

Writing Data with FHIR

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Example Scenarios

- **Record** an *allergy* indicating hives as a reaction to Diphenhydramine
- **Schedule** an *appointment* for a patient
- **Update** a patient's epilepsy *condition* with a note
- **Create** a discharge summary *note*
- **Document** a patient-reported *medication*



Prerequisites

- Core FHIR Concepts
- Calling Secured FHIR Services
- Know your friends
 - <http://hl7.org/fhir/dstu2/>
 - <http://fhir.cerner.com/>



Security

- OAuth 2 required
- App must be registered in the code console
 - Details: <http://fhir.cerner.com/authorization/#registration>



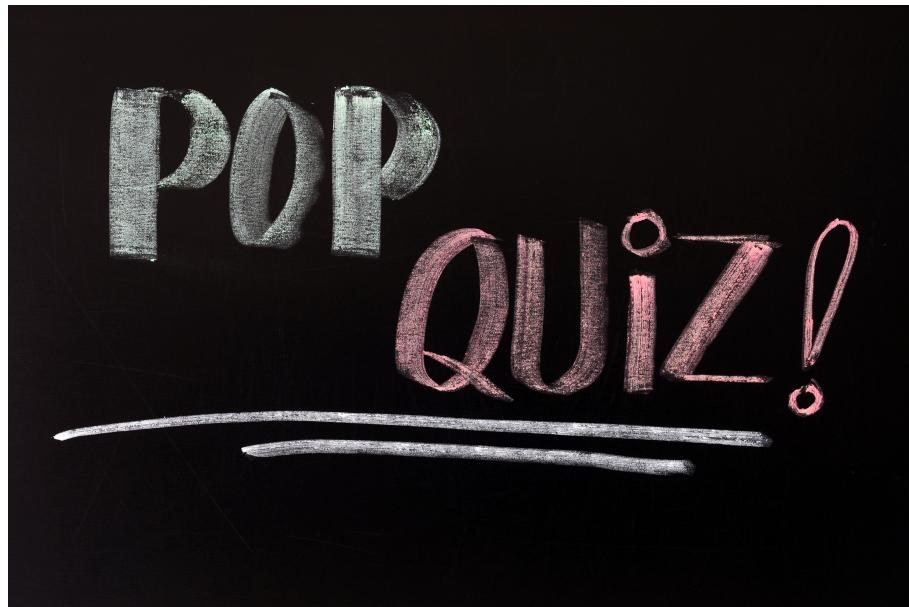
OAuth Scopes

- *[patient|user]/Resource.write*
- Examples:
 - patient/MedicationStatement.write
 - user/Appointment.write
- Must be
 - granted in app registration
 - requested during authorization



Scope Quiz: Sufficient Scopes?

- **Action:** Creating a MedicationStatement
- **Scopes:** openid profile launch patient/Patient.read patient/AllergyIntolerance.read patient/AllergyIntolerance.write patient/DiagnosticReport.read patient/Observation.read patient/Encounter.read patient/MedicationStatement.read patient/MedicationOrder.read patient/DocumentReference.write



Scope Quiz: Sufficient Scopes?

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Scope Quiz

- **Action:** Creating a MedicationStatement
- **Scopes:** openid profile launch patient/Patient.read patient/AllergyIntolerance.read patient/AllergyIntolerance.write patient/DiagnosticReport.read patient/Observation.read patient/Encounter.read **patient/MedicationStatement.read** patient/MedicationOrder.read patient/DocumentReference.write **patient/MedicationStatement.write**



HTTP Verbs

- **POST** - create resource instance
 - *POST <base url>/AllergyIntolerance*
- **PUT** - update body of instance having the given id
 - *PUT <base url>/AllergyIntolerance/123456*



HTTP Verbs

- **PATCH (STU3)** - update specific fields in a resource
 - *PATCH <base url>/AllergyIntolerance/123456*
 - Body follows JSON Patch spec
 - **original:** { "baz": "qux", "foo": "bar" }
 - **patch body:** [{ "op": "replace", "path": "/baz", "value": "boo" }, { "op": "add", "path": "/hello", "value": ["world"] }, { "op": "remove", "path": "/foo" }]
 - **result:** { "baz": "boo", "hello": ["world"] }

Request Considerations



Body - Meta

 Meta	Σ	Element	Metadata about a resource
└  versionId	Σ	0..1 id	Version specific identifier
└  lastUpdated	Σ	0..1 instant	When the resource version last changed

- in particular...
 - **meta.versionId**
 - **meta.lastUpdated**
- *ignored on writes*
 - populated by server

Body - Updates & Omissions

- On an update...
 - **GET** the original resource entry make content updates
 - Send full retrieved body + changes
 - Missing fields == nulling out or removing data



Body - Modifiers

- Modifier elements change interpretations
 - Requests with unsupported modifiers will be rejected
- Supported example: **status**
- Unsupported examples:
 - **implicitRules** - uri of some implicit rules required to understand the resource's content or context
 - **modifier extensions** - modifies the meaning of a resource or attribute

Name	Flags	Card.	Type	Description & Constraints
Resource Name			Base Type	Definition
nameA	Σ	1..1	type	description of content
nameB[x]	?! Σ	0..1		description SHALL at least have a value

• ?! : This element is a modifying element - see [Modifier Elements](#)



Request Headers

- **Authorization** - OAuth 2 Bearer token (JWT)
 - *Authorization: Bearer eyJraWQiOilyMDE3LTA5LT...*
- **Content-Type** - media type of request body
 - *Content-Type: application/json+fhir*
- **Accept** - media type you understand for response
 - *Accept: application/json+fhir*



PUTting it together

- Request Headers
 - *Authorization: Bearer eyJraWQiOilyMDE3LTA5LT...*
 - *Content-Type: application/json+fhir*
 - *Accept: application/json+fhir*
- **PUT** <https://fhir-ehr.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/AllergyIntolerance/6167733>
- **Body:** { "resourceType": "AllergyIntolerance", "id": "6167733", "patient": { "reference": "Patient/1316020"}, ... }



The background of the slide features a dark, abstract architectural image of a building's exterior. The image is dominated by a complex network of dark lines forming a triangular grid pattern, resembling a geodesic dome or a modern glass facade. The perspective is from below, looking up at the building's height.

What about resource contention?



Optimistic Locking

- **ETag** - entity tag *write response header* indicating version
 - e.g. *ETag: W/"6167741"*
 - alternatively *W/"< meta.versionId >"*
- **If-Match** - *update request header* indicating the update should be made **If** the version **Matches**
 - *PUT <base url>/AllergyIntolerance/12345*
 - *If-Match: W/"6167741"*



Ready to go!

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Successful Responses

- **Successful Create**
 - *Status: 201 Created*
 - *Location: <base url>/Appointment/34567*
- **Successful Update**
 - *Status: 200 OK*



Create/Update Example

Create AllergyIntolerance

- **Request Headers**
 - *Authorization*: Bearer eyJraWQiOilyMDE3LTA5LT...
 - *Content-Type*: application/json+fhir
 - *Accept*: application/json+fhir
- **POST** <https://fhirehr.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/AllergyIntolerance>
- **Body**:

```
{"resourceType": "AllergyIntolerance",
"patient": {"reference": "Patient/1316020"}, ...}
```



Response

- **Status:** 201 Created
- **Response Headers**
 - *Location:* <https://fhir-ehr.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/AllergyIntolerance/6167733>
 - *ETag:* W/"1"



Retrieve AllergyIntolerance

- Request Headers
 - *Authorization*: Bearer eyJraWQiOilyMDE3LTA5LT...
 - *Accept*: application/json+fhir
- **GET** <https://fhir-ehr.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/AllergyIntolerance/6167733>



Response

- **Status:** 200 OK
- **Headers**
 - *Content-Type:* application/json+fhir
- **Body:** { "resourceType": "AllergyIntolerance",
"id": "6167733", "meta": { "versionId": "2",
"lastUpdated": "2017-02-28T21:08:25.000Z" },
"patient": { "reference": "Patient/1316020" }, ...}

Update AllergyIntolerance

- Request Headers
 - *Authorization*: Bearer eyJraWQiOilyMDE3LTA5LT...
 - *Content-Type*: application/json+fhir
 - *Accept*: application/json+fhir
 - *If-Match*: W/"2"
- **PUT** <https://fhir-ehr.sandboxcerner.com/dstu2/0b8a0111-e8e6-4c26-a91c-5069cbc6b1ca/AllergyIntolerance/6167733>
- **Body:** { "resourceType": "AllergyIntolerance", "id": "6167733", "patient": { "reference": "Patient/1316020" }, ... }



Reply

- **Status:** 200 OK
- **Headers:**
 - *ETag:* W/"3"



Failure Responses

Are you lost?

- **404 Not Found**



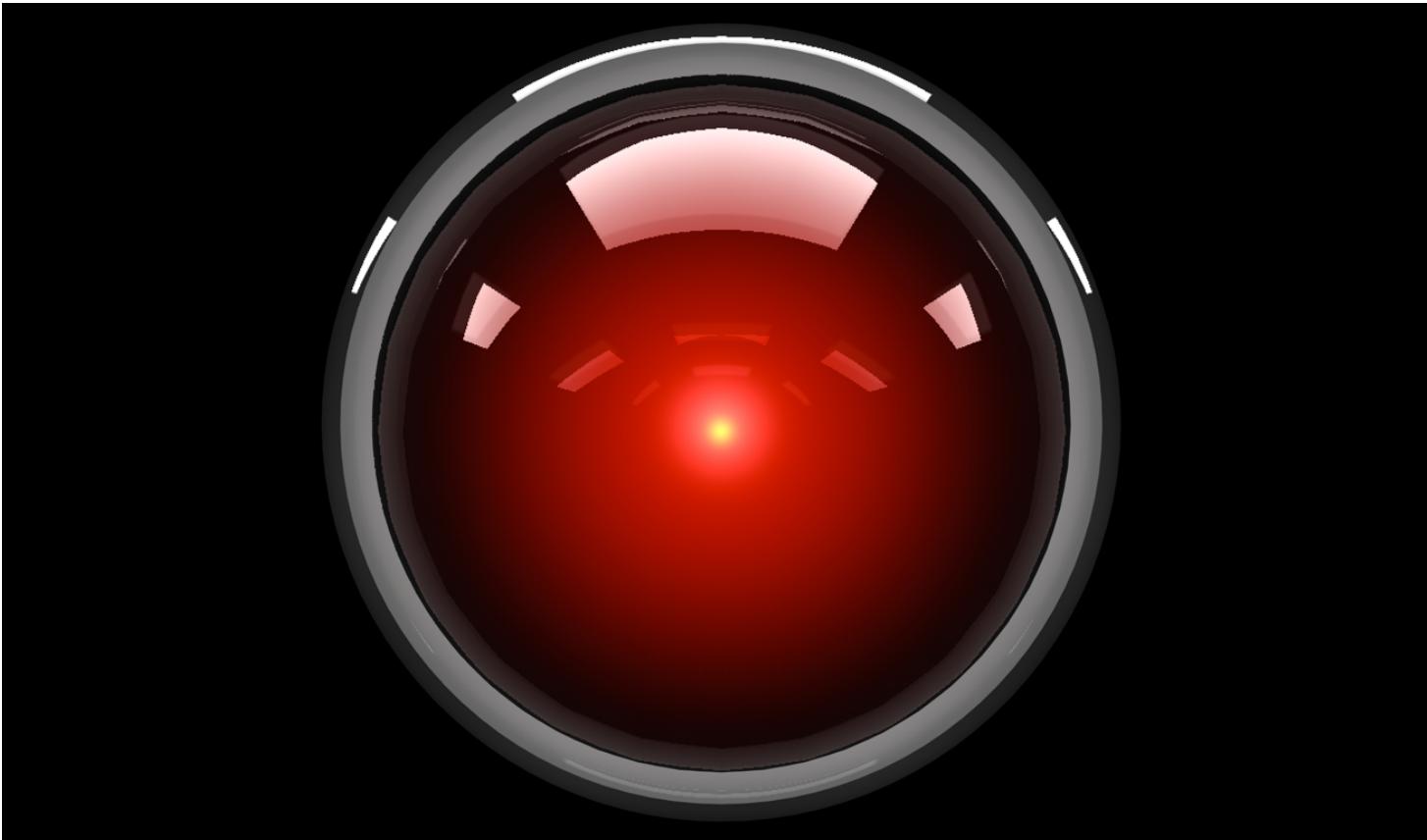
Communication Breakdown

- **415 Unsupported Media Type** - Content-Type not json
- **406 Not Acceptable** - Accept header not json
- **400 Bad Request** - invalid json, field invalid or required field missing
- **422 Unprocessable Entity**
 - couldn't process your json body
 - implicit rules / modifier extensions



“I’m sorry Dave”

- **401 Unauthorized** - missing/expired/invalid Authorization token
- **403 Forbidden** - required scope(s) not in token



Playing Nicely with Others

- **412 Precondition Failed** - no If-Match header provided for an update
- **409 Conflict** - If-Match version out of date



Oops

- **500 Internal Server Failure - Sorry! We're working on it**



Processing Failures

- OperationOutcome
 - severity - error, warning,...
 - type - code for what failed
 - details - more info, human readable text
 - location - which field?
- troubleshooting: x-request-id response header



Example Failure

- **Status:** 422 Unprocessable Entity

- **Body:**

```
{  
  "resourceType": "OperationOutcome",  
  "issue": [  
    {  
      "severity": "error",  
      "code": "business-rule",  
      "details": {  
        "coding": [  
          {  
            "system": "http://hl7.org/fhir/operation-outcome",  
            "code": "MSG_PARAM_INVALID",  
            "display": "Parameter 'wasNotTaken' content is invalid"  
          }  
        ],  
        "text": "a value of true for wasNotTaken is not supported."  
      },  
      "location": [  
        "/f:MedicationStatement/f:wasNotTaken"  
      ]  
    }  
  ]  
}
```



Resource Specifics



Resource specifics

- Touch on resources that support create/update
- Overview of resource
- Highlight special considerations (not every field)



AllergyIntolerance

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Summary

- **Purpose:** A record of a clinical assessment of an allergy or intolerance; a propensity, or a potential risk to an individual, to have an adverse reaction on future exposure to the specified substance, or class of substance.
- **Actions:** create, update
- **Consumers:** Practitioners, Systems



Capture...

- onset date/time
- recorded date/time
- recorder
- patient
- reporter
- substance
- status
- criticality
- type (allergy/intolerance)
- category (med/food/environment)
- note
- reaction



AllergyIntolerance.reporter

reporter	Σ	0..1	Reference(Patient RelatedPerson Practitioner)	Source of the information about the allergy
----------	----------	------	---	---

- Millennium captures
 - patient
 - *relationship type* of related person (contained)
 - *role type* of practitioner (contained)

AllergyIntolerance.reporter (Patient)

```
{  
...  
  "reporter": {  
    "reference": "Patient/5366327"  
  }  
...  
}
```



Contained Resources

- include other resources in the primary resource body
- contained resources do **not** have external existence
- reference relatively by '#<id>'



AllergyIntolerance.reporter (RelatedPerson)

```
{  
...  
  "contained": [  
    {  
      "resourceType": "RelatedPerson",  
      "id": "123",  
      "relationship": {  
        "coding": [  
          {  
            "system": "http://hl7.org/fhir/v3/RoleCode",  
            "code": "SIGOTHR"  
          }  
        ]  
      }  
    },  
...  
  "reporter": "#123"  
...  
}
```



AllergyIntolerance.reporter (Practitioner)

```
{  
...  
  "contained": [  
    {  
      "resourceType": "Practitioner",  
      "id": "123",  
      "practitionerRole": [  
        {  
          "role": {  
            "coding": [  
              {  
                "system": "http://hl7.org/fhir/v2/0286",  
                "code": "RP"  
              }  
            ]  
          }  
        }  
      ]  
    },  
    ...  
    "reporter": "#123"  
  ...  
}
```



AllergyIntolerance.substance

 substance	Σ	1..1	CodeableConcept	Substance, (or class) considered to be responsible for risk AllergyIntolerance Substance and Negation Codes (Example)
---	----------	------	-----------------	--

- RxNorm for specific medical substances
- SNOMED CT
 - non-medical
 - negations
 - NKA - No Known Allergies
 - NKMA - No Known Medication Allergies

AllergyIntolerance.substance (example)

```
"substance": {  
    "coding": [  
        {  
            "system": "http://snomed.info/sct",  
            "code": "256349002",  
            "display": "Peanut - dietary (substance)"  
        }  
    ]  
}
```



AllergyIntolerance.reaction.manifestation

 manifestation	Σ	1..*	CodeableConcept	Clinical symptoms/signs associated with the Event SNOMED CT Clinical Findings (Example)
---	----------	------	-----------------	--

- Options
 - codified (SNOMED CT)
 - freetext

AllergyIntolerance.reaction.manifestation (codified)

```
"reaction": [
  {
    "manifestation": [
      {
        "coding": [
          {
            "system": "http://snomed.info/sct",
            "code": "39579001",
            "display": "Anaphylactic reaction"
          }
        ]
      }
    ]
  }
]
```



AllergyIntolerance.reaction.manifestation (freetext)

```
"reaction": [  
  {  
    "manifestation": [  
      {  
        "text": "Hives"  
      }  
    ]  
  }  
]
```

AllergyIntolerance.note



note

0..1 Annotation

Additional text not captured in other fields

- Create
- Update
 - add a note if no current note
 - single note cannot be modified or replaced
 - limitation of DSTU2, resolved in STU3

AllergyIntolerance.note (example)

```
"note": {  
  "authorReference": {  
    "reference": "Practitioner/21500971"  
  },  
  "time": "2015-10-14T13:13:20-06:00",  
  "text": "Patient complains of discomfort"  
}
```



Full Example (part 1/3)

```
{  
  "resourceType": "AllergyIntolerance",  
  "category": "medication",  
  "criticality": "CRITL",  
  "recordedDate": "2017-02-28T15:03:00-06:00",  
  "status": "active",  
  "type": "allergy",  
  "onset": "2015-12-15T00:00:00Z",  
  "patient": {  
    "reference": "Patient/1316020"  
  },  
  "reporter": {  
    "reference": "Patient/1316020"  
  },  
  "recorder": {  
    "reference": "Practitioner/1316007"  
  },  
  ...  
}
```



Full Example (part 2/3)

```
...
"reaction": [
  {
    "manifestation": [
      {
        "text": "Hives"
      }
    ]
  }
],
"note": {
  "authorReference": {
    "reference": "Practitioner/41562141"
  },
  "time": "2017-02-28T09:03:00Z",
  "text": "Note 1"
},
...

```



Full Example (part 3/3)

```
...  
  "substance": {  
    "coding": [  
      {  
        "system": "http://www.nlm.nih.gov/  
research/umls/rxnorm",  
        "code": "3498"  
      }  
    ]  
  }  
}
```



The background of the slide features a complex, abstract geometric pattern composed of numerous triangles. A prominent vertical axis of symmetry runs through the center of the image. The triangles are rendered in varying shades of blue and teal, creating a sense of depth and perspective. The overall effect is modern and architectural.

Demo

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Appointment

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Summary

- Purpose: information about a planned meeting that may be in the future or past.
- Actions: create, update
- Consumers: Practitioners, Systems



Capture...

- time slot id
 - type (i.e. clinical specialty)
 - start/end
 - location
- status
- patient



Workflow

- Search for Slot by...
 - Slot type (clinical specialty)
 - Practitioner id or Location id
 - Start date/time
- Choose desired Slot
- Create Appointment using Slot id



Appointment.status

...:	status	?!	Σ	1..1	code	proposed pending booked arrived fulfilled cancelled noshow AppointmentStatus (Required)
------	--------	----	----------	------	------	--

- Set to *proposed* for a new Appointment
 - "status": "proposed"
- Set to *arrived* or *cancelled* for an existing Appointment
 - "status": "cancelled"
 - "status": "arrived"

Appointment.[start|end]

 start	Σ	0..1	instant	When appointment is to take place
 end	Σ	0..1	instant	When appointment is to conclude

- Handled by selecting a Slot
 - Will be populated on a GET
 - No need to populate separately

Appointment.participant

L  participant I 1..* BackboneElement Participants involved in appointment
Either the type or actor on the participant MUST be specified

- Participant - specify the patient
- Status - needs-action
- Type (e.g. primary/secondary) - leave unset
- Required - leave unset or specify required

Appointment.participant (example)

```
"participant": [
  {
    "actor": {
      "reference": "Patient/123",
      "display": "Last Name, First"
    },
    "status": "needs-action"
  }
]
```



Full Example

```
{  
  "resourceType": "Appointment",  
  "slot": {  
    "reference": "Slot/21265426-633867-3120917-20"  
  },  
  "participant": [  
    {  
      "actor": {  
        "reference": "Patient/3886413",  
        "display": "PATIENT, TEST"  
      },  
      "required": "required",  
      "status": "needs-action"  
    }  
  ],  
  "status": "proposed"  
}
```



The background of the slide features a complex, abstract geometric pattern composed of numerous triangles. A prominent vertical axis of symmetry runs through the center of the image. The triangles are rendered in varying shades of blue and teal, creating a sense of depth and perspective. The overall effect is modern and architectural.

Demo

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The background of the slide features a complex, abstract architectural structure composed of a dense grid of dark lines forming a series of triangles. This pattern creates a sense of depth and perspective, resembling a modern building's facade or a geodesic dome. The overall color palette is dominated by shades of blue and teal.

Condition

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Summary

- **Purpose:** Used to record detailed information pertinent to a clinician's assessment and assertion of a particular aspect of a person's state of health. Examples of condition include problems, diagnoses, concerns, issues.
- **Actions:** create, update
- **Consumers:** Practitioners, Systems



Capture...

- verification status
 - severity
 - onset date/time
 - abatement
 - notes
- patient
 - encounter
 - practitioner who asserted
 - identification of issue
 - clinical status
 - category (diagnosis / problem)



Condition.category

 category	Σ	0..1	CodeableConcept	complaint symptom finding diagnosis Condition Category Codes (Preferred)
---	----------	------	-----------------	---

- diagnosis
 - system: <http://hl7.org/fhir/condition-category>
- problem
 - system: <http://argonaut.hl7.org>

Condition.category (example)

```
{  
  "category": {  
    "coding": [  
      {  
        "system": "http://argonaut.hl7.org",  
        "code": "problem",  
        "display": "Problem"  
      }  
    ]  
  }  
}
```



Condition.code



Σ

1..1

CodeableConcept

Identification of the condition, problem or diagnosis
[Condition/Problem/Diagnosis Codes \(Example\)](#)

- SNOMED CT
- ICD-10-CM
- ICD-9-CM
- freetext

Condition.code (example)

```
{  
...  
  "code": {  
    "coding": [  
      {  
        "system": "http://hl7.org/fhir/sid/icd-9-cm",  
        "code": "345.0",  
        "display": "Generalized nonconvulsive epilepsy",  
        "userSelected": true  
      }  
    ]  
  }  
...  
}
```



Condition.dateRecorded

dateRecorded Σ 0..1 date When first entered

- only for diagnoses (not problems)
 - both have onset date/time

Condition.abatement[x]

abatement[x]	Σ	0..1	If/when in resolution/remission
abatementDateTime		dateTime	
abatementQuantity		Age	
abatementBoolean		boolean	

- Boolean/DateTime supported
- only for problems (not for diagnoses)
 - both have clinical status (e.g. resolved)

Condition.notes

L  notes

Σ 0..1 string

Additional information about the Condition

- Create
- Update
 - add a note if no current note
 - note cannot be modified or replaced
 - limitation of DSTU2, resolved in STU3

Condition.notes (example)

```
{  
  "notes": "Information related to condition"  
}
```



Full Example

```
{  
  "resourceType": "Condition",  
  "patient": {  
    "reference": "Patient/1316020"  
  },  
  "code": {  
    "text": "Freetext Condition"  
  },  
  "category": {  
    "coding": [  
      {  
        "system": "http://argonaut.hl7.org",  
        "code": "problem"  
      }  
    ]  
  },  
  "clinicalStatus": "resolved",  
  "verificationStatus": "differential",  
  "abatementDateTime": "2017-01-01T00:00:00Z"  
}
```



DocumentReference



Summary

- **Purpose:** Used to describe a document that is made available to a healthcare system. A document is some sequence of bytes that is identifiable, establishes its own context (e.g., what subject, author, etc. can be displayed to the user), and has defined update management.
- **Actions:** create
- **Consumers:** Practitioners, Systems



Capture...

- patient
- type
- author
- creation date/time
- document status (final/preliminary)
- description/title
- content
- encounter



DocumentReference.relatesTo

 relatesTo	?! Σ	0..*	BackboneElement	Relationships to other documents
 code	Σ	1..1	code	replaces transforms signs appends DocumentRelationshipType (Required)
 target	Σ	1..1	Reference(DocumentReference)	Target of the relationship

- unsupported modifier element

DocumentReference.type

 type	Σ	1..1	CodeableConcept	Kind of document (LOINC if possible) Document Type Value Set (Preferred)
---	----------	------	-----------------	---

- LOINC (e.g. discharge summary, consult note)
- Mapped values in sandbox - <http://fhir.cerner.com/millennium/dstu2/infrastructure/document-reference/#terminology-bindings>
 - Additional LOINCs mapped by request

DocumentReference.type (example)

```
{  
  "coding": [  
    {  
      "system": "http://loinc.org",  
      "code": "34840-9"  
    }  
  ]  
}
```



DocumentReference.author

author	Σ	0..*	Reference(Practitioner Organization Device Patient RelatedPerson)	Who and/or what authored the document
--------	----------	------	---	---------------------------------------

- optional; defaults to principal in token

DocumentReference.author (example)

```
{  
...  
"author": [  
    {  
        "reference": "Practitioner/2150097"  
    }  
]  
...  
}
```



DocumentReference.status



status

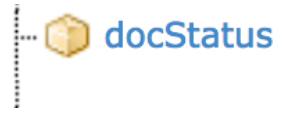
?! Σ 1..1 code

current | superseded | entered-in-error

[DocumentReferenceStatus \(Required\)](#)

- status of the DocumentReference *resource*
 - "status": "current" for new documents

DocumentReference.docStatus



docStatus

Σ

0..1

CodeableConcept

preliminary | final | appended | amended | entered-in-error
CompositionStatus (Required)

- Status of the *document itself*
- must be 'final' or 'preliminary' for new documents
 - e.g. "docStatus": "final"
- preliminary documents
 - stored in Millennium as "In Progress"
 - finalized in PowerChart
 - allows more detail to be added later

DocumentReference.context.period.end



- date/time marking the end of what's documented
- if absent, will be backfilled with DocumentReference.indexed (i.e. when document was created)



DocumentReference.context.period (example)

```
"context": {  
    "period" : {  
        "end": "2015-08-20T09:10:14Z"  
    }  
}
```



DocumentReference.content.attachment

 content	Σ	1..*	BackboneElement	Document referenced
 attachment	Σ	1..1	Attachment	Where to access the document
 Attachment	ΣI		Element	Content in a format defined elsewhere <i>If the Attachment has data, it SHALL have a contentType</i>
 contentType	Σ	0..1	code	Mime type of the content, with charset etc. MimeType  (Required)
 language	Σ	0..1	code	Human language of the content (BCP-47) Language  (Required)
 data	Σ	0..1	base64Binary	Data inline, base64ed
 url	Σ	0..1	uri	Uri where the data can be found
 size	Σ	0..1	unsignedInt	Number of bytes of content (if url provided)
 hash	Σ	0..1	base64Binary	Hash of the data (sha-1, base64ed)
 title	Σ	0..1	string	Label to display in place of the data
 creation	Σ	0..1	dateTime	Date attachment was first created

DocumentReference.content.attachment

- must be XHTML, UTF-8 encoded
- contentType
 - application/xhtml+xml; charset=utf-8
- data
 - Base64-encoded



DocumentReference.content.attachment.data

- XHTML converted to RTF when stored in Millennium
- Validate your XHTML
 - http://validator.w3.org/#validate_by_upload+with_options
 - <https://html5.validator.nu/>



DocumentReference.content.attachment.data conversion

- Sanitization
 - CSS, Javascript
 - Applet, iframe, link, script, and style tags will be removed completely
 - Other tags (a, button, form, frame, frameset, input, object, option, select, textarea) may be removed but the text within will remain.
- Images
 - can be inlined, but not external references
- Formatting may require tweaking



DocumentReference.content.attachment.data (example)

```
"content": [  
  {  
    "attachment": {  
      "contentType": "application/  
xhtml+xml; charset=utf-8",  
      "data":  
"PCFET0NUWVBFIGh0bWwNCiAgU1lTVEVNI..."  
    }  
  },  
]
```



Full Example (part 1/2)

```
{  
  "resourceType": "DocumentReference",  
  "subject": {  
    "reference": "Patient/53663272"  
  },  
  "type": {  
    "coding": [  
      {  
        "system": "http://loinc.org",  
        "code": "34840-9"  
      }  
    ]  
  },  
  "author": [  
    {  
      "reference": "Practitioner/21500981"  
    }  
  ],  
  "indexed": "2015-11-18T18:00:00Z",  
  "status": "current",  
  ...
```



Full Example (part 2/2)

```
...  
  "docStatus": {  
    "coding": [  
      {  
        "system": "http://hl7.org/fhir/composition-status",  
        "code": "final"  
      }  
    ]  
  },  
  "description": "Rheumatology Note",  
  "content": [  
    {  
      "attachment": {  
        "contentType": "application/xhtml+xml; charset=utf-8",  
        "data": "PCFET0NUWVBFIGh0bWwNCiAgU1lTVEVNI..."  
      }  
    }  
  ],  
  "context": {  
    "encounter": {  
      "reference": "Encounter/4208059"  
    },  
    "period": {  
      "end": "2015-08-20T09:10:14Z"  
    }  
  }  
}
```



The background of the slide features a complex, abstract geometric pattern composed of numerous triangles. A prominent vertical axis of symmetry runs through the center of the image. The triangles are rendered in varying shades of blue and teal, creating a sense of depth and perspective. The overall effect is modern and architectural.

Demo

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MedicationStatement



Summary

- **Purpose:** A record of a medication that is being consumed by a patient. A MedicationStatement may indicate that the patient may be taking the medication now, or has taken the medication in the past or will be taking the medication in the future.
- **Actions:** create, update
- **Consumers:** Practitioners, Systems



Capture...

- patient
- status
- effective date range
- note
- medication
- dosage
- route
- quantity



MedicationStatement.status

status

?! Σ 1..1 code

active | completed | entered-in-error | intended

[MedicationStatementStatus \(Required\)](#)

- Create - must be active
- Update - must be completed
 - only supported change for Update action

MedicationStatement.wasNotTaken

└─  **wasNotTaken**

?! Σ 0..1 boolean

True if medication is/was not being taken

- unsupported modifier

MedicationStatement.medication[x]

 medication[x]	Σ	1..1	What medication was taken
 medicationCodeableConcept			CodeableConcept
 medicationReference			Reference(Medication)

- CodeableConcept
- single-ingredient
- options
 - RxNorm
 - freetext

MedicationStatement.medicationCodeableConcept (example)

```
{  
...  
  "medicationCodeableConcept": {  
    "coding": [  
      {  
        "system": "http://www.nlm.nih.gov/research/umls/rxnorm",  
        "code": "2551",  
        "display": "Ciprofloxacin"  
      }  
    ],  
    "text": "ciprofloxacin"  
  }  
...  
}
```



MedicationStatement period

- interval of time that patient has asserted taking the med
- options:
 - effectivePeriod
 - dosage.timing.repeat.boundsPeriod
- if both populated, must be the same



MedicationStatement.effectivePeriod



Σ 0..1

dateTime

Period

Over what period was medication consumed?

MedicationStatement.dosage.timing.repeat.bounds (spec)

L	dosage	Σ	0..*	BackboneElement	Details of how medication was taken
	text	Σ	0..1	string	Reported dosage information
F	timing	Σ	0..1	Timing	When/how often was medication taken
	repeat	ΣI	0..1	Element	When the event is to occur <i>Either frequency or when can exist, not both</i> <i>if there's a duration, there needs to be duration units</i> <i>if there's a period, there needs to be period units</i> <i>If there's a periodMax, there must be a period</i> <i>If there's a durationMax, there must be a duration</i> Length/Range of lengths, or (Start and/or end) limits
	bounds[x]	Σ	0..1		
	boundsQuantity			Duration	
	boundsRange			Range	
	boundsPeriod			Period	

MedicationStatement.dosage.timing.repeat.bounds

- Either...
 - the outer bounds for start and/or end limits of the timing schedule (Period)
 - the length of timing schedule (Quantity)



MedicationStatement.dosage.timing.repeat.boundsPeriod

```
{  
  "boundsPeriod": {  
    "start": "2014-11-03T14:38:00.000-05:00"  
  }  
}
```



MedicationStatement.dosage.timing.repeat.boundsQuantity

```
{  
  "boundsQuantity": {  
    "value": 10,  
    "unit": "days",  
    "system": "http://unitsofmeasure.org",  
    "code": "d"  
  }  
}
```



Full Example (part 1/2)

```
{  
  "resourceType": "MedicationStatement",  
  "patient": {  
    "reference": "Patient/4766007"  
  },  
  "status": "active",  
  "medicationCodeableConcept": {  
    "text": "FHIR Test Medication"  
  },  
  ...
```



```
...  
  "dosage": [  
    {  
      "timing": {  
        "code": {  
          "coding": [  
            {  
              "system": "http://hl7.org/fhir/v3/vs/GTSAbbreviation",  
              "code": "BID"  
            }  
          ],  
          "text": "BID"  
        }  
      },  
      "quantityQuantity": {  
        "value": 60.0,  
        "units": "mg",  
        "system": "http://unitsofmeasure.org",  
        "code": "mg"  
      }  
    }  
  ]  
}
```





Try it out!

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Hands on exercises

- http://bit.ly/chc_learning_lab





Thank you!

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