Record Lifecycle Events on FHIR

W5 Analysis Project
October FHIR Connectathon Track

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http://www.hl7.org/fhir

As of 9 June 2015

FHIR Infrastructure Resources

Infrastructure

Support:

- Media
- Basic
- Provenance ←
- AuditEvent ←

Documents & Structure:

- List
- Composition (+ Clinical Document)
- DocumentReference (+ XDS)
- DocumentManifest

Exchange:

- MessageHeader
- OperationOutcome
- Subscription
- Bundle
- Binary

Conformance:

- Conformance
- StructureDefinition
- ValueSet
- ConceptMap
- DataElement
- OperationDefinition
- SearchParameter
- NamingSystem
- TestScript

Targets

- W5 = who, what, when, where, why
- FHIR W5 Report
  - http://hl7-fhir.github.io/w5.html?
- DSTU-2 Reconciliation Deadline
  - 31 August 2015
- Next FHIR Connectathon
  - 3-4 October 2015, HL7 Atlanta

Mapping to FHIR

Requirements	Are Fulfilled by…
ISO/HL7 10781 EHR-S FM R2 Record Infrastructure (RI) → 24(+7) Record Lifecycle Events	Implementable FHIR Resources
Basic Lifecycle Event	• AuditEvent
Provenance Lifecycle Event when Record Entry content is originated or updated	• AuditEvent • Provenance • Other new/updated resource(s) → corresponding to Action Taken

↑ Resources may also be indivisibly and immutably bound by one or more digital signatures in a Record Entry.

Fundamentals

- EHR and PHR Record Entries document (show evidence of) Actions Taken in health and healthcare
- Actors take Actions
- Actors may be individuals, organizations or software/devices
- Actions and Record Entries have separate (yet corresponding) sets of metadata
- Thus: Action W5 + Record Entry W5

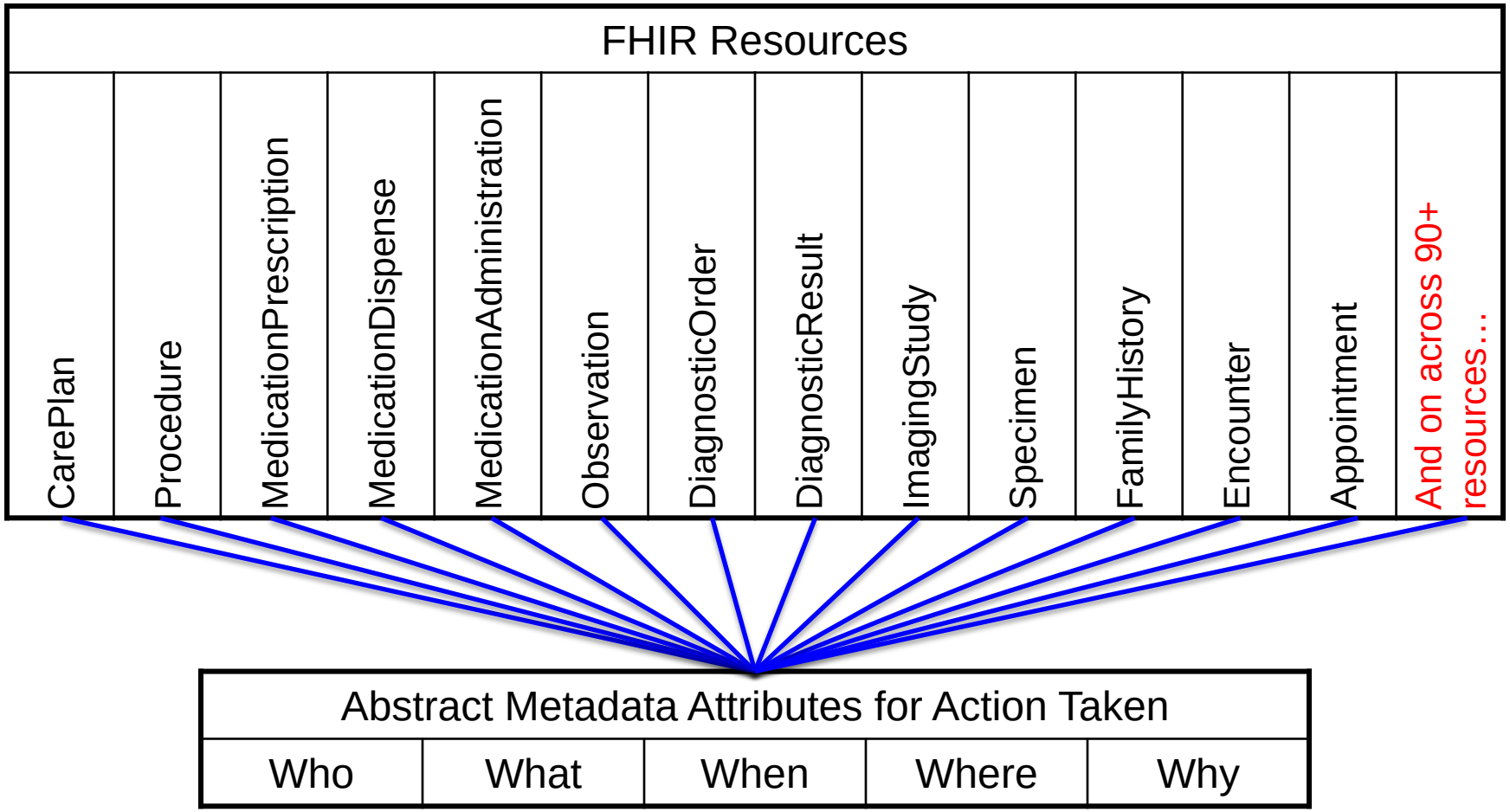
Action/Record Entry W5 Metadata

Action	Is documented/evidenced by	Record Entry
<u>Action W5:</u> Who/role – Action subject, patient Who/role – Action performer, assistant, observer What – Action taken When – Action date/time/duration Where – Action physical location Why – Action rationale, purpose		**<u>Record Entry W5:</u>** Who/role – Entry target, subject, patient Who/role – Entry author, scribe, verifier, attester, witness… What – Entry Action: originate, update… When – Entry date/time Where – Entry device ID, network address Why – Entry rationale, purpose
Expressed across all FHIR resources		<u>Fully Expressed</u> in FHIR AuditEvent and Provenance resources when bound to other FHIR resources

Submitted to
FHIR DSTU-2
GForge #6304

Action Metadata

Abstract Attributes



Individuals have specific…

Action and Record Entry Roles

Action Roles	Record Entry Roles
• Subject • Performer • Witness	• Record Target • Author • Recorder (Enterer?) • Verifier • Attester • Informant • Source/Copy From

Fundamentals

- EHR/PHR Record Entries:
  - Have a lifespan:
    - Point of origination to ultimate point of destruction/deletion
  - Have one or more lifecycle events occurring over the course of their lifespan:
    - Originate/retain, update, attest, view/access and more
  - Retain relevant W5 metadata to document/evidence authenticity of, and accountability for:
    - Lifecycle events, content and data state changes
  - Enable transparency/traceability:
    - From point of origination to real-time point of access/use
    - Evidencing W5 metadata from each previous lifecycle event

Fundamentals

- Persistent FHIR Resource Instances are:
  - Captured in EHR/PHR Record Entries
    - *As native artifacts*
  - Bound with FHIR AuditEvent and Provenance Resources to capture:
    - Evidence of authenticity and accountability (as W5 metadata)
  - Retained on source system for legal retention period
- Transient FHIR Resource Instances are (typically):
  - Created for purposes of exchange
    - *As transient artifacts*
  - Retained on source/receiver system for limited time

Objective

W5 Evidence

- Show how Action W5 and Record Entry W5 metadata is expressed (evidenced) in FHIR resources
  - Record Entry W5 metadata: AuditEvent and Provenance
  - Action W5 metadata: TBD = W5 Analysis across FHIR resources
- As evidence of authenticity and accountability
- Establish use of FHIR AuditEvent and Provenance as best practice

Objective

Consistency

- Establish consistent W5 metadata definitions
  - To include: attribute names, descriptions, data types, code/value sets
  - Across FHIR resources and especially:
  - When bound to FHIR AuditEvent resource:
    - Tracking resource (instance) lifecycle (including CRUDE) events
  - When bound to FHIR Provenance resource:
    - Tracking resource (instance) lifecycle events when content is created or updated (including signature)

Action and Record Entry Metadata

Ideally…

Action W5 metadata…	Record Entry W5…
May be expressed in <any> resource	Is expressed in AuditEvent resource
Is expressed consistently across <all> resources: attribute name, description, data type, code/value set	Is also expressed in Provenance resource when content is originated or updated
	If carried in <any> resource (not bound to AuditEvent or Provenance), it is expressed consistently

FHIR

W5 Report

- FHIR W5 Link (Current Build)
  - Now Referencing Current Build
  - Compilation now includes all W5 metadata
    - Who, what, when, where, why
  - Across
    - FHIR Clinical, Administrative, Infrastructure Domains
    - Not Finance (yet)
  - Two Sections
    - Concise: FHIR Resources + Attributes
    - Full: FHIR Resources + Attributes + Data Types

FHIR W5 Report – Analysis

Worksheet

W5 Worksheet, 1st Tab

- Col B – W5 Metadata
  - Current Build - W5 Report: Blue
  - Proposed: Orange (ISO/HL7 10781), Purple (Lloyd)
  - Is W5 Metadata list complete?
  - Criteria to add metadata:
    - Breakout by who role: e.g., subject, performer, assistant, witness, author, attester, informant
    - Breakout by Action and Record Event
    - Requirement from ISO/HL7 10781 EHR System Functional Model Release 2 Record Infrastructure
    - Concept missing, not combinable

Worksheet

W5 Worksheet, 1st Tab

- Col C – Action or Record Entry Metadata
  - Is concept Action or Record Entry (or both) Metadata?
- Col D – AuditEvent/Provenance Reference
  - At least for Record Entry W5 Metadata
- Col E – W5 Attribute Names
  - Review and disambiguate concepts…
  - Same concept, different attribute name?
  - Different concept, same or different attribute name?

Worksheet

W5 Worksheet, 1st Tab

- Col F – Current W5 Definition
- Col G – Proposed Definition
  - Review and refine

W5 Analysis Issues

- W5 metadata attributes are designated by resource owner WG
  - Many empty cells, significance:
    - No equivalent Metadata Attribute? <u>or</u>
    - Not yet evaluated? <u>or</u>
    - Inadequate definition of W5 concept/term?
  - Not directly based on AuditEvent or Provenance W5 metadata attributes and datatypes

W5 Analysis Issues

- Identify overlap between FHIR AuditEvent and Provenance metadata and that of other resources
- Ensure W5s are synchronous in same Action Instant (point in time)?
  - Snapshot
  - Instant corresponds to FHIR instance

3-4 October – HL7 Meeting – Atlanta

October FHIR Connectathon

- October 2015 FHIR Connectathon Link
- Start with/piggyback on existing Scenario: Track 1 – Patient ID/Demographic
- Identify CRUDE points
- Add AuditEvent to all Scenarios
- Add Provenance resource to CUE Scenarios, as appropriate

October FHIR Connectathon

Track 1 - Patient

Scenario		CRUDE	AuditEvent	Provenance
1	Register a New Patient	C	X	X
2	Update a Patient	U	X	X
3	Retrieve Patient History	R	X	
4	Search for a Patient on Name	R	X	

Links

- RLE on FHIR Materials – HL7 EHR Interop Wiki:
  - http://wiki.hl7.org/index.php?title=EHR_Interoperability_WG
- FHIR DSTU-2 – Record Lifecycle Event Implementation Guide
  - http://www.hl7.org/fhir/2015May/ehrs-rle.html
- FHIR W5 Report (Continuous Build)
  - http://hl7-fhir.github.io/w5.html?
- FHIR May 2015 Connectathon
  - http://wiki.hl7.org/index.php?title=FHIR_Connectathon_9#Track_1_-_Patient

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 AuditEvent 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: • Accessed/Viewed • Transmitted • Received • Extracted • Archived/Restored • Destroyed/Deleted • On/Off Legal Hold …			

CRUDE Points

- W5 Metadata is captured (in FHIR resource instances) at CRUDE points
  - **C**apture: Originate content in new instance
  - **R**ead: Access/view content in existing instance
  - **U**pdate: Update content in existing instance
  - **D**elete: Purge/destroy existing instance and its content
  - **E**xecute: Perform operation(s) on content in existing instance

ISO/HL7 10781 EHR System Functional Model Release 2

CRUDE per Record Lifecycle

	ISO/HL7 10781 EHRS FM R2 – Record Lifecycle Events																							New		
	1 Originate/retain	2 Amend	3 Translate	4 Attest/sign	5 Access/view	6 Output/report	7 Disclose	8 Transmit	9 Receive/retain	10 Deidentify	11 Reidentomynize	12 Reidentify	13 Extract	14 Archive	15 Restore	16 Destroy	17 Deprecate	18 Reactivate	19 Merge	20 Immerge	21 Link	22 Unlink	23 + Legal Hold	24 – Legal Hold	25 Verify	26 Encrypt	27 Decrypt
Create	X			X					X																		
Read					X																						
Update		X	X	X						X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Delete																X											
Execute			X	X		X	X	X		X	X	X	X				X	X			X	X	X	X	X	X	X

Duplicate U/E events – to be resolved