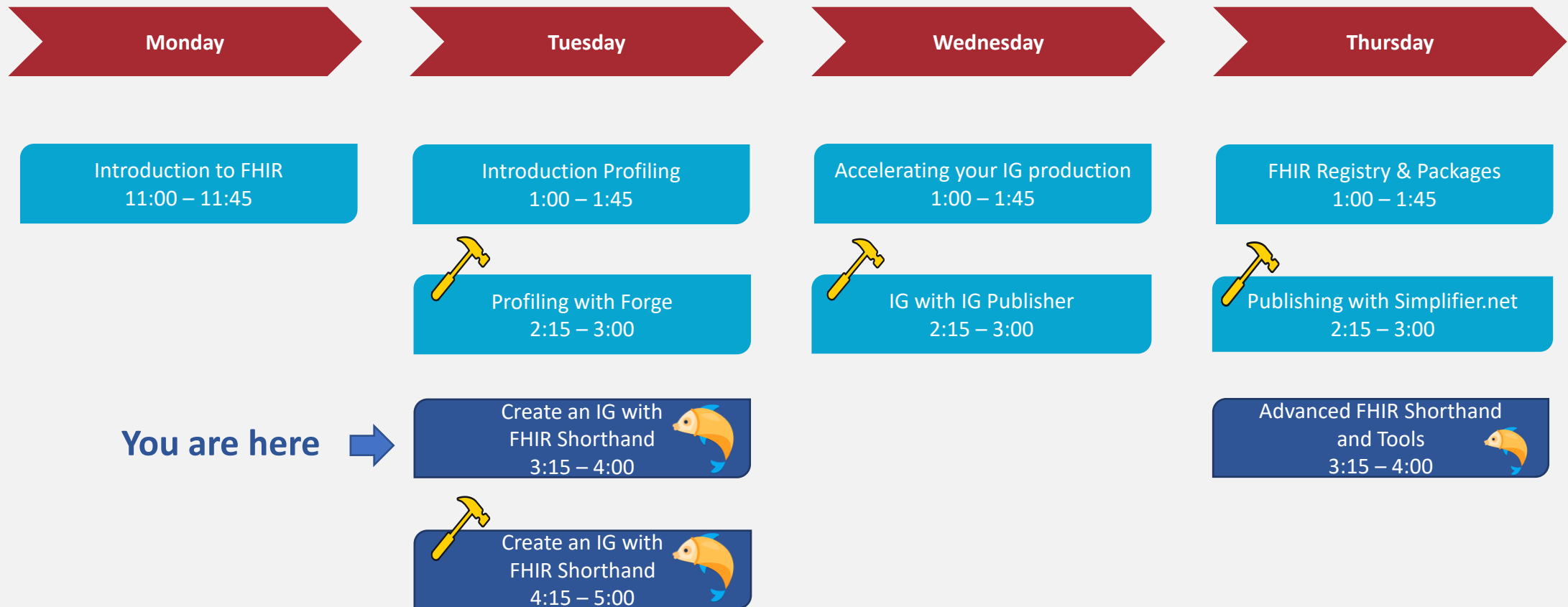
mCODE™



**Clinical**  
**Quality**  
**Language**

FHIR®  
**Short** ™

# Track overview: Let's Build a FHIR specification







# FSH Background



# FHIR Profiles and Implementation Guides

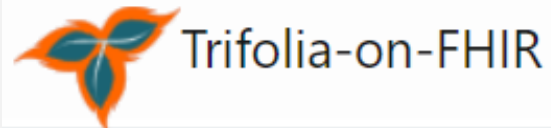
- Base FHIR does not provide the specifics required to implement most exchanges
- **Profiles** are FHIR's way to provide additional details
  - A FHIR profile specifies acceptable codes, extensions, restrictions on data types, and more
- Profiles are collected into **Implementation Guides (IGs)** that describe national standards or complete use cases
- Implementers use IGs to create actual APIs

# Profiling Approaches

## Hand-Editing



## User Interfaces



Profile on Patient<sup>(5)</sup>: *PatienNL*

Properties Narrative Element Tree Element Grid Xml

Edit the meta properties of the selected resource or component.

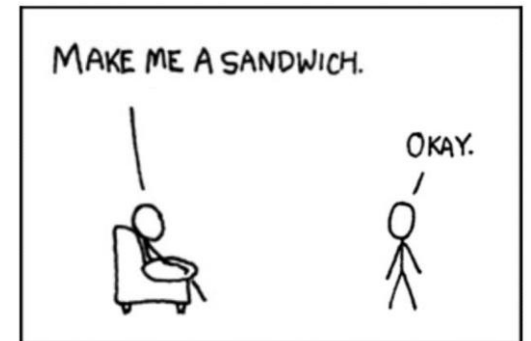
**URL**

**Resource ID**

**Name**

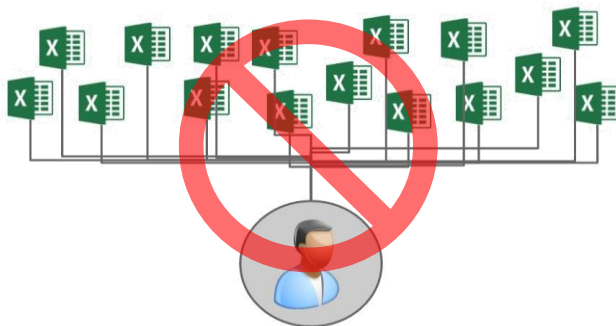
**Description**

## Command-Driven



Profile: MyPatient  
 Parent: Patient  
 \* name 1..\* MS

## Spreadsheets



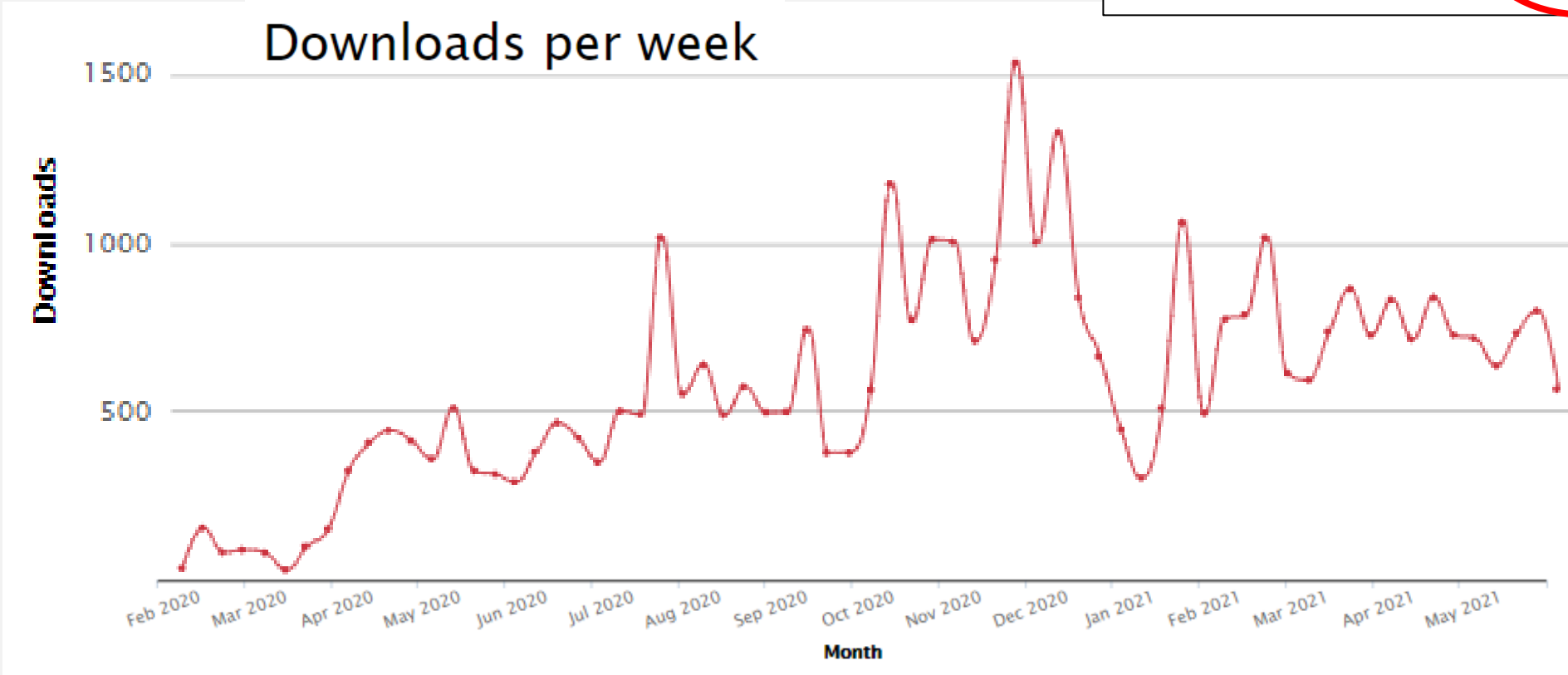
## Advantages of FHIR Shorthand Profiling Language

- Concise, readable, understandable
- Rapid changes via text operations: copy, paste, search, and replace
- Perfect for source code control (branching, merging, diffs)
- Error checking and incorporation of best practices
- Complete: FSH does *everything* you can do by manually editing
  - Profiles, extensions, value sets, code systems, invariants, mappings
  - Resources and logical models (NEW!)
- HL7 Standard and integrated with HL7 FHIR IG Publisher

# FSH Consumption

Total number of downloads between 2020-02-12 and 2021-05-27:


package	downloads
fsh-sushi	39,685





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











































































































## 100+ Implementation Guides

- US
- New Zealand
- Switzerland
- Belgium
- Denmark
- Sweden
- WHO
- DaVinci
- Covid SANER, Logica
- CARIN Blue Button
- SMART Vaccine Credential

FSH Finder  Other formats  Source code  Report a problem

This is a list of GitHub repositories that contain FSH code. Please see the README for more details on how this works. Last refreshed about 6 hours ago.

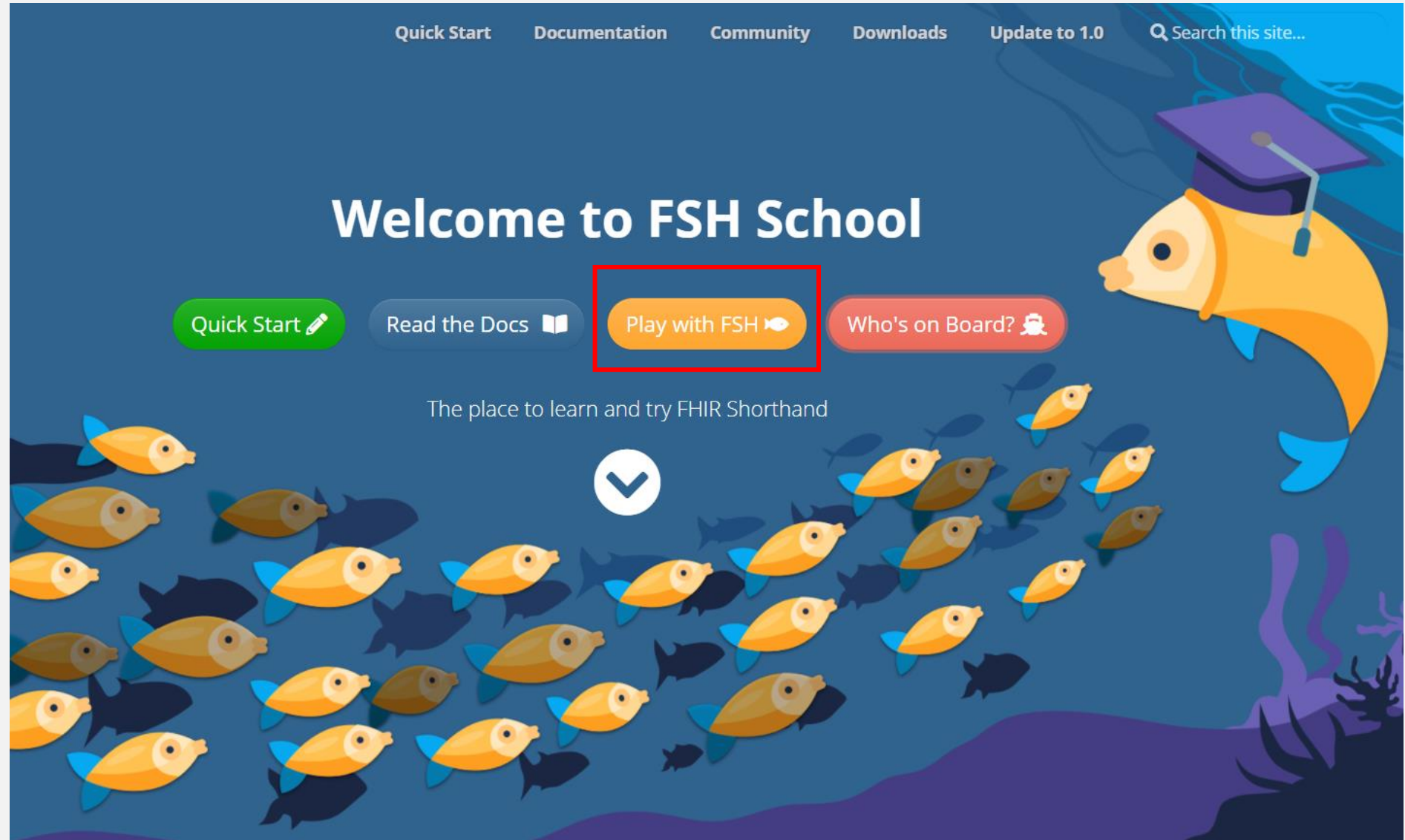
Note: you can mouse over the FSH  icons to see which branches in the repository support SUSH 1.0. The badge is dimmed  if FSH is not supported on said branch.

#	Implementation Guide	FSH Version	FSH Profile	FSH Instance	FSH Extension	FSH ValueSet	FSH CodeSystem
1	<a href="#">CIR Immunisation API</a> O <a href="#">danielrossier / CIRimmunization</a> updated about 11 hours ago [CI build]						
2	<a href="#">New Zealand HPI Implementation Guide</a> O <a href="#">HL7NZ / hpi</a> updated about 15 hours ago [CI build]						
3	<a href="#">Mobile access to Health Documents (MHD)</a> O <a href="#">hl7 / MHD</a> updated about 17 hours ago [CI build]						
4	<a href="#">HL7 FHIR Implementation Guide: Clinical Genomics Reporting Release 1   STU1</a> O <a href="#">HL7 / genomics-reporting</a> updated about 20 hours ago [CI build]						
5	<a href="#">SPL Mapping FHIR Implementation Guide</a> O <a href="#">HL7 / fhir-spl</a> updated about 21 hours ago [CI build]						
6	<a href="#">pcsp</a> O <a href="#">hl7.eu / pcsp</a> updated about 24 hours ago [CI build]						
7	<a href="#">dpc</a> O <a href="#">dpc/dpc</a> updated a day ago [CI build]						
8	<a href="#">Implementation Guide for faellesommunal informationsmodel</a> O <a href="#">hl7sk / RL-dk</a> updated a day ago [CI build]						
9	<a href="#">Radiation Dose Summary for Diagnostic Procedures on FHIR</a> O <a href="#">HL7 / fhir-radiation-dose-summary</a> updated a day ago						
10	<a href="#">CH RAD-Order (R4)</a> O <a href="#">HL7 / ch-rad-order</a> updated 2 days ago [CI build]						
11	<a href="#">di-orf</a> O <a href="#">HL7 / di-orf</a> updated 2 days ago [CI build]						
12	<a href="#">rivv-medication-record</a> O <a href="#">hl7.be / rivv-medication-record</a> updated 2 days ago [CI build]						
13	<a href="#">Catspacer Implementation Guide</a> O <a href="#">spaher / catspacer-fhir</a> updated 2 days ago [CI build]						
14	<a href="#">Basic AuditEvent Implementation Guide by John Moehrke</a> O <a href="#">johnmoehrke / BasicAudit</a> updated 3 days ago [CI build]						
15	<a href="#">case-reporting-hiv-nv</a> O <a href="#">openhiv / case-reporting-hiv-nv</a> updated 3 days ago						
16	<a href="#">SMART Health Cards: Vaccination &amp; Testing Implementation Guide</a> O <a href="#">hl7 / vaccine-credential-ig</a> updated 5 days ago [CI build]						
17	<a href="#">KLFBMessaging</a> O <a href="#">hl7sk / klfb-messaging</a> updated 6 days ago [CI build]						
18	<a href="#">New Zealand FHI IG</a> O <a href="#">HL7NZ / fhi</a> updated 7 days ago [CI build]						
19	<a href="#">HL7® FHIR® New Zealand Base Implementation Guide</a> O <a href="#">HL7NZ / nbase</a> updated 7 days ago [CI build]						
20	<a href="#">empty-fhir-ig</a> O <a href="#">openhiv / empty-fhir-ig</a> updated 7 days ago						
21	<a href="#">WHO Smart Vaccination Certificate</a> O <a href="#">vaccin / smart-vax</a> updated 7 days ago						
22	<a href="#">US Core Implementation Guide</a> O <a href="#">HL7 / US-Core</a> updated 7 days ago [CI build]						
23	<a href="#">Da Vinci Prior Authorization Support (PAS) FHIR IG</a> O <a href="#">HL7 / davinipri-ig</a> updated 7 days ago [CI build]						
24	<a href="#">minimal Common Oncology Data Elements (mCODE) Implementation Guide</a> O <a href="#">HL7 / fhir-mcode-ig</a> updated 9 days ago [CI build]						
25	<a href="#">Situational Awareness for Novel Epidemic Response</a> O <a href="#">HL7 / fhir-saner</a> updated 10 days ago [CI build]						
26	<a href="#">rivv-inami</a> O <a href="#">hl7.be / rivv-inami</a> updated 11 days ago [CI build]						
27	<a href="#">dpc</a> O <a href="#">hl7.eu / dpc</a> updated 12 days ago [CI build]						
28	<a href="#">HL7 FHIR Implementation Guide: Standard Health Record (SHR) Adverse Events Release 1 - DAFT</a> O <a href="#">standards4health / fhir-ae</a> updated 13 days ago [CI build]						
29	<a href="#">Patient Corrections Implementation Guide</a> O <a href="#">HL7 / fhir-patient-correction</a> updated 13 days ago [CI build]						
30	<a href="#">智慧疫苗卡: 疫苗接種紀錄IG</a> O <a href="#">openhiv / vaccine-ig</a> updated 14 days ago [CI build]						
31	<a href="#">HL7 FHIR Implementation Guide - New Zealand Formulary/NZSLM IG</a> O <a href="#">HL7NZ / nzf</a> updated 14 days ago [CI build]						
32	<a href="#">SMART Web Messaging Implementation Guide: STU1</a> O <a href="#">hl7 / smart-web-messaging</a> updated 15 days ago [CI build]						
33	<a href="#">Carequality Subscription Implementation Guide for Push Notifications</a> O <a href="#">DataFate / CEOSubscription</a> updated 15 days ago [CI build]						
34	<a href="#">manzana-ig</a> O <a href="#">hl7.be / manzana-ig</a> updated 15 days ago [CI build]						
35	<a href="#">FHIR-FAIRig</a> O <a href="#">hl7 / fhir-fairig</a> updated 15 days ago [CI build]						
36	<a href="#">mCSD</a> O <a href="#">HL7 / HL7mCSD</a> updated 16 days ago [CI build]						
37	<a href="#">Foodbar</a> O <a href="#">hl7 / supplement-template</a> updated 17 days ago [CI build]						
38	<a href="#">HL7 FHIR Implementation Guide: DK Core</a> O <a href="#">hl7sk / dk-core</a> updated 17 days ago [CI build]						
39	<a href="#">hiv-ig</a> O <a href="#">openhiv / hiv-ig</a> updated 18 days ago [CI build]						
40	<a href="#">DRABT - CoRx Implementation Guide: Integrated Trial Matching for Cancer Patients and Providers</a> O <a href="#">standards4health / fhir-pt</a> updated 20 days ago [CI build]						
41	<a href="#">CH eTOC (R4)</a> O <a href="#">HL7ch / ch-etoc</a> updated 22 days ago [CI build]						
42	<a href="#">HL7 FHIR Implementation Guide: Profiles for ICSR Transfusion and Vaccination Adverse Event Detection and Reporting</a> O <a href="#">HL7 / fhir-icse-ae-reporting</a> updated 22 days ago [CI build]						
43	<a href="#">fhir-ips</a> O <a href="#">HL7 / fhir-ips</a> updated 22 days ago [CI build]						
44	<a href="#">medTech IG</a> O <a href="#">HL7NZ / medtech</a> updated 23 days ago [CI build]						
45	<a href="#">DK MedCom Core</a> O <a href="#">hl7sk / dk-medcom</a> updated 23 days ago [CI build]						
46	<a href="#">Sw</a>						



Let's Dive  
into FSH

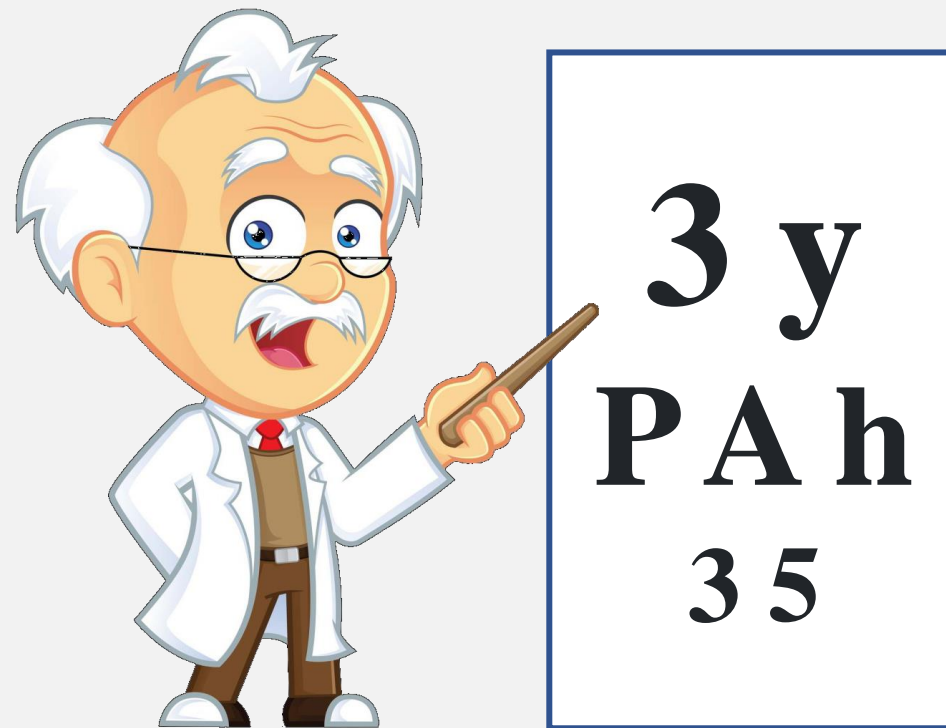
Go to  
fshschool.org





**Follow along:**

**<https://bit.ly/3yPAh35>**



## Example: COVID-19 Diagnosis Profile

1. Base on Condition
2. Diagnosis code U07.1
3. Bind severity to a required value set
4. Require a Patient as subject

```
Profile: CovidDiagnosis
Parent: Condition
Description: "How to report COVID"
* code = $icd#U07.1
* severity from CovidSeverityVS (required)
* subject only Reference(Patient)
* subject 1..1

Alias: $icd = http://hl7.org/fhir/sid/icd-10-cm
```

# COVID-19 Severity Value Set

1. Start with the FHIR [condition-severity](#) value set

- Include these codes as defined in <http://snomed.info/sct>

Code	Display
<a href="#">24484000</a>	Severe
<a href="#">6736007</a>	Moderate
<a href="#">255604002</a>	Mild

2. Add SNOMED-CT code for "life threatening"

```

ValueSet: CovidSeverityVS
Description: "Values for COVID severity"
* include codes from valueset http://hl7.org/fhir/ValueSet/condition-severity
* include $sct#442452003 "Life threatening severity (qualifier value)"

Alias: $sct = http://snomed.info/sct
  
```

## Add an example of the profile:

1. Create an instance of CovidDiagnosis
2. Set the subject, code, and severity
3. Create the sample patient

```
Instance: DiagnosisExample
InstanceOf: CovidDiagnosis
Description: "Simple example"
* subject = Reference(JaneDoe)
* code = ICD10#U07.1
* severity = SCT#24484000 "Severe"

Instance: JaneDoe
InstanceOf: Patient
Description: "Minimal patient"
* name.family = "Doe"
* name.given = "Jane"
```

**FSH ONLINE**  
Powered by SUSHI v1.3.2 and GoFSH v1.1.0

[Back to School](#)

**Convert to JSON ▶** ◀ **Convert to FSH**

[Configuration](#)

**FSH**

```
1 Profile: CovidDiagnosis
2 Parent: Condition
3 Description: "How to report COVID"
4 * code = $icd#U07.1
5 * severity from CovidSeverityVS (required)
6 * subject only Reference(Patient)
7 * subject 1..1
8
9 Alias: $icd = http://hl7.org/fhir/sid/icd-10-cm
10
11 ValueSet: CovidSeverityVS
12 Description: "Values for COVID severity"
13 * include codes from valueset http://hl7.org/fhir/ValueSet/cond
14 * include $sct#442452003 "Life threatening severity (qualifier
15
16 Alias: $sct = http://snomed.info/sct
17
18 Instance: DiagnosisExample
19 InstanceOf: CovidDiagnosis
20 * subject = Reference(JaneDoe)
21 * code = $icd#U07.1
22 * severity = $sct#24484000 "Severe"
23
24 Instance: JaneDoe
25 InstanceOf: Patient
26 * name.family = "Doe"
27 * name.given = "Jane"
28
29
```

**FHIR JSON: CovidDiagnosis**

```
1 {
2   "resourceType": "StructureDefinition",
3   "id": "CovidDiagnosis",
4   "extension": [
5     {
6       "url": "http://hl7.org/fhir/StructureDefinition/structure
7       "valueString": "Clinical.Summary"
8     },
9     {
10      "url": "http://hl7.org/fhir/StructureDefinition/structure
11      "valueCode": "patient"
12    }
13  ],
14  "url": "http://example.org/StructureDefinition/CovidDiagnosis
15  "version": "1.0.0",
16  "name": "CovidDiagnosis",
17  "status": "active",
18  "description": "How to report COVID",
19  "fhirVersion": "4.0.1",
20  "mapping": [
21    {
22      "identity": "workflow",
23      "uri": "http://hl7.org/fhir/workflow",
24      "name": "Workflow Pattern"
25    },
26    {
27      "identity": "sct-concept",
28      "uri": "http://snomed.info/conceptdomain",
29      "name": "SNOMED CT Concept Domain Binding"
30    }
31  ]
32 }
```

**FHIR JSON**

- + New JSON Editor
- StructureDefinitions
- CovidDiagnosis
- ValueSets
- CovidSeverityVS
- Instances
- DiagnosisExample
- JaneDoe

**FHIR Artifacts**

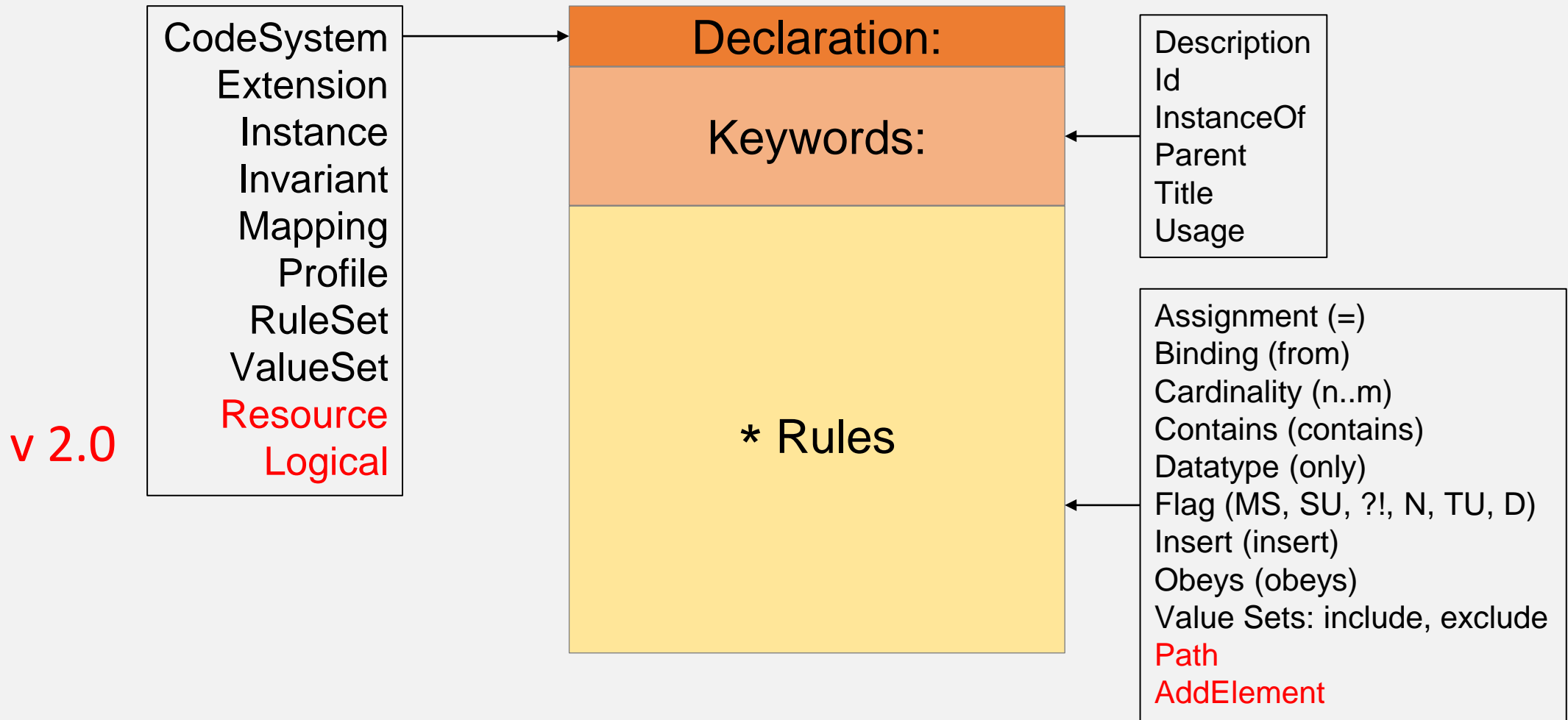
Console ✓ Success!

## Things to Remember

- Keywords: **Profile** and **Parent**
- Keywords: **Instance** and **InstanceOf**
- Codes: {code system}#{code}
- Assignments: \* <element> = {value}
- Binding rule: \* <coded element> **from** {value set} ({bindingstrength})
- Cardinality rule: \* <element> {min}..{max}
- Data Type rule: \* <element> **only** {datatype1} **or** {datatype2}...

Key:  
 {substitute}  
 <path>

# Anatomy of a FSH item:



# Automating Repeated Patterns with Rule Sets

- "Don't repeat yourself" principle
- Share best practices with others

```
RuleSet: CreateComponent(sliceName, min, max, code, short, definition)
```

```
* component contains {sliceName} {min}..{max} MS
```

```
* component[{sliceName}].code = {code}
```

```
* component[{sliceName}] ^short = {short}
```

```
* component[{sliceName}] ^definition = {definition}
```

```
RuleSet: ObservationComponentSlicingRules
```

```
* component ^slicing.discriminator.type = #pattern
```

```
* component ^slicing.discriminator.path = "code"
```

```
* component ^slicing.rules = #open
```

```
* component ^slicing.description = "Slice based on the component.code pattern"
```



## Applying Rule Sets ("insert" rules)

```
Profile: TumorSize
Parent: Observation
Id: tumor-size
Title: "Tumor Size"
Description: "Records the dimensions of a tumor"
* insert ObservationComponentSlicingRules
* insert CreateComponent(maxDimension, 1, 1, LNC#33728-7, "Maximum dimension of tumor",
"The longest tumor dimension")
* insert CreateComponent(otherDimension, 0, 2, LNC#33729-5, "Other tumor dimension",
"Additional tumor dimensions should be ordered from largest to smallest")
```

# Get or share FSH Examples

**FSH ONLINE**  
Powered by SUSHI v1.3.2 and GoFSH v1.1.0

FSH Examples

- > Aliases
- > Code Systems
- > Extensions
- > Instances
- > Invariants
- > Mappings
- > Paths
- > Profiles
- > Rule Sets
  - Parameterized
    - Create Observation Component**
    - Set Extension Context
    - Set Short and Definition
    - Using Soft Indexing
  - Simple
  - Slicing
- > Rules
- > Value Sets

```

Create Observation Component
1 // @Name: Create Observation Component
2 // @Description: Create Observation components easily using RuleSets
3
4 RuleSet: CreateComponent(sliceName, min, max, code, short, definition)
5 * component contains {sliceName} {min}..{max} MS
6 * component[{sliceName}].code = {code}
7 * component[{sliceName}] ^short = {short}
8 * component[{sliceName}] ^definition = {definition}
9
10
11 Alias: LNC = http://loinc.org
12
13 // Put these rules into action
14 Profile: TumorSize
15 Parent: Observation
16 Id: tumor-size
17 Title: "Tumor Size"
18 Description: "Records the dimensions of a tumor"
19 * insert ObservationComponentSlicingRules
20 // Require 1 dimension; up to two additional dimensions are optional
21 * insert CreateComponent(maxDimension, 1, 1, LNC#33728-7, "Maximum dimension of tumor", "The longest
22 * insert CreateComponent(otherDimension, 0, 2, LNC#33729-5, "Other tumor dimension", "Additional tum
23
24
25 // Slice the component element on the component.code element
26 RuleSet: ObservationComponentSlicingRules
27 * component ^slicing.discriminator.type = #pattern
28 * component ^slicing.discriminator.path = "code"
29 * component ^slicing.rules = #open
30 * component ^slicing.description = "Slice based on the component.code pattern"
    
```

contribute your FSH examples at <https://github.com/FSHSchool/FSHOnline-Examples>

# Define an Extension

1. Create Extension
2. Constrain value[x] to CodeableConcept
3. Bind value[x] to a value set
4. Define the value set

```
Extension: ConditionCertainty
Description: "The certainty of diagnosis"
* value[x] only CodeableConcept
* value[x] from ConditionCertaintyVS

ValueSet: ConditionCertaintyVS
Description: "Degree of confidence the condition is present"
* $sct#415684004 "Suspected (qualifier value)"
* $sct#410592001 "Probably present (qualifier value)"
* $sct#41060500 "Confirmed present (qualifier value)"
```

## Add an Extension Context (optional)

- The preceding extension can only be applied to Conditions. The way to limit this is:

```
* ^context[0].type = #element
* ^context[0].expression = "Condition"
```

- This is hard to remember, so consider capturing in a reusable Rule Set:

```
RuleSet: ExtensionContext(path)
* ^context[+].type = #element
* ^context[=].expression = "{path}"
```

Note: You must copy the rule set into your project. FSH does not have libraries at the current time

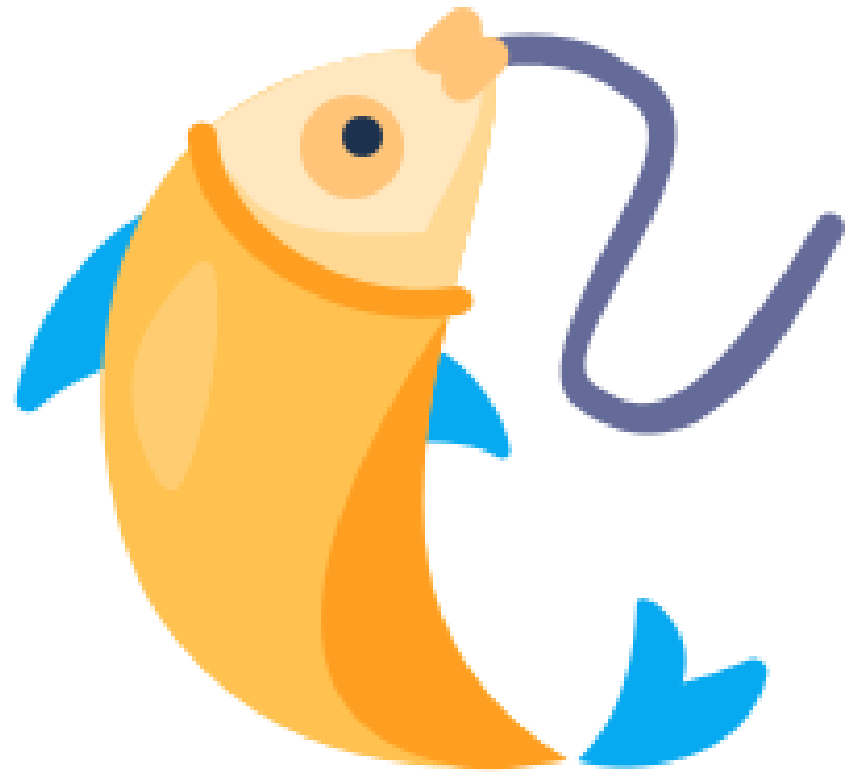
- Then insert into the Extension definition:

```
* insert ExtensionContext(Condition)
```

# Add the Extension to the CovidCondition Profile

1. Add the extension
2. Use the element name "certainty"
3. Set cardinality 0..1
4. Add "Must Support"

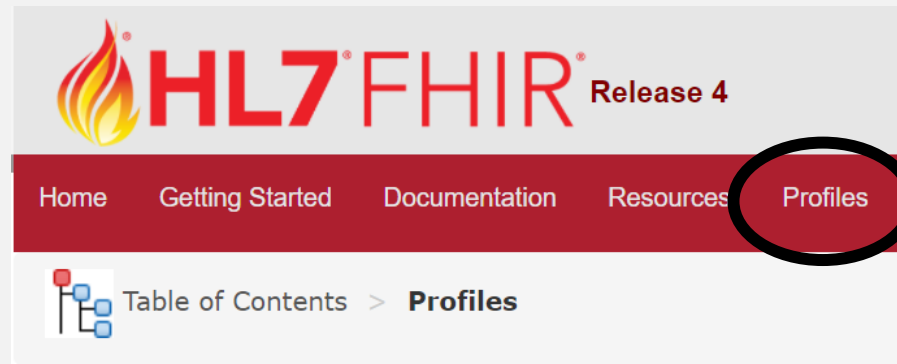
```
Profile: CovidDiagnosis
Parent: Condition
Description: "How to report COVID"
* code = $icd#U07.1
* severity from CovidSeverityVS (required)
* subject only Reference(Patient)
* extension contains ConditionCertainty named certainty 0..1 MS
```



Learn FSH  
using GoFSH

The screenshot displays the FSH ONLINE web application interface. At the top left, the logo for FSH ONLINE is shown, along with the text "Powered by SUSHI v1.3.2 and GoFSH v1.1.0". In the top right corner, there is a "Back to School" button. Below the header, there are two main buttons: "Convert to JSON" and "Convert to FSH". The "Convert to FSH" button is highlighted with a red rectangular box. To the right of these buttons is a "Configuration" button with a gear icon. The main workspace is split into two panels. The left panel is titled "FSH" and contains a text area with the prompt "1 Paste or edit FSH here...". The right panel is titled "FHIR JSON: Untitled" and contains a text area with the prompts "1 Paste or edit single FHIR JSON artifact here..." and "Create additional FHIR JSON artifacts to the right.". A large white text overlay is centered across both panels, reading "GoFSH converts FHIR JSON to FHIR Shorthand". On the right side of the workspace, there is a sidebar with a "+ New JSON Editor" button and a list of editors, including "Unknown Type" and "Untitled". At the bottom left of the interface, there is a "Console" button with an upward-pointing arrow.

## Try this: Convert Body Height Vital Signs Profile to FSH



- <https://www.hl7.org/fhir/bodyheight.profile.json>
  - Or Profiles: observation-bodyheight → JSON → Raw JSON
- **Copy and paste** into right pane of FSH Online
- Click **Convert to FSH**



# GoFSH Converted FHIR profile:

FSH	FHIR JSON: bodyheight
1 Alias: \$vitalsigns = http://hl7.org/fhir/StructureDefinition/vitalsigns	1 {
2	2 "resourceType" : "StructureDefinition",
3 Profile: observation-bodyheight	3 "id" : "bodyheight",
4 Parent: \$vitalsigns	4 "text" : {
5 Id: bodyheight	5 "status" : "generated",
6 Title: "Observation Body Height Profile"	6 "div" : "<div xmlns=\\"http://www.w3.org/1999/xhtml\">to do</div>"
7 Description: "FHIR Body Height Profile"	7 },
8 * ^extension[0].url = "http://hl7.org/fhir/StructureDefinition/structurede	8 "extension" : [{
9 * ^extension[=].valueMarkdown = "#### Complete Summary of the Mandatory Re	9 "url" : "http://hl7.org/fhir/StructureDefinition/structuredefinition-sum
10 * ^extension[+].url = "http://hl7.org/fhir/StructureDefinition/structurede	10 "valueMarkdown" : "#### Complete Summary of the Mandatory Requirements\r
11 * ^extension[=].valueInteger = 5	11 },
12 * ^extension[+].url = "http://hl7.org/fhir/StructureDefinition/structu	12 {
13 * ^extension[=].valueCode = #oo	13 "url" : "http://hl7.org/fhir/StructureDefinition/structuredefinition-fmm
14 * ^extension[+].url = "http://hl7.org/fhir/StructureDefinition/structur	14 "valueInteger" : 5
15 * ^extension[=].valueCode = #trial-use	15 },
16 * ^status = #draft	16 {
17 * ^experimental = false	17 "url" : "http://hl7.org/fhir/StructureDefinition/structuredefinition-wg"
18 * ^date = "2018-08-11"	18 "valueCode" : "oo"
19 * ^publisher = "Health Level Seven International (Orders and Observations	19 },
20 * ^contact.telecom.system = #url	20 {
21 * ^contact.telecom.value = "http://www.hl7.org/Special/committees/orders/i	21 "url" : "http://hl7.org/fhir/StructureDefinition/structuredefinition-sta
22 * . 0..*	22 "valueCode" : "trial-use"
23 * . ^short = "FHIR Body Height Profile"	23 }],
24 * . ^definition = "This profile defines how to represent Body Height obser	24 "url" : "http://hl7.org/fhir/StructureDefinition/bodyheight",
25 * code ^short = "Body Height"	25 "version" : "4.0.1",
26 * code ^definition = "Body Height."	26 "name" : "observation-bodyheight",
27 * code ^comment = "additional codes that translate or map to this code are	27 "title" : "Observation Body Height Profile",
28 * code ^alias[0] = "Test"	28 "status" : "draft",
29 * code ^alias[+] = "Name"	29 "experimental" : false.

## Additional Syntax:

- Caret (^) refers to metadata in the StructureDefinition

```
* ^experimental = false
* ^date = "2018-08-11"
* ^publisher = "Health Level Seven International (Orders and Observations Workgroup)"

* code ^short = "Body Height"
* code ^definition = "Body Height."
```

- [0], [+], [=] refer to first, next, same array elements


```
* ^extension[+].url = "http://hl7.org/fhir/StructureDefinition/structuredefinition-fmm"
* ^extension[=].valueInteger = 5
```

*(indicate the FHIR Maturity of this profile = 5 using extension on StructureDefinition)*


## FSH Resources and Tools

- [FSH Language Specification](#) -- HL7 FHIR Standard
- [SUSHI](#) -- compile FSH into FHIR Artifacts
- [FSH School](#) -- web site with documentation, tools, examples
- [FSH Online](#) -- interactive FHIR Shorthand with examples
- [GoFSH](#) -- convert existing implementation guides into FSH (beta)
- [FSH Finder](#) -- web crawler to find FSH projects
- [VS Code extension](#) -- code highlighter for VS Code editor
- [# shorthand](#) -- Zulip chat channel

# Language Reference: FHIR Shorthand IG



**FHIR Shorthand**  
1.1.0 - CI Build



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FHIR Shorthand, published by HL7 International - FHIR Infrastructure Group. This is not an authorized publication; it is the continuous build for version 1.1.0). This version is based on the current content of <https://github.com/HL7/fhir-shorthand/> and changes regularly. See the [Directory of published versions](#)

## 3 Language Reference

This chapter contains the formal specification of the FHIR Shorthand (FSH) language. It is intended as a reference, not a tutorial.

In this specification, the key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" are to be interpreted as described in [RFC2119](#).

### 3.1 About the Specification

The FSH specification uses syntax expressions to illustrate the FSH language. While FSH has a formal grammar (see [Appendix](#)), most readers will find the syntax expressions more instructive.

Syntax expressions uses the following conventions:

Style	Explanation	Example
Code	Code fragments, such as FSH keywords, FSH statements, and FSH syntax expressions	* status = #open
{curly braces}	An item to be substituted in a syntax expression	{display string}
<datatype>	An element or path to an element with the given data type, to be substituted in the syntax expression	<CodeableConcept>
<i>italics</i>	An optional item in a syntax expression	"{string}"
ellipsis (...)	Indicates a pattern that can be repeated	{flag1} {flag2} {flag3} ...
<b>bold</b>	A directory path or file name	<b>example-1.fsh</b>
vertical bar	A choice of items or data types in the syntax	name id url

**Examples:**

- A FSH rule to assign the value of a Quantity:


```
* <Quantity> = {decimal or integer} '{UCUM unit}'
```

A FSH statement following this pattern would be written as:


- About the Specification
- FSH Foundations
- FSH Language Basics
- FSH Paths
- Rules for Profiles, Extensions, and Instances
- Defining Items
- Appendix: Abbreviations
- Appendix: Formal Grammar

<http://build.fhir.org/ig/HL7/fhir-shorthand/>

# Downloads → Quick Reference Card



FHIR Shorthand 1.0 Quick Reference: Syntax



Key to Expression Syntax	
{curly braces}	An item to be substituted
<angle brackets>	Path to an element of given data type
<i>Italics</i>	An optional item
<i>Italics</i>	An optional statement
ellipsis (...)	Indicates a pattern that can be repeated
vertical bar ( )	Indicates a choice of items or data types
<b>bold</b>	Default value


Notations and Special Values	
code	#(code)
Coding	{CodeSystem name id url /version string [(code) "display string"]}
Cardinality	(min).. <b>(max)</b> (min).. <b>(max)</b>
Quantity with units	{decimal or integer} "UCUM code"
Comments	// single line comment /* multi-line comment */
Flags	MS // must support TU // trial use SU // summary, I N // normative ? // modifier D // draft
Binding strengths	<b>required</b>   <b>extensible</b>   <b>preferred</b>   <b>example</b>
Triple quote string	"""(string markdown)"""
References	Reference({Resource name id url}) Canonical({name id /version string})

Paths	
Array element	<array element>[0-based index]
Reference	<Reference>{[Resource] Profile name id url}
Extension	<Extension>{[extension name id url]}
Sliced array	<array element>[slice-name]{reslice-name}
Caret paths	^element of StructureDefinition <element in Profile> ^element in corresponding ElementDefinition

Slicing Rubric	
* <array-path> ^slicing.discriminator.type = {#pattern} #value  #type  #profile  #exits	
* <array-path> ^slicing.discriminator.path = {FHIRPath string}	
* <array-path> ^slicing.rules = {#open  #closed  #openAtEnd}	
* <array-path> ^slicing.ordered = true false	
* <array-path> ^slicing.description = {string}	

Item	Keywords
Alias	Alias: {alias name} = {url urn:oid} // alias name may begin with \$
Extension	Extension: {name} Parent: {Extension name id url} Id: {id} Title: {string} Description: {string or markdown}
Instance	Instance: {id} InstanceOf: {Resource Profile name id url} Usage: {#example   #definition   #inline} Title: {string} Description: {string or markdown}
Invariant	Invariant: {id} Severity: {#error  #warning} Description: {string markdown} Expression: {FHIRPath string} XPath: {XPath expression string}
Mapping	Mapping: {id} Source: {Profile name id} Target: {Target specification url} Id: {Target specification id} Title: {Target description string} Description: {string}
Profile	Profile: {name} Parent: {Resource Profile name id url} Id: {id} Title: {string} Description: {string or markdown}
RuleSet	RuleSet: {name}
Value Set and Code System	ValueSet: {name} or CodeSystem: {name} Id: {id} Title: {string} Description: {string or markdown}


Code System Rules	
Define local code	* {code} "display string" "definition string"

Get More Information	
	<a href="#">FSH Specification</a> <a href="#">FSH Chat</a> <a href="#">FSH School</a> <a href="#">HL7 Project Page</a>


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Syntax



FHIR Shorthand 1.0 Quick Reference: Examples



Notations and Special Values	
code	#confirmed
Coding and CodeableConcept	http://snomed.info/ctt#363346000 "Malignant neoplastic disease (disorder)" ICD10CM#C004
Cardinality	0..1 1..1 2..* (two-sided) ..1 1.. 2.. (one-sided)
Comments	// end of line or single line /* This comment continues over multiple lines */
References	Reference(Patient or Practitioner) Canonical(MyPatient)

Paths	
Nested element	stage.assessment
Array element	name[0].given[1]
Choice [x] element	valueQuantity, valueReference
Reference choices	performer[Organization]
Extensions	extension[terminationReason] extension[http://hl7.org/fhir/StructureDefinition/location-distance]
Sliced arrays	component[DiastolicPressure]
Resliced arrays	component[RespiratoryScore][OneMinute]
StructureDefinition escape (caret syntax)	^abstract component[VariationCode] ^short

Slicing Rubric	
* component ^slicing.discriminator.type = #pattern	
* component ^slicing.discriminator.path = "code"	
* component ^slicing.rules = #open	
* component ^slicing.ordered = false	
* component ^slicing.description = "Slice on component.code"	

Code System Rule	
Local code definition	* #NED "No Evidence of Disease" "No physical evidence of disease on exam or imaging tests."

Item	Keywords
Alias	Alias: UCUM = http://unitsofmeasure.org Alias: race = urn:oid:2.16.840.1.113883.6.238 Alias: \$Genderidentity = http://hl7.org/fhir/StructureDefinition/patient-genderidentity
Code system	CodeSystem: AJCC_FairUse Title: "AJCC Fair Use" Description: "A small subset of AJCC staging codes used for IG examples."
Extension	Extension: TreatmentTerminationReason Id: treatment-termination-reason Title: "Treatment Termination Reason" Description: "Reason for stopping a treatment."
Instance	Instance: TumorMarkerExample01 InstanceOf: TumorMarker Usage: #example Description: "Epidermal growth factor example."
Invariant	Invariant: us-core-8 Description: "Patient.name.given or Patient.name.family or both SHALL be present" Expression: "family.exists() or given.exists()" Severity: #error XPath: "f.given or f.family"
Mapping	Mapping: USCancerPatientToArgonaut Source: USCancerPatient Target: "http://unknown.org/Argonaut-DQ-DSTU2" Id: argonaut-dq-dstu2 Title: "Argonaut DSTU2"
Profile	Profile: USCancerPatientProfile Id: mcode-cancer-patient Title: "Cancer Patient" Description: "A patient diagnosed with cancer"
Rule set	RuleSet: ExperimentalProfileRules
Value set	ValueSet: AnatomicalOrientationVS Title: "Anatomical Orientation Value Set" Description: "Values for anatomical orientation."

Rules	
Assignment	* status = #arrived * code = SCT#18165001 "Jaundice (finding)" * onsetDateTime = "2019-04-02" * subject = Reference(EveAnyPerson) * valueQuantity = 2.5 "mm" * valueQuantity = UCUM#mm "millimeters"
Binding	* bodySite from CancerBodyLocationVS (preferred) * valueCodeableConcept from http://loinc.org/vs/LL1971-2 (required) * valueQuantity from LengthUnitsVS (extensible)
Cardinality	* severity 0..0 * subject 1..*
Contains (inline extension)	* extension contains treatmentint 0..1 MS and terminationReason 0..* MS
Contains (standalone extension)	* extension contains \$Genderidentity named genderidentity 0..1 MS and http://hl7.org/fhir/StructureDefinition/patient-disability named disability 0..1 MS
Contains (slicing)	* component contains GeneStudied 0..* MS and VariationCode 0..* and GenomicDNAChange 0..1
Flag	* deceased[x] MS ?! SU * reasonCode and extension[terminationReason] MS
Insert	* insert USCoreTerminologyRuleSet
Mapping	* -> "Patient" * identifier.system -> "Patient.identifier.system"
Obeys	* obeys us-core-6 and us-core-9 * name obeys us-core-8
Type	* value[x] only CodeableConcept * effective[x] only dateTime or Period * subject only Reference(CancerPatient) * asserter only Reference(Practitioner or Patient)

Value Set Rules	
Single code	* SCT#54102005 "G1 grade (finding)"
Exclude single code	* exclude SCT#12619005
All codes in system	* include codes from system HGVS
Filter Rules for SNOMED-CT (assumes code system aliased as 'SCT')	
Subsumption	* include codes from system SCT where concept is a #123037004 "Body Structure"
Exclude subsumption	* exclude codes from system SCT where concept is a #123037004 "Body Structure" * Secondary malignant neoplastic disease (disorder)

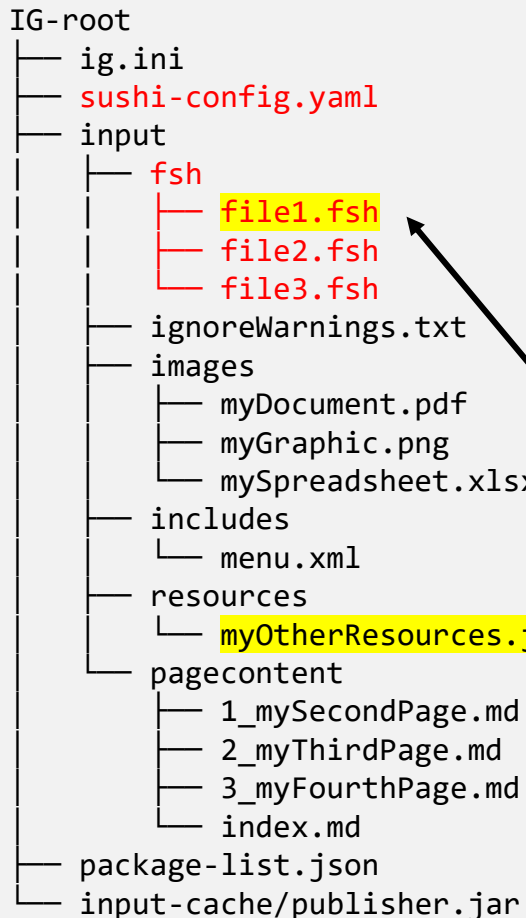
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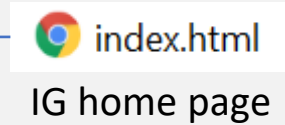
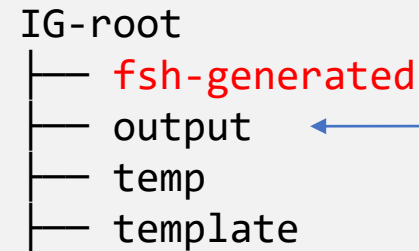
Examples

# Look Ahead to Let's Build (next session)

## Creating a FSH Implementation Guide



run HL7 IG publisher  
(runs SUSHI for you)



You can mix FSH with resources created by Trifolia or Forge

## Prepare for Let's Build (next session)

- Install **Node.js LTS** edition from <https://nodejs.org/>
- Install **SUSHI** and **GoFSH**
  - Open a terminal and run: `npm install -g fsh-sushi`
  - Open a terminal and run: `npm install -g gofsh`
- Install **VS Code** (if text editor is needed)
  - <https://code.visualstudio.com/download>

Questions?





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