

C-CDA on FHIR

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Amsterdam, 15-17 November | [@fhir_furore](#) | [#fhirdevdays17](#) | [www.fhirdevdays.com](#)

Instructor

- Rick Geimer
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 - HL7 CDA R2 Certified Specialist
 - Co-Editor, CDA Consolidation and many other implementation guides
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Lantana Consulting Group

- Our Mission
 - Improve healthcare through health information technology (IT)
 - Lead the industry through consulting and volunteer practice
- Our Services
 - Software and standard development and implementation
 - Terminology, data governance, and education
 - Strategic advice for health IT planning, design, and purchasing

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Outline

- CDA and C-CDA
- C-CDA on FHIR
- US Core
- C-CDA on FHIR Walkthrough/Demo

Clinical Document Architecture (CDA)

- A specification for exchange of clinical documents, defining their structure and semantics
- ANSI/ISO standard developed by HL7's Structured Documents Work Group (SDWG)
- Base standard on which many implementation guides (IGs) are built:
 - Quality Reporting Document Architecture (QRDA)
 - Healthcare Associated Infection (HAI) Reports
 - Consolidated CDA (C-CDA)
 - . . . and many others

Consolidated CDA

- HL7 Consult Note
- HL7 Diagnostic Imaging Report
- HL7 Discharge Summary
- HL7 History and Physical
- HL7 Operative Note
- HL7 Procedure Note
- HL7 Unstructured Documents
- HL7 Progress Notes
- HL7 Continuity of Care Document
- HITSP/C84 Consult and History & Physical Note Document
- HITSP/C32 - Summary Documents Using HL7 CCD
- HITSP/C48 Referral and Discharge Summary Document constructs
- HITSP/C62 Scanned document



Consolidate and harmonize various standalone documents into one master implementation guide for the primary care use case.

Later versions added additional document types.

FHIR and CDA

Similarities

- Support profiling for specific use-cases
- Human readability is minimum for interoperability
- Validation tooling, profile tooling

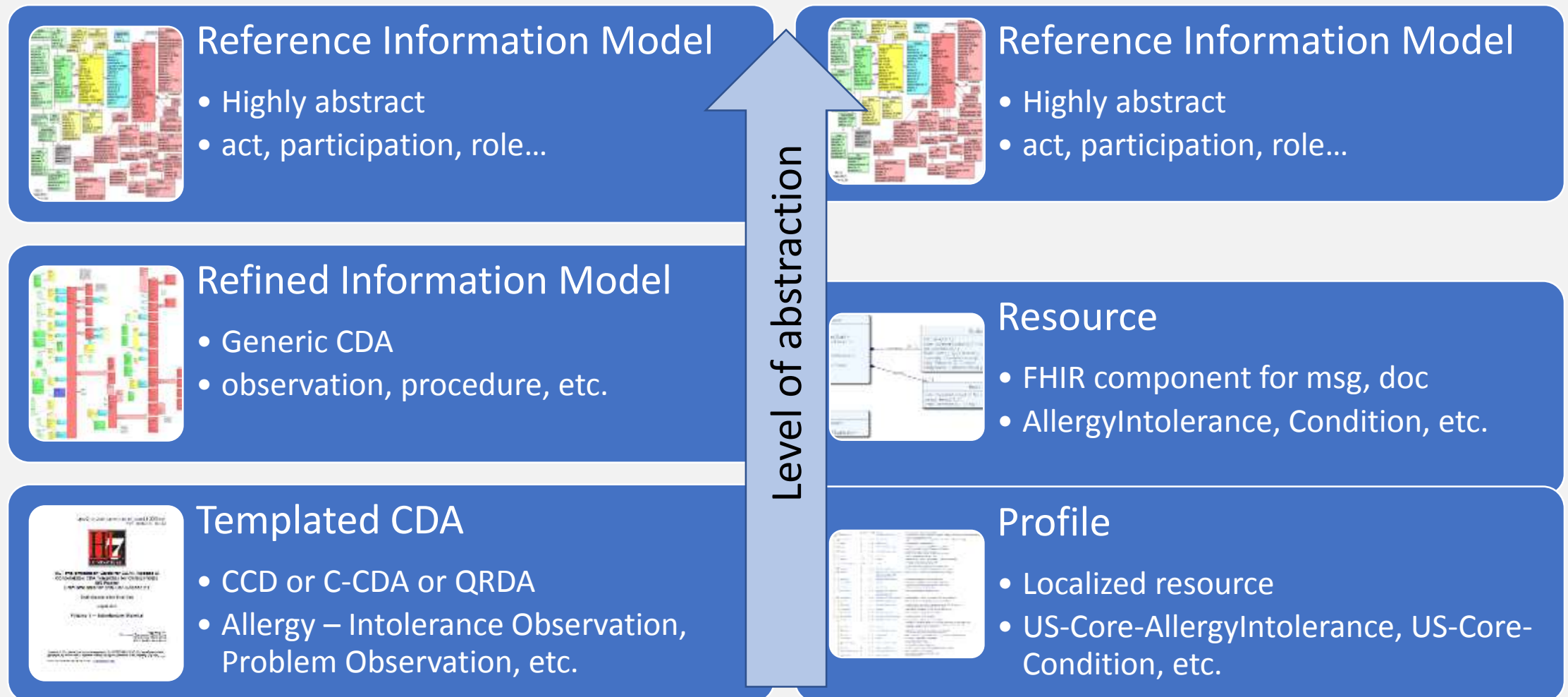
FHIR Differences

- Can use out of the box – no templates required (but profiling still recommended)
- Not restricted to just documents
- Implementer tooling generated with specification
- Tighter coupling to APIs (RESTful services)

Brief History of CDA to FHIR Mapping

- Initial CDA to FHIR mappings
 - Addressed question: “Can FHIR handle the CDA use case?”
 - Fixed FHIR when it couldn’t
 - Based on FHIR DSTU1, so mostly for historical reference
 - <http://tinyurl.com/jqyc4l8>
- Argonaut Project C-CDA to FHIR mappings
 - Conceptual mappings of C-CDA to FHIR, for use by analysts
 - Based on pre-DSTU2 FHIR (resulted in key changes to DSTU2)
 - <http://tinyurl.com/zhj2u9s>
- C-CDA on FHIR project
 - Implementable profiles targeting FHIR STU3
 - http://wiki.hl7.org/index.php?title=C-CDA_on_FHIR

CDA Templates vs. FHIR Resources and Profiles

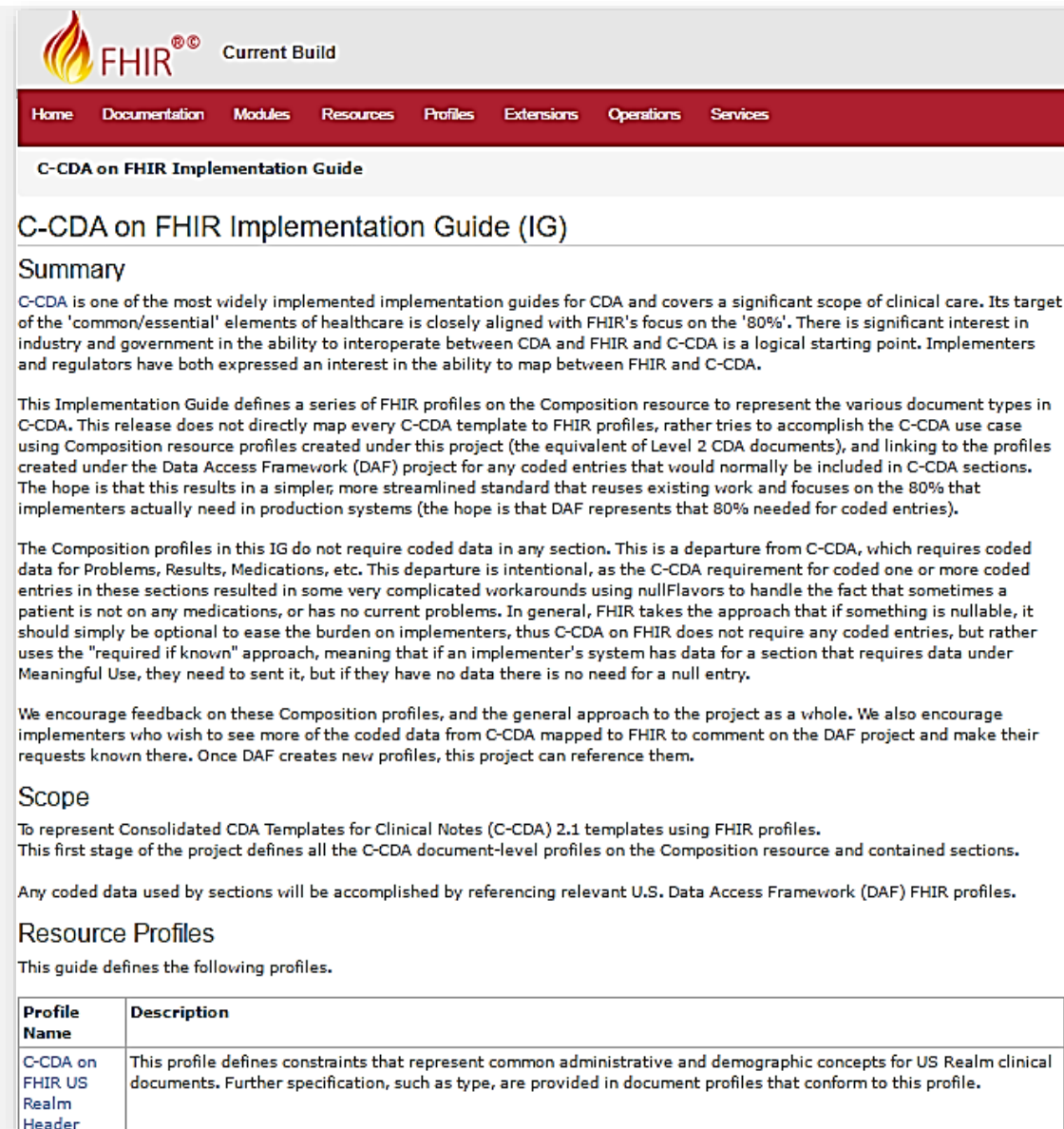


FHIR Implementation Guides and Profiles

- FHIR IGs are collections of profiles, value sets, examples, resource instances (conformance, etc.) and human readable documentation.
- An ImplementationGuide resource ties it all together.
- Publishing FHIR IGs is a rather new and tricky process.

C-CDA on FHIR

- US Realm FHIR Implementation Guide
- Picked up where Argonaut mappings left off
- Goal: Implementable FHIR profiles for the C-CDA use case



FHIR Current Build

Home Documentation Modules Resources Profiles Extensions Operations Services

C-CDA on FHIR Implementation Guide

C-CDA on FHIR Implementation Guide (IG)

Summary

C-CDA is one of the most widely implemented implementation guides for CDA and covers a significant scope of clinical care. Its target of the 'common/essential' elements of healthcare is closely aligned with FHIR's focus on the '80%'. There is significant interest in industry and government in the ability to interoperate between CDA and FHIR and C-CDA is a logical starting point. Implementers and regulators have both expressed an interest in the ability to map between FHIR and C-CDA.

This Implementation Guide defines a series of FHIR profiles on the Composition resource to represent the various document types in C-CDA. This release does not directly map every C-CDA template to FHIR profiles, rather tries to accomplish the C-CDA use case using Composition resource profiles created under this project (the equivalent of Level 2 CDA documents), and linking to the profiles created under the Data Access Framework (DAF) project for any coded entries that would normally be included in C-CDA sections. The hope is that this results in a simpler, more streamlined standard that reuses existing work and focuses on the 80% that implementers actually need in production systems (the hope is that DAF represents that 80% needed for coded entries).

The Composition profiles in this IG do not require coded data in any section. This is a departure from C-CDA, which requires coded data for Problems, Results, Medications, etc. This departure is intentional, as the C-CDA requirement for coded one or more coded entries in these sections resulted in some very complicated workarounds using nullFlavors to handle the fact that sometimes a patient is not on any medications, or has no current problems. In general, FHIR takes the approach that if something is nullable, it should simply be optional to ease the burden on implementers, thus C-CDA on FHIR does not require any coded entries, but rather uses the "required if known" approach, meaning that if an implementer's system has data for a section that requires data under Meaningful Use, they need to send it, but if they have no data there is no need for a null entry.

We encourage feedback on these Composition profiles, and the general approach to the project as a whole. We also encourage implementers who wish to see more of the coded data from C-CDA mapped to FHIR to comment on the DAF project and make their requests known there. Once DAF creates new profiles, this project can reference them.

Scope

To represent Consolidated CDA Templates for Clinical Notes (C-CDA) 2.1 templates using FHIR profiles. This first stage of the project defines all the C-CDA document-level profiles on the Composition resource and contained sections.

Any coded data used by sections will be accomplished by referencing relevant U.S. Data Access Framework (DAF) FHIR profiles.

Resource Profiles

This guide defines the following profiles.

Profile Name	Description
C-CDA on FHIR US Realm Header	This profile defines constraints that represent common administrative and demographic concepts for US Realm clinical documents. Further specification, such as type, are provided in document profiles that conform to this profile.

C-CDA on FHIR Scope

- Represent C-CDA Templates for Clinical Notes (C-CDA 2.1) templates using FHIR profiles
- First stage of the project defines all the C-CDA document-level profiles on the Composition resource and contained sections
- Any coded data used by sections will be represented by relevant US-Core FHIR profiles














Finding C-CDA on FHIR

- January 2017 ballot
 - <http://hl7.org/fhir/us/ccda/index.html>
- Current build
 - <http://build.fhir.org/ig/HL7/ccda-on-fhir/>

This is the Continuous Integration Build of FHIR (will be incorrect/inconsistent at times). See the [Directory of published versions](#)

0 Welcome to FHIR®

First time here? See the executive summary, the developer's introduction, clinical introduction, or architect's introduction, and then the FHIR overview / roadmap. See also the open license (and don't miss the full Table of Contents or you can search this specification).

 Clinical Reasoning		Decision Support, Clinical Quality Measures		
 Clinical	 Diagnostics	 Medications	 Workflow	 Financial
Allergy, Problem, etc.	Observation, Report, Request, etc.	Order, Dispense, Administration, Statement, etc.	Task, Subscription, etc.	Claim, EligibilityRequest, etc.
 Administration		Patient, Practitioner, Device, Organization, Location, Healthcare Service		
 Implementer Support	 Security & Privacy	 Conformance	 Terminology	 Ontology
Downloads, Common Use Cases, Testing	Security, Consent	StructureDefn, CapabilityStatement, Profiling	CodeSystem, ValueSet, ConceptMap, Terminology Svc	RDF
 Foundation		Base Documentation, XML, JSON, REST API + Search, Data Types, Extensions		

External Links:

<p>Implementation Guides</p> <p>Specifications based on the FHIR standard</p> <ul style="list-style-type: none"> • Published by HL7, Affiliates & FHIR Foundation ↗ • Other IGs (FHIR Wiki) ↗ 	<p>FHIR Foundation ↗</p> <p>Enabling health interoperability through FHIR</p> <ul style="list-style-type: none"> • Community Forum ↗ + FHIR Chat ↗ • Public Test Servers & Software ↗ • Blogs that cover FHIR ↗ • FHIR Wiki ↗ 	<p>Translations</p> <p>Note that translations are not always up to date</p> <ul style="list-style-type: none"> • Russian ↗ • Chinese ↗ • Japanese ↗
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C-CDA on FHIR Details

- Included in the specification
 - Composition profiles
 - Composition resource examples
 - Extensions
- Not included (yet)
 - Mappings
 - Profiles on resources other than Composition
 - Unstructured Documents
(may be a profile on DocumentReference)

US Realm Header

- Generic constraints that apply to all US Realm documents
- References common US Realm extensions
- Abstract
 - Not meant to be implemented standalone
 - Base profile for all C-CDA on FHIR Composition profile

Name	Flags	Card.	Type	Description & Constraints
Composition		0..*		
language		1..1	code	language
identifier		1..1	Identifier	identifier
subject		0..1	Reference(US Core Patient Profile), Reference(Group)	
date		1..1	dateTime	date
author		1..*	Reference(US Core Practitioner Profile), Reference(PractitionerRole), Reference(US Core Patient Profile), Reference(Device), Reference(RelatedPerson)	
title		1..1	string	Document Title
confidentiality		1..1	code	confidentiality
attester		0..1	BackboneElement	Slice: Unordered, Open by value:mode
mode		1..1	code	attester
party		1..1	Reference(US Core Practitioner Profile)	mode Fixed Value: legal
attester		0..*	BackboneElement	party
mode		1..*	code	attester
party		1..1	Reference(US Core Practitioner Profile)	mode Fixed Value: professional
attester		0..*	BackboneElement	party
mode		1..*	code	attester
party		1..1	Reference(US Core Patient Profile)	mode Fixed Value: personal
custodian		1..1	Reference(US Core Organization Profile)	party
CCDA-on-FHIR-Data-Enterer		0..1	Reference(US Core Practitioner Profile)	custodian
url		1..1	url	Extension URL: http://hl7.org/fhir/us/ccda/StructureDefinition/CCDA-on-FHIR-Data-Enterer
CCDA-on-FHIR-Informant		0..*	Reference(US Core Practitioner Profile), Reference(US Core Patient Profile), Reference(RelatedPerson)	informant URL: http://hl7.org/fhir/us/ccda/StructureDefinition/CCDA-on-FHIR-Informant
url		1..1	url	informant URL: http://hl7.org/fhir/us/ccda/StructureDefinition/CCDA-on-FHIR-Informant
CCDA-on-FHIR-Information-Recipient		0..*	Reference(US Core Practitioner Profile)	informationRecipient URL: http://hl7.org/fhir/us/ccda/StructureDefinition/CCDA-on-FHIR-Information-Recipient
url		1..1	url	informationRecipient URL: http://hl7.org/fhir/us/ccda/StructureDefinition/CCDA-on-FHIR-Information-Recipient
CCDA-on-FHIR-Participant		0..*	Reference(US Core Practitioner Profile), Reference(US Core Patient Profile), Reference(RelatedPerson)	participant URL: http://hl7.org/fhir/us/ccda/StructureDefinition/CCDA-on-FHIR-Participant
url		1..1	url	participant URL: http://hl7.org/fhir/us/ccda/StructureDefinition/CCDA-on-FHIR-Participant
CCDA-on-FHIR-Performer		0..*	Reference(US Core Practitioner Profile)	performer URL: http://hl7.org/fhir/us/ccda/StructureDefinition/CCDA-on-FHIR-Performer
url		1..1	url	performer URL: http://hl7.org/fhir/us/ccda/StructureDefinition/CCDA-on-FHIR-Performer
CCDA-on-FHIR-Authorization		0..*	Reference(C-CDA on FHIR Consent)	authorization URL: http://hl7.org/fhir/us/ccda/StructureDefinition/CCDA-on-FHIR-Authorization
url		1..1	url	authorization URL: http://hl7.org/fhir/us/ccda/StructureDefinition/CCDA-on-FHIR-Authorization
CCDA-on-FHIR-In-Fulfillment-Of-Order		0..*	Reference(ServiceRequest)	authorization URL: http://hl7.org/fhir/us/ccda/StructureDefinition/CCDA-on-FHIR-In-Fulfillment-Of-Order
url		1..1	url	authorization URL: http://hl7.org/fhir/us/ccda/StructureDefinition/CCDA-on-FHIR-In-Fulfillment-Of-Order

US Core Framework

- US Core Implementation Guide:
<http://hl7.org/fhir/us/core/index.html>
- FHIR Profiles for the Common Clinical Data Set (CCDS):
https://www.healthit.gov/sites/default/files/2015Ed_CCG_CCDS.pdf

- [US Core AllergyIntolerance Profile](#)
- [US Core CareTeam Profile](#)
- [US Core Condition \(a.k.a Problem\) Profile](#)
- [US Core Device Profile](#)
- [US Core DiagnosticReport Profile](#)
- [US Core Goal Profile](#)
- [US Core Immunization Profile](#)
- [US Core Location Profile](#)
- [US Core Medication Profile](#)
- [US Core MedicationRequest Profile](#)
- [US Core MedicationStatement Profile](#)
- [US Core Practitioner Profile](#)
- [US Core Procedure Profile](#)
- [US Core Results Profile](#)
- [US Core Smoking Status Profile](#)
- [US Core CarePlan Profile](#)
- [US Core Organization Core Profile](#)
- [US Core Patient Profile](#)
















US Core adopts the [Vitals Signs Profile](#) from FHIR Core.

Key US Core Profiles Used in the US Realm Header

- Patient
- Practitioner
- Organization











Key US Core Profiles / Patient

- Patient
- Practitioner
- Organization
- Profile on the Patient resource
- Key Constraints
 - Birth date
 - Communication
 - Race/ethnicity
 - Birth sex

Name	Flags	Card.	Type
 Patient		0..*	
 identifier	S	1..*	Identifier
 system	S	1..1	uri
 value	S	1..1	string
 name	S	1..*	HumanName
 family	S	1..1	string
 given	S	1..*	string
 gender	S	1..1	code
 birthDate	S	0..1	date
 animal		0..0	
 communication	S	0..*	BackboneElement
 language	S	1..1	CodeableConcept
 us-core-race	S	0..1	(Complex)
 us-core-ethnicity	S	0..1	(Complex)
 us-core-birthsex	S	0..1	code

Key US Core Profiles / Practitioner

- Patient
 - Practitioner
 - Organization
- Profile on the Practitioner resource
 - Key Constraints
 - Identifier
 - Name
 - For identifier, National Provider Identifier (NPI) preferred, but tax ID and local IDs also allowed

name	Flags	Card.	Type
Practitioner		0..*	
 identifier		1..*	Identifier
 system		1..1	uri
 value		1..1	string
 name		1..1	HumanNa
 family		1..1	string

Key US Core Profiles / Organization

- Patient
- Practitioner
- **Organization**
 - Profile on the Organization resource
 - Key Constraints
 - Identifier
 - Organization status
 - Name
 - Contact info
 - Address
 - Endpoint info (for web services)

Name	Flags	Card.	Type
Organization		0..*	
identifier	S	1..*	Identifier
active	S	1..1	boolean
name	S	1..1	string
telecom	S	1..*	ContactPoint
address	S	1..*	Address
line	S	0..*	string
city	S	0..1	string
state	S	0..1	string
postalCode	S	0..1	string
endpoint	S	0..*	Reference(Endpoint)

C-CDA on FHIR Extensions

- Adds features missing from Composition and needed for the C-CDA use case
- Some may eventually be added to Composition if the use case proves to be general (and international) enough
- Data Enterer
 - US Core Practitioner
- Informant
 - US Core Practitioner
- Information Recipient
 - US Core Practitioner
- Participant
 - RelatedPerson
- Performer
 - US Core Practitioner
- Authorization
 - Contract

Document Types

- Based on the US Realm Header
 - Each adds additional constraints specific to that document type
 - Each defines legal sections and coded data for that document type
- Care Plan
 - Continuity of Care Document (CCD)
 - Consultation Note
 - Diagnostic Imaging Report
 - Discharge Summary
 - History and Physical
 - Operative Note
 - Procedure Note
 - Progress Note
 - Referral Note
 - Transfer Summary

CCD Overview

- Most common document type in C-CDA (the CDA-based standard)
- Expected to be highly prevalent in C-CDA on FHIR
- Is a summary document type, intended for transfer of care scenarios
- Is often overused as a kind of “EHR data dump” (Who wants to read a 60 page “summary”?)

CCD Header

- Inherits from US Core
- Binds type to 34133-9 (summarization of Episode Note) from LOINC
- Requires event to be present (the period of care being summarized)

Name	Flags	Card.	Type	Description & Constraints
Composition		0..*		
type		1..1	CodeableConcept	Summary of episode note Required Pattern: {"coding": [{"system": "http://loinc.org", "code": "34133-9"}]}
event		1..1	BackboneElement	serviceEvent
code		0..*	CodeableConcept	code Required Pattern: {"coding": [{"system": "urn:oid:2.16.840.1.113883.5.6", "code": "PCPR"}]}
period		1..1	Period	period
start		1..1	dateTime	start
end		1..1	dateTime	end

CCD Sections

Required

- Allergies and Intolerances
- Medications
- Problems
- Results
- Vital Signs
- Social History

Optional

- Procedures
- Advance Directives
- Encounters
- Family History
- Functional Status
- Immunizations
- Nutrition
- Mental Status
- Plan of Treatment
- Payers
- Medical Equipment

Key Profiles Used in CCD Sections

- US Core Allergies
- US Core Medication Statement
- US Core Condition
- US Core Procedure
- US Core Result
- US Core Immunization
- US Core Vital Signs
- US Core Smoking Status Observation

Plus other unprofiled resources such as Observation, Encounter, etc.

C-CDA on FHIR Demo

- Live walkthrough of the specification
- Composition profiles and US Core
- Converting CDA documents to FHIR

C-CDA on FHIR Timeline

- Sept 2016 “For Comment” ballot completed (Ballot reconciliation finished Dec 2016)
- First STU ballot in January 2017
- Final publication...imminent!

Resources

- The FHIR specification
 - Updated continuously
 - Latest balloted version: <http://hl7.org/fhir>
 - Continuous build: <http://build.fhir.org/>
- C-CDA on FHIR
 - <http://build.fhir.org/ig/HL7/ccda-on-fhir/index.html>
- US Core
 - <http://hl7.org/fhir/us/core//index.html>
- Pharmacist Care Plan Document CDA <-> FHIR Transforms
 - <https://github.com/lantanagroup/PhCP-Public-Transforms>
 - Open source, Apache 2.0 license
- Rick Geimer
 - Updated continuously, rebooted occasionally
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