Verb Categorization by Record-Entry Events

EHR Interoperability-Privacy and Security Work Groups

Verb Harmonization Initiative Work-in-Progress Notes

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**INTRODUCTION[[1]](#footnote-1)**: Privacy and Security can provide authorization and access controls to EHR system operations and information exchanges, which result in record-entry lifecycle state transitions; where,

* CRUDEA (Create, Read, Update, Delete, Execute, Append) are underlying computer operations
* Record entries go through a sequence of lifecycle events (aka state transitions)
* EHRS FM operation verbs are “triggers” to the record-entry state transitions
* Security audit log and/or provenance metadata may be captured, at the record-entry state transitions, as Fast Healthcare Interoperability Resources (**FHIR**).
* The goal of this initiative is to align EHR, Security and Privacy terms.
* The objectives / approach of this initiative are to iteratively
  1. categorize the verbs by the Record-Entry lifecycle events they trigger
  2. align events and their trigger verbs in the context of each Record-Entry lifecycle event
  3. align lifecycle events, Privacy and Security controls, and EHR operational verbs.
* The products of this initiative are:
  1. Domain Analysis Model (DAM) (e.g., State Transition Model of record-entry events)
  2. Vocabulary, taxonomy (abstract hierarchy) and glossary of “terms”; where,
     + term implies classes or objects containing record-entry nouns and operation verbs.

**REFERENCE**: See companion Excel workbook “*EHRS-FM Verb triggers mapped to Record-Entry Lifecycle Events Harmonization-Matrix and Definitions*.xlsx”, which also contains the glossary of terms.

REQUESTED ACTION: Please pose questions and provide suggestions for improvement.

**ASSUMPTIONS**: **Lifecycle Event State Transition Diagram (below)**

1. Foundational Events need full provenance metadata resource; while, derived events may only need privacy & security metadata resource; where,

* Events/States are adjectives for Record-Entries (e.g., originated/ retained and encrypted record-entry)
* One-or-more verbs can trigger one-or-more events/states
  + (e.g., Export record-entry results-in an exported and disclosed record-entry)

1. Within an EHRS-FM profile, this Notional Record-Entry-Lifecycle State-Transition-Diagram should be adapted to define "fit-for-purpose" state-transitions and state-transition metadata according-to scope-of practice, organizational-policy and jurisdictional-law.

* e.g. business Rules may change the “Final State” from “Destroyed” to “Archived” and/or remove “Destroyed”.

**SUGGESTIONS / ISSUES:**

1. 7/29/14 MvdZ – CRUDEA needs Query and Search [Michael Van Der Zel]
2. 7/29/14 TW – Categorizations/ hierarchies based-on policy (e.g., read access of sensitive data).
   1. 7/30/14 SH – What provenance is associated with ABAC access to sensitive data
3. 7/29/14 RDG - “Disambiguate” verb may be merited. [Reed Gelzer]
4. 7/29/14 RDG - The EHR FM R2 glossary definition for Attest/Attested may or may not line up entirely with its use here.
5. 7/29/14 RDG - The EHR FM R2 Glossary does not have Verify as a noun or verb.
6. 7/29/14 RDG - Consider the concept that there are undoubtedly transition events that are aggregations of simultaneous transition types. For example, when executing an amendment on a Record Entry, a common scenario will include retaining the original as an immutable entry AND executing the amendment transition to an Amended record AND retaining the amended record entry as an immutable entry? Presumably “aggregated transition events” would be designed in and “hard coded” or configurable.



Figure 1 Notional State Transition Machine for Record-Entry Lifecycle Events

* State Transition from Archived to Destroyed was added.
* Direct transition from originate receive to destroy was added for non-retained information
* Immutable record transition from Originated / Retained or Received / Retained was added
* RBAC & ABAC added as managing record-entry state-transitions

Legend

* *Record-Entry Lifecycle Event*
* EHRS-FM Verb
* Privacy & Security verb

**Manage an EHR**

* + 1. CRUDEA (Create, Read, Update, Delete, Execute, Append)
       1. ISSUE: What about Query and Search [Michael Van Der Zel]
       2. **Control Access** (Privacy & Security) applies to all operational verbs
          1. **Authenticate**
          2. **Authorize**
          3. **NOTE**: RBAC is at the CRUDEA level, ABAC is at the operational verb level [Steve Hufnagel]
       3. **Metadata, with each type of CRUDEA (Create, Read, Update, Delete, Execute, Append)**
          1. **Provenance**
          2. **Privacy & Security Track**

**Log** (Logging typically means the recording of implementation level events that happen as the program is running (methods get called, objects are created, etc.). As such it focuses on things that interest programmers)

**Audit** (Auditing is about recording domain-level events: a transaction is created, a user is performing an action, etc. In certain types of application (Banking) there is a legal obligation to record such events.)

* + - 1. Privacy & Security Modify\_Status These are at the CRUDEA level [Steve Hufnagel]
         1. Abort
         2. Activate
         3. Cancel
         4. Complete
         5. Hold
         6. Jump
         7. Nullify
         8. Release
         9. Resume
         10. Suspend
    1. **Maintain** 
       - 1. **Foundational Lifecycle Events/States and associated Trigger Verbs**

**C**RUDEA, **FHIR**: Provenance & Security Event, RBAC access controls

**Originate/ Retain** Event-State may be triggered by the following verbs.

Originate

Capture

Enter

Retain

Store

Save

**Receive/ Retain** Event State-transition may be triggered by the following verbs:

Exchange (needs definition!)

Receive

Import Import

Retain

Store

Save

Auto Populate

Copy

Duplicate

Reproduce

CRUDEA, **FHIR**: Provenance & Security Event, [if Attest is done separately from Originate],

*Amend Event State-transition may be triggered by the following verbs:*

*Amend [deprecated to edit in glossary action required!]*

Update [top level verb] 🡪 **RECOMMENDATION:** Change Amend Event to Update Event

Edit, [Definitions refer to amend, action required!]

Redact

Replace [Out of place?]

Annotate Annotate

Append

Integrate

Tag [aka flag, does not require re-attest, out of place? Where does this belong?, EHRS Definition is flag for follow-on action] **ACTION**: Security definition of Tag

*Attest Event State-transition may be triggered by the following verbs:*

Sign (includes a digital signature) =? Attest (does attest include a signature?)

*Verify Event State-transition may be triggered by the following verbs:*

Verify Verify

CRUDEA, FHIR: Provenance & Security Event

*Destroy Event State-transition may be triggered by the following verbs:*

Purge Purge (specific type of delete where recovery is NOT possible))

Delete (recovery is potentially possible)

* + - * 1. **Derived Lifecycle Events/States and associated Trigger Verbs**

CRUDEA, FHIR: Security Events

*View/ Access* *Event State-transition may be triggered by the following verbs:*

Access (privacy permission … ability to read) =? Read (data operation)

Collect

Use

Transmit , Exchange

Harmonize

Determine

Analyze

Decide

Privacy permissions constrain or require logging of the data operations

**FHIR**: Security Event

Disclose *Event State-transition may be triggered by the following verbs: (Deprecated verb)*

Disclose (privacy operation?)

Export (deprecated) Export

Exchange (send and receive 🡪 recommend deprecation of Exchange)

Render

Print

Present

Forward

Transfer

**FHIR**: Security Event

*Output/ Report Event State-transition may be triggered by the following verbs:*

Transmit

Export Export

Exchange

Render

Print

Present

Forward

Transfer

Disclose (based on Privacy & Security policy)

**FHIR**: Security Event

**NOTE**: This may result in a Receive/ Retain event for the recipient

*Transmit Event State-transition may be triggered by the following verbs:*

Transmit

Export Export

Exchange

Render

Print

Present

Forward

Transfer

Disclose (based on Privacy & Security policy)

**FHIR**: Security Event

**NOTE**: This may result in a Receive/ Retain event for the recipient

**ISSUE**: What is the difference between Output/Report and Transmit?

*Extract Event State-transition may be triggered by the following verbs:*

Extract

Excerpt

Derive

**FHIR**: Security Event

**NOTE**: This may result in a Create/ Retain event for a new record-entry

CRUDEA, **FHIR**: Provenance & Security Event

*Link Event State-transition may be triggered by the following verbs:*

Link

Tag

Track

Log

Audit

Sustain (Ops.) [Out of place?]

**FHIR**: Security Event

*Unlink Event State-transition may be triggered by the following verbs:*

unlink

**FHIR**: Security Event

*Translate Event State-transition may be triggered by the following verbs:*

Translate

Convert

Encrypt Encrypt

Decrypt Decrypt

(Modify) Data Visibility [Does this belong here?]

De-identify De-identify

Pseudonymize

Anonymize

Mask Mask

Redact

Hide

**FHIR**: Security Event

**NOTE**: This may result in a Create/ Retain event for a new record-entry

*Pseudomynize Event State-transition may be triggered by the following verbs:*

Pseudonymize

De-identify De-identify

**FHIR**: Security Event

**NOTE**: This may result in a Create/ Retain event for a new record-entry

*De-Identify* *Event State-transition may be triggered by the following verbs:*

(Modify) Data Visibility [Does this belong here?]

De-identify De-identify

Pseudonymize

Anonymize

Mask Mask

Redact

Hide

**FHIR**: Security Event

**NOTE**: anonymize and randomize missing?

**NOTE**: This may result in a Create/ Retain event for a new record-entry

*Re-Identify Event State-transition may be triggered by the following verbs:*

(Modify) Data Visibility [Does this belong here?]

Re-identify, Re-identify

Identify

Unmask

Unhide

**FHIR**: Security Event

**NOTE**: This may result in a Create/ Retain event for a new record-entry

*Place Legal Hold Event State-transition may be triggered by the following verbs:*

Annotate / [Log]

Tag

**FHIR**: Security Event

**NOTE**: This may result in a Create/ Retain event for a new record-entry

*Remove Legal Hold Event State-transition may be triggered by the following verbs:*

Annotate / [Log]

Tag

**FHIR**: Security Event

**NOTE**: This may result in a Destroy event for a copied record-entry, put on legal hold.

*Encrypt Event State-transition may be triggered by the following verbs:*

Encrypt Encrypt

**FHIR**: Security Event

**NOTE**: This may result in a Create/ Retain event for a new record-entry

*Decrypt Event State-transition may be triggered by the following verbs:*

Decrypt Decrypt

**FHIR**: Security Event

**NOTE**: This may result in a Create/ Retain event for a new record-entry

*Archive Event State-transition may be triggered by the following verbs:*

Archive Archive

Backup Backup

**FHIR**: Security Event

**NOTE**: This may result in a Create/ Retain event for a new record-entry

*Restore Event State-transition may be triggered by the following verbs:*

Restore Restore

Recover

**FHIR**: Security Event

**NOTE**: This may result in a Create/ Retain event for a new record-entry

*Deprecate/ Retract Event State-transition may be triggered by the following verbs:*

Remove

Obsolete

Tag [Out of place?]

**FHIR**: Security Event

**NOTE**: This may also result in an archive event

*Re-Activate Event State-transition may be triggered by the following verbs:*

Re-activate

Annotate / [Log]

Tag [Out of place?]

Restore Restore

Recover

**FHIR**: Security Event

**NOTE**: This may result in a Create/ Retain event for a new record-entry

1. This Introduction is based on the 2014-07-15 EHR Interoperability Workgroup and Privacy and Security Workgroup PSS discussions. [↑](#footnote-ref-1)