

Health Level Seven (HL7) Fast Health Interoperable Resources (FHIR) – Provenance

Presentation to S&I DPROV Community

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16 January 2015

<http://www.hl7.org/fhir>

FHIR Clinical Resources

Clinical

General:

- AllergyIntolerance
- ClinicalAssessment
- Condition (aka Problem)
- ReferralRequest
- Procedure
- Contraindication
- RiskAssessment
- VisionPrescription

Data Collection & Care Plan:

- Questionnaire
- QuestionnaireAnswers
- FamilyHistory
- CarePlan
- CarePlan2
- Goal

Medication, Immunization & Nutrition:

- Medication
- MedicationPrescription
- MedicationAdministration
- MedicationDispense
- MedicationStatement
- NutritionOrder
- Immunization
- ImmunizationRecommendation

Diagnostics:

- Observation
- DiagnosticReport
- DiagnosticOrder
- ImagingStudy
- ImagingObjectSelection
- Specimen

FHIR Administrative Resources

Administrative

Attribution:

- Patient
- RelatedPerson
- Person
- Practitioner
- Organization
- HealthcareService

Entities:

- Contract
- Device
- DeviceComponent
- DeviceMetric
- Location
- Substance
- Group

Workflow Management:

- Encounter
- EpisodeOfCare
- Alert
- Communication
- CommunicationRequest
- Supply
- DeviceUseStatement

Scheduling / Ordering:

- Appointment
- Appointment Response
- Schedule
- Slot
- Order
- OrderResponse
- DeviceUseRequest
- ProcedureRequest

FHIR Infrastructure Resources

Infrastructure

Support:

- Media
- Basic
- Other
- Provenance ←
- SecurityEvent ←

Documents & Structure:

- List
- Composition
- DocumentReference
- DocumentManifest

Exchange:

- MessageHeader
- OperationOutcome
- Subscription
- Bundle
- Binary

Conformance:

- Conformance
- Profile
- ExtensionDefinition
- DataElement
- SearchParameter
- OperationDefinition
- ValueSet
- NamingSystem
- ConceptMap

<http://www.hl7.org/fhir>

FHIR Financial Resources

Financial

Support:

- Coverage
- EligibilityRequest
- EligibilityResponse
- EnrollmentRequest
- EnrollmentResponse
- PendedRequest
- Reversal
- StatusRequest
- StatusResponse
- SupportingDocumentation

Billing:

- ClaimResponse
- InstitutionalClaim
- OralHealthClaim
- PharmacyClaim
- ProfessionalClaim
- Readjudicate
- VisionClaim

Payment:

- PaymentNotice
- PaymentReconciliation

Other:

- ExplanationOfBenefit

- Segue to HL7 FHIR Resource:
 - <http://hl7-fhir.github.io/provenance.html>

Deadlines

- 30 September 2014
 - FHIR Profile Proposals Due
- 7 December 2014
 - Complete DRAFT Proposal Due
- 12 December 2014
 - Comment Only Ballot opened
- 12 January 2015
 - Comment Only Ballot closed
- **Next: 31 March 2015**
 - Complete Final DRAFT Proposal
 - Ready for FHIR DSTU 2 Ballot

Record Entry and FHIR Resources

- An EHR System manages a persistent EHR comprising Record Entries for
 - One or more provider organizations,
 - One or more individual practitioners, and
 - Many patients
- An EHR comprises
 - Many Record Entry instances
- A Record Entry instance may comprise
 - One or more FHIR Resource instance(s)
 - Bound to FHIR Infrastructure Resources (as applicable)
 - Provenance
 - SecurityEvent
 - Signature


Record Lifecycle Events on FHIR

Mapping to FHIR

Requirements	Are Fulfilled by...
ISO/HL7 10781 EHR-S FM R2 Record Infrastructure (RI) → 24(+3) Record Lifecycle Events	Implementable FHIR Resources
<u>Basic Lifecycle Event</u>	<ul style="list-style-type: none">• SecurityEvent
<u>Provenance Lifecycle Event</u> when Record Entry content is originated or updated	<ul style="list-style-type: none">• SecurityEvent• Provenance• Other new/updated resource(s) → corresponding to Action Taken

EHR-S FM Record Lifecycle


Pre/Post Events 1-9



Pre Event State	Resource @ Event	Post Event State				
	SecurityEvent + Provenance	Added Event Evidence	Retained Pre Edition Unaltered	Added New Edition	Signed as Author	Signed as System
[none]	1 Originate/Retain	X		X	Opt	X
[Record Entry as persisted, indivisible and immutable since previous Lifecycle Event]	2 Amend	X	X	X	Opt	X
	3 Translate	X	X	X		X
	4 Attest	X	X		X	X
	5 Access/View	X				
	6 Output/Report	X				X
	7 Disclose	X				X
	8 Transmit	X				X
	9 Receive/Retain	X	X			

EHR-S FM Record Lifecycle


Pre/Post Events 10-18



Pre Event State	Resource @ Event	Post Event State				
	SecurityEvent + Provenance	Added Event Evidence	Retained Pre Edition Unaltered	Added New Edition	Signed as Author	Signed as System
[Record Entry as persisted, indivisible and immutable since previous Lifecycle Event]	10 De-Identify	X	X	X		X
	11 Pseudonymize	X				
	12 Re-Identify	X				
	13 Extract	X	X	X		X
	14 Archive	X				
	15 Restore	X				
	16 Destroy/Delete	X	[none]			
	17 Deprecate	X				
	18 Re-Activate	X				

EHR-S FM Record Lifecycle

Pre/Post Events 19-27



Pre Event State	Resource @ Event	Post Event State				
	SecurityEvent + Provenance	Added Event Evidence	Retained Pre Edition Unaltered	Added New Edition	Signed as Author	Signed as System
[Record Entry as persisted, indivisible and immutable since previous Lifecycle Event]	19 Merge	X	X	X		
	20 Unmerge	X				
	21 Link	X				
	22 Unlink	X				
	23 Add Legal Hold	X				
	24 Remove Legal Hold	X				
	25 Verify (new event)	X				
	26 Encrypt (new event)	X	X	?		
	27 Decrypt (new event)	X	X	?		

Example – Medication Order

Action and Record Entry Metadata

	Action Metadata	Record Entry Metadata
Who	Action Subject (Patient) Johnny Walker Role: Subject	Entry Subject (Patient) Johnny Walker Role: Record Target
	Action Organization Bay City Medical Center	
	Action Practitioner/ Performer Doctor Sally Smith Role: Performer	Entry Source – Author or Scribe Nurse Janice Jones Role: Recorder
		Entry Source – System/Device Erstwhile EHR/Device XX123456

Example – Medication Order

Action and Record Entry Metadata

	Action Metadata	Record Entry Metadata
What	Action Taken Medication Order for Ambien 20mg PRN	Entry Origination/Retention evidenced by SecurityEvent Provenance + FHIR Resources related to Medication Order MedicationPrescription, et al
When	Action Date/Time 22 Aug 2014 @ 1800	Entry Date/Time 22 Aug 2014 @ 1810
	Action Duration 3 Minutes	
Where	Action Physical Location Ward/Room B/12	Entry Location – IP Address 255.255.255.1
Why	Action Reason/Purpose To Induce Sleep	Entry Reason/Purpose <none entered>

EHR-S FM Record Infrastructure (RI) – Lifecycle Events

Plus... More Evidentiary Metadata

Lifecycle Event →	Originate Retain	Amend	Attest	Translate
Record Entry Unique ID	X			
Record Entry Content: Data, Document, Artifact ID(s)	X	X		
Digital Signature(s) – Individual(s)			X	
Digital Signature – Acting System/Device	Any/All			
Corresponding/linked Record Entry(ies)	X	X		
Pointer to Pre-Event Entry, if any: pre update/translation		X		X
Pointer to Post-Event Entry, if any: post update/translation		X		X
Amendment and/or Translation Sequence		X		X
Identity and version of Translation Tool(s), if any				X

EHR-S FM Record Infrastructure (RI) – Lifecycle Events

Plus... More Evidentiary Metadata

Lifecycle Event →	Originate Retain	Amend	Attest	Disclose Transmit
Source of Copied Content: if copy/paste, template or boilerplate	X	X		
Event is Known Disclosure Indicator				X
Permissions associated with Record Entry Content	X	X		X
Entries in Event Transaction, if multiple	Set of Entries: <ul style="list-style-type: none"> • Accessed/Viewed • Transmitted • Received • Extracted • Archived/Restored • Destroyed/Deleted • On/Off Legal Hold ... 			

Provenance

- Based on
 - HL7 EHR Record Lifecycle Events on FHIR Project
- Basic
 - Who, What, When, Where, Why
- Evidentiary
 - Record Entry ID, Signature, Pre/Post Event States and more

Lifecycle Event Metadata

Who

Lifecycle Event Metadata	FHIR Resource	Resource Attribute(s)
Organization	Provenance	signature : string 0..*
	Provenance.Agent : 0..*	role : Coding 1..1 « ProvenanceAgentRole+ » type : Coding 1..1 « ProvenanceAgentType+ » reference : uri 1..1
Patient	Provenance	signature : string 0..*
	Provenance.Agent : 0..*	role : code 1..1 « ProvenanceEntityRole » type : Coding 1..1 « ProvenanceEntityType+ » reference : uri 1..1
	SecurityEvent.Participant : 1..*	role : CodeableConcept 0..* « DICOMRoleId+ » reference : Resource(Organization Practitioner Patient Device) 0..1 requester : Boolean 1..1
Action - Performer	TBD	

Lifecycle Event Metadata

Who, con't

Lifecycle Event Metadata	FHIR Resource	Resource Attribute(s)
Record - Author/ User	Provenance	signature : string 0..*
	Provenance.Agent : 0..*	role : Coding 1..1 « ProvenanceAgentRole+ » type : Coding 1..1 « ProvenanceAgentType+ » reference : uri 1..1
	SecurityEvent.Participant : 1..*	role : CodeableConcept 0..* « DICOMRoleId+ » reference : Resource(Practitioner Patient Device) 0..1 userId : string 0..1 requester : Boolean 1..1
Record - System/Device	Provenance	signature : string 0..*
	Provenance.Agent : 0..*	role : Coding 1..1 « ProvenanceAgentRole+ » type : Coding 1..1 « ProvenanceAgentType+ » reference : uri 1..1
	SecurityEvent.Participant : 1..*	role : CodeableConcept 0..* « DICOMRoleId+ » reference : Resource(Practitioner Patient Device) 0..1 userId : string 0..1 requester : Boolean 1..1

Lifecycle Event Metadata

What

Lifecycle Event Metadata	FHIR Resource	Resource Attribute(s)
Action - Taken	TBD	
Record - Lifecycle Event	SecurityEvent.Event : 1..1	type : CodeableConcept 1..1 « SecurityEventType+ » subtype : CodeableConcept 0..* « SecurityEventSubType+ » action : code 0..1 « SecurityEventAction » policy : uri 0..*
	SecurityEvent.Object : 0..*	identifier : Identifier 0..1 reference : Resource(Any) 0..1 type : code 0..1 « SecurityEventObjectType » role : code 0..1 « SecurityEventObjectRole » lifecycle : code 0..1 « SecurityEventObjectLifecycle »

Lifecycle Event Metadata

When

Lifecycle Event Metadata	FHIR Resource	Resource Attribute(s)
Action - Date/ Time	TBD	
Record - Date/ Time	Provenance	recorded : instant 1..1
	SecurityEvent.Event : 1..1	dateTime : instant 1..1
Action - Duration/ Elapsed Time	TBD	

Lifecycle Event Metadata

Where

Lifecycle Event Metadata	FHIR Resource	Resource Attribute(s)
Action - Physical Location	TBD	
Record - Network Address	Provenance	location : Resource(Location) 0..1
	SecurityEvent.Participant.Network	identifier : string 0..1 type : code 0..1 « SecurityEventParticipantNetworkType » location : Resource(Location) 0..1

Lifecycle Event Metadata

Why

Lifecycle Event Metadata	FHIR Resource	Resource Attribute(s)
Action - Reason, Rationale, Purpose	TBD	
Record - Reason, Rationale, Purpose	Provenance	<i>reason</i> : CodeableConcept 0..1
		<i>policy</i> : uri 0..*
	SecurityEvent.Event : 1..1	<i>reason</i> : CodeableConcept 0..1

Lifecycle Event Metadata

Evidentiary

Lifecycle Event Metadata	FHIR Resource	Resource Attribute(s)
Digital Signature(s)	Provenance	<code>signature</code> : string 0..*
Record Entry ID	SecurityEvent.Object : 0..*	<code>identifier</code> : Identifier 0..1 <code>reference</code> : Resource(Any) 0..1
Record Entry Content ID(s): data, docs, artifacts	SecurityEvent.Object : 0..*, one for each Content item	<code>identifier</code> : Identifier 0..1 <code>reference</code> : Resource(Any) 0..1
Corresponding/ linked Record Entry(ies)	SecurityEvent.Object : 0..*, one for each linked Record Entry	<code>identifier</code> : Identifier 0..1 <code>reference</code> : Resource(Any) 0..1
Amendment/ Translation Sequence	SecurityEvent.Object : 0..*	<code>lifecycle</code> : code 0..1 « SecurityEventObjectLifecycle »
Pointer to Pre Event Entry, if chained	SecurityEvent.Object : 0..*, one to previous instance	<code>identifier</code> : Identifier 0..1 <code>reference</code> : Resource(Any) 0..1

Lifecycle Event Metadata

Evidentiary, con't

Lifecycle Event Metadata	FHIR Resource	Resource Attribute(s)
Source of Copied Content (e.g., copy/paste template)	SecurityEvent.Object : 0..*, <i>one for each source</i>	identifier : Identifier 0..1 reference : Resource(Any) 0..1 type : code 0..1 « SecurityEventObjectType » role : code 0..1 « SecurityEventObjectRole »
Event is known Disclosure	SecurityEvent.Object : 0..*	lifecycle : code 0..1 « SecurityEventObjectLifecycle », where lifecycle = "disclosure"
Record Entry Permissions	SecurityEvent.Participant : 1..*, <i>one for each participant</i>	role : CodeableConcept 0..* « DICOMRoleId+ » [<i>for role-based</i>] reference : Resource(<u>Practitioner</u> <u>Patient</u> <u>Device</u>) 0..1 userId : string 0..1 [<i>for user-based permissions</i>]
	SecurityEvent.Object : 0..*	sensitivity : code 0..1 « SecurityEvent.object.sensitivity »
Event Transaction Entries	SecurityEvent.Object : 0..*, <i>one for each Record Entry</i>	identifier : Identifier 0..1 reference : Resource(Any) 0..1 type : code 0..1 « SecurityEventObjectType »
Identifier/Version of Translation Tools	SecurityEvent.Participant : 1..*, <i>one for each tool</i>	role : CodeableConcept 0..* « DICOMRoleId+ » reference : Resource(<u>Practitioner</u> <u>Patient</u> <u>Device</u>) 0..1 userId : string 0..1

Contact/Links

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