KP Deployment of SNOMED-CT as the Foundation for Enterprise Wide Clinical Data
Today’s Topics

- Introduction to Kaiser Permanente
- Introduction to the Convergent Medical Terminology (CMT) Project
- Architecture of CMT Tooling
Take Home Messages

- KP is deploying SNOMED-CT as the foundation for all clinical data needs of the enterprise, not simply as just as one of many data resources.

- KP is using the IHTSDO workbench as the foundation for enterprise terminology tooling.

- The SNOMED-CT standardized extension mechanisms, history mechanisms and the IHTSDO workbench, enable enterprise terminology management.
The KP Donation of the CMT project content & resources to the IHTSDO and the US National Library of Medicine exemplify KP’s confidence in—and commitment to—SNOMED-CT as the standard foundation for clinical data representation and data analysis.

KP will continue to donate workbench improvements, content extensions and reference extensions to the IHTSDO and US National Library of Medicine.
About Kaiser Permanente

• Nation’s largest nonprofit health plan
• Integrated health care delivery system
  • 8.7 million members
  • 14,000 physicians
  • 165,000 employees
• 8 regions serving 9 states & D.C.
  • 36 hospitals & medical centers
  • 431 medical offices
• *$44.2 billion annual revenues

* 2010 revenues
Kaiser Permanente's Mission

To provide affordable, quality health care services and to improve the health of our members and the communities we serve
• **1970s**: Morris Collen, MD, pioneers the use of computers in recording and sorting clinical data in real time at the San Francisco Medical Center. The focus is physical examination and laboratory screening.

• **1970-1980s**: Regions independently automate demographic, appointments, pharmacy, laboratory and other ancillary systems.

• **Late 1980s**: Regions experiment with clinical systems development and deployment without wide success.
• **Early 1990s**: Several regions develop operations data stores, notably NCAL (CIPS), Ohio (MARS) and Mid-Atlantic (PACE) with various forms of real time data views and entry

• **Mid 1990s**: Northwest deploys EpicCare to all MDs and RNS, Colorado deploys CIS (joint development with IBM) to all MDs and RNs. California deploys (Oceania’s) WAVE. These are the first three products not internally developed
• **2003**: KP HealthConnect development began

• **2009**: KP HealthConnect deployment complete
Today’s Topics

- Introduction to Kaiser Permanente
- Introduction to CMT project
- Architecture of CMT tooling
Introduction to Convergent Medical Terminology
What is Convergent Medical Terminology (CMT)?

- CMT is KP’s Enterprise Terminology System that is designed to “converge” disparate terminology sources into a single central terminology platform, and includes several components:
  - End user terminology
  - Standard terminology
  - Administrative codes
  - Query and Decision support
  - Request and Release process

- Terminology used in KP HealthConnect (the KP Electronic Health Record)
Also known as “Interface Terminology” – connecting the human readable form to machine readable form

End User terms are mapped to the standard terminologies and have the specific attributes the application needs

End Users use/see the terms that are familiar to them, and the application uses the codes and attributes it needs
### CMT Terminology Model – OLD “Concept” Based

#### Modelers create Terms

<table>
<thead>
<tr>
<th>Community ID</th>
<th>Display Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>12020657</td>
<td>ADHD</td>
</tr>
<tr>
<td>12132215</td>
<td>ADHD, combined</td>
</tr>
<tr>
<td>12126589</td>
<td>ADHD, hyperactive impulsive</td>
</tr>
<tr>
<td>12020656</td>
<td>ADHD, inattentive</td>
</tr>
<tr>
<td>12123907</td>
<td>Alzheimers dementia, early onset, w delirium</td>
</tr>
<tr>
<td>12135929</td>
<td>Alzheimers dementia, early onset, w delusions</td>
</tr>
<tr>
<td>12147273</td>
<td>Alzheimers dementia, early onset, w depressed mood</td>
</tr>
</tbody>
</table>

#### Coders map to codes

<table>
<thead>
<tr>
<th>Community ID</th>
<th>Display Name</th>
<th>ICD9-CM</th>
</tr>
</thead>
<tbody>
<tr>
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<td>ADHD, hyperactive impulsive</td>
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<td>12020656</td>
<td>ADHD, inattentive</td>
<td>314.00</td>
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<tr>
<td>12123907</td>
<td>Alzheimers dementia, early onset, w delirium</td>
<td>331.0/294.10/293.0</td>
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<tr>
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<td>Alzheimers dementia, early onset, w delusions</td>
<td>331.0/294.10/293.81</td>
</tr>
<tr>
<td>12147273</td>
<td>Alzheimers dementia, early onset, w depressed mood</td>
<td>331.0/294.11</td>
</tr>
</tbody>
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#### Map to SNOMED CT

<table>
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<th>SCTID</th>
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<th>Display Name</th>
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</thead>
<tbody>
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<td>Alzheimers dementia, early onset, w delirium</td>
</tr>
<tr>
<td>54502004</td>
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<td>Alzheimers dementia, early onset, w delusions</td>
</tr>
<tr>
<td>10532003</td>
<td>12147273</td>
<td>Alzheimers dementia, early onset, w depressed mood</td>
</tr>
</tbody>
</table>

#### KPHC
- Problem List
- Encounter Dx

#### Billing/Claims

#### Update Code
- Retire Term
- Remap SCTID
CMT Terminology Model – NEW “Concept” Based

Concept: Congestive heart failure (disorder) (SNOMED ID: 42343007)

- 428.0 (ICD-9 CM)
- 150.9 (ICD-10 CM)

Descriptions:
- CHF* [EDG Display Name]
- "Congestive heart disease" [Synonym]
- "CHF (congestive heart failure)" [Pt. friendly name]

Is A: Heart Failure
Has site: Cardiac ventricular structure

SNOMED ID: 42343007
EDG Community ID: 12020738
EXM: Epic translation file
End User Terminology Component

- Protects end users from changes in Standard terminology or coding schemes

**Examples:**
- Majority of the diagnosis terms currently being used do not have to be changed or deleted because of transition from ICD9 to ICD10
- When LOINC names change, there is no need to change the Result display name that end users are seeing
- When SNOMED descriptions change, there is no need to change the display names end users see
With CMT, certain MasterFile and category list content is standardized across the enterprise, all eight KP regions.

IntraConnect is used to define the build levels and tracking levels of each MasterFile and category lists.

Provides the ability to allow localization while keeping certain data standard across the enterprise.

Focuses on end user usability:
- Neither ICD9 or SNOMED can be used out of box as end user terminology, their purpose is not end user usability.
- KP CMT’s “End User Terminology” is a bi-product of actual user experience, and continues to improve.
● 2014-2015 - All components and content developed and maintained by CMT will take place in ETT
Why did KP adopt IHTSDO Workbench?

● Too many disparate tools to “complete” the job
  – Costly
  – Inefficient
  – Lack of visibility

● Interface/end user terminology management not integrated well with the “Reference” terminology
  – Confusion about the term meaning
  – Duplicate work
Why did KP adopt IHTSDO Workbench? (continued)

- No ability to model a new concept as a logical extension of SNOMED CT
- No ability to integrate/converge multiple terminologies into a single platform
- Collaborate on terminology development more efficiently within and outside of organization
- Classifier – formal ontology allows inheritance and inferencing
KP Roadmap

- Pilot now completed: Proved KP can extend IHTSDO Workbench to support KP CMT terminology model (including Reference + Interface attributes) and KP operations

- Sunset all KP legacy tools/databases and operationalize all MasterFiles and category lists CMT maintains by 2014

- Creates a truly “Convergent” CMT
CMT Future Direction

Request Tracking

Regionalization

To Epic

Enterprise Terminology Tool

Queries/Decision Support

Other

Standard Reference Terminologies

KP Only concepts

SNOMED

LOINC

ICD9

CPT4

HCPCS

FDB

PRODNAM

NCA

SCAL

HI

NW

OH

CO

GA

MAS

Queries/Decision Support

Other

Standard Reference Terminologies

Request Tracking

Regionalization

To Epic
Formal agreement to donate CMT content and Tool to IHTSDO and NLM (February 2011)

**Content component**
- CMT SNOMED CT Extensions: Kaiser Permanente modeled SNOMED CT concepts including Fully Specified Name (FSN), Patient Facing Name (PF), Synonym, Relationships (defining)
- CMT derivatives: Kaiser Permanente derivatives to SNOMED CT or non-SNOMED CT terminology including KP Clinician Display Names, KP Patient Display Names, KP mappings to ICD9-CM, ICD 10-CM, CPT4, LOINC, etc.

**Tool component**
- All enhancements KP makes to IHTSDO Workbench
- KP operation specific, i.e. “extracting into Epic load file format”
In 2009, the International Health Terminology Standards Development Organization (IHTSDO) released the initial version of “Terminology Workbench”

- Kaiser Permanente piloted the initial version in late 2009
- KP implementation and migration path started in 2010
- KP enhanced IHTSDO Workbench = ETT
- First go live in September 2011 (Diagnosis/Problem domain)
- Migration of all legacy tools/databases to ETT by 2014
Why is KP Donating?

- Accelerate the growth of a distributed international network of terminology developers, who will work together to ensure that SNOMED CT and other standard vocabularies are more quickly updated and enriched with clinician and patient facing terminology
  - With this “Network effect”, the more contributors, the more each individual contributor can benefit

- This collaborative approach will enhance the usability of CMT with more adaptable interface terminology for different use cases and enhance SNOMED CT & other standard terminologies, more practical & useful
Why is KP Donating? (continued)

- Over time, this distributed and collaborative approach will reduce the level of terminology development effort required by any single institution, vendor, or country
  - saving time and reducing costs for all participating organizations
  - another example of the network effect

- Accelerate the adoption of SNOMED CT and other standard terminologies, and lower the barrier of entry and achieve Meaningful Use standards

- Three key problems in semantic interoperability of terminology sets in healthcare today
  1. Coherence and coordination of provider-based terminologies
  2. Coherence and coordination of consumer-based terminologies
  3. Coherence and coordination of provider-based terminologies with consumer based terminologies
How will the Donation Manifest?

Content Deliverable

- KP sends to IHTSDO and NLM at the same time
  - Format: spreadsheet format and RF1 (later also in RF2)
    
    RF1 and RF2 are the formats in which SNOMED CT is released
  
  - Two description types are added in RF1 “Description” table to represent KP Clinician Display Name and KP Patient Display Name
  - Cross Map tables include KP ICD 9-CM/ICD 10-CM mappings (direct, one to one mapping)

- IHTSDO evaluates for “International Fit”

- Anything rejected by IHTSDO, NLM evaluates for “US Fit”
How will the Donation Manifest? (continued)

- Tool Deliverable
  - Enhancements that are “international fit” will become part of future IHTSDO Workbench versions
  - Enhancements that are “US fit” may be released as US version of Workbench (details pending)
For public, content to be available in three ways


- Via International SNOMED CT release for those accepted by IHTSDO

- Via U.S. SNOMED CT Extension release for those accepted by NLM
Content and Tool delivered separately

Content delivered every 2-3 months

- First focus on Problem List subsets, including SNOMED CT Extensions modeled by KP
- KP clinician and patient display names mapped to SNOMED CT concepts
- Mappings to ICD-9 CM codes and ICD-10 CM codes
  - Top 2500 initially, then by Specialty
  - Cardiology, Mental Health, Neurology, Musculoskeletal, Ophthalmology, Oncology, Endocrinology, Infectious diseases, OB/Gyn, Injuries, Orthopedics, etc.
2011 Deliveries

• Delivered to date:
  • Top 2500 Problem List subset
  • Cardiology Problem List subset**
  • Mental Health Problem List subset**
  • Neurology Problem List subset**
  • Musculoskeletal Problem List subset**

• Delivery on target:
  • Ophthalmology – Nov 5th-

• **all with ICD9-CM/ICD10-CM Map
Today’s Topics

- Introduction to Kaiser Permanente
- Introduction to CMT project
- CMT tooling and environments
CMT ETT - Integration Context

- **Subversion**: Change sets to CMT ETT

- **Requestors**: Requests to CMT ETT
  - **CSDB External organizations**: Content updates to CSDB
  - **KPHC**: Synchronization content to CSDB

- **CMT ETT**
  - **Term warehouse**: Content

- **KPHC**:
  - Load files to NLM/IHTSDO
  - Synchronization to CSDB

- **Requestors**: Release notes to Requestors
CMT ETT - Development Road Map

KP, Informatics
- Terminology and information model
  - ETT path structures
  - Profiles
  - Terminology model
  - Refset to annotation conversion

Maestro Dev
- Standard archetype for bundle generation
- Source Code promotion
- Bundle generation with production content

KP
- Bulk import
- Q.A. reports
- ETT users security

Infrastructur

KP
- Content versioning
- Terminology model / schema changes

Workbench Capability

KP
- SCTID ID generation
- KPHC External id persistence and exposure

Functionality

KP
- Management of external content updates
- CSDB backfill (temporary measure)
- Synchronization with Epic/KPHC
- Release notes generation

Integration

KP, Informatics, Maestro Dev
- Modeling and Content release system testing

Release: system testing
CMT ETT – Bundle Components

SVN repository

Kaiser project C
Kaiser project B
Kaiser project A

IHTSDO release

Artifacts repository (archiva)

dependencies
database projects

required artifacts
built artifacts

Continuous Integration (continuum)
Bundle Generation

built artifacts
build result

Project Build Library

Bundle A
Bundle B
Bundle C

required resources

components to build a bundle

Kaiser project

KP api extensions
cmt-core, task, …

KP content extension
arf,econcepts,…

IHTSDO release

dependencies
database projects

IHTSDO release

(Profiles and Queues not illustrated)
CMT ETT – Bundle Generation and Usage

SVN repository
- Kaiser project A
  - KP api extensions
  - KP content extension
- IHTSDO release

Artifacts repository (archiva)
- dependencies
- database projects

Continuous Integration (continuum)
- Bundle Generation

Project Build Library
- Sync Bundle B
- Standalone Bundle A
- Sync Bundle C
- Sync Bundle D

Build result
- built artifacts
- required artifacts

Required resources
- required resources

Change sets
- synchronization

Environments
- Modeler 1
- Modeler 2
- Modeler 3
- Users (developers) Using Sync bundle B
- User 1
- User 2
- User 3
- Tester 1
- Tester 2
- Tester 3
- QA Using Sync bundle D

Change sets
- synchronization

Developers / trainers
- Using Standalone bundle A
- Trainer 1
- Dev 1
- dev 2
- dev 3

Download
-

Users
- (developers)
- Using Sync bundle C
- User 2
- User 3

Modelers
- Using Sync bundle B
Q & A

Alan Abilla, RN, MS
Chief Informatics & Innovations Lead
Product Manager

Rita H Barsoum, CLS
Content Release Manager
Quality Assurance
Product Manager

Connie Morgan, PMP, CSM
Program Manager
Enterprise Terminology Tools
& CMT Donation Program

Bouchta Irbouh, CSM
CMT Enterprise Architect