Terminology Management With SNOMED CT At
Kaiser Permanente

Jamie Ferguson, Vice President, Health IT Strategy & Policy

May 2016
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Presentation agenda

- **What:**
  Scope And Scale Of Terminology Management At Kaiser Permanente

- **How:**
  Staffing Cost Drivers For Terminology Management

- **Why:**
  Benefits Supported By Or Directly Attributable To Using Enterprise Terminology Based On SNOMED CT

- Discussion
What:
Scope And Scale Of Terminology Management
Scale: Kaiser Permanente By The Numbers (2015-16)

- 10.6 million members
- 433,413 2015 hospital admissions;
- 6,291 2015 neurosurgeries;
- >1 million 2015 mammograms
- 650+ outpatient surgery centers, medical office buildings, and other outpatient facilities
- 38 hospitals co-located with medical offices
- 40.2mm doctor office visits
- 225,000 inpatient surgeries
- 98,000 births
- 650+ outpatient surgery centers, medical office buildings, and other outpatient facilities
- 60B in revenue
- $62B in assets
- 70+ years of providing care
- 38 hospitals co-located with medical offices
- 650+ outpatient surgery centers, medical office buildings, and other outpatient facilities
- 4.8mm appointments booked online
- 188mm visits to KP.org
- My Health Manager
- 22mm secure messages sent to providers
- 150mm lab orders per year
- 78mm prescription orders per year
- 23.2 million health information exchanges (HIE document exchanges)
- About 18,000 Physicians and 51,000 Nurses

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Scenarios for the use of terminology

- Use case for **classification** based on ICD:
  - *I have a record.* Everything in the record needs to be assigned the **right code** in a classification system.
  - Not everything is in the classification system, therefore “Not Otherwise Specified” (NOS) and “Not Elsewhere Classified” (NEC) codes are necessary and meaningful.
  - Supports consistent administrative reporting and financial transactions.

- Use case for **clinical terminology** based on SNOMED CT:
  - *I have a patient.* I can document everything that is relevant, and my EHR system will attach codes to much of it (*but not all*).
  - NOS and NEC are meaningless.
  - Supports semantic interoperability, decision support, care of individual patients, and population health management.
Key U.S. legal/regulatory requirements

- **Meaningful Use** regulations require certified EHR technology to use **SNOMED CT** for clinical documentation of problems, and **LOINC** for laboratory procedures, for care coordination, referrals, transitions of care, and patient access to health summaries.

  - Use of SNOMED CT and LOINC for interoperability is required for certification of EHRs and hospital or physician compliance may be audited under Meaningful Use.

- **HIPAA** law requires the use of classification systems to document health care interventions for administrative purposes such as insurance billing, mortality records, or reporting.

  - Current Procedure Terminology (CPT) is used to classify outpatient procedures and inpatient services. **CPT-4** is owned by the American Medical Association.

  - International Classification of Diseases (specific schemes published by the US government) is used to classify inpatient and outpatient diagnoses and inpatient procedures: **ICD-10-CM** (Clinical Modification) for diagnoses; **ICD-10-PCS** (Procedure Coding System).
Implementing an enterprise terminology management solution is an important part of the implementation of health information technology with electronic health records. It is not an independent activity.

Kaiser Permanente uses Convergent Medical Terminology (CMT) in KP HealthConnect®
- Based on SNOMED CT and Laboratory LOINC.
- CMT includes concepts not yet in SNOMED CT therefore not in cross-maps to ICD.
What is Convergent Medical Terminology (CMT)?

CMT is Kaiser Permanente’s enterprise terminology system – how data is captured in KP HealthConnect® – which includes several components:

- End user terminology
- Standard terminology
- Administrative codes
- Patient/population query and decision support
- Terminology request process
CMT end user terminology component (1)

- CMT contains the terminology used by clinicians in KP HealthConnect® and by patients in kp.org and mobile apps.

- End user terms are mapped to the standard terminologies and have data attributes needed by the application software.

- End users use and see the terms that are familiar to them, and the application uses the codes and attributes it needs.

- Patient-preferred display terms usually are the same as medical terminology but may be synonyms — such as “miscarriage” instead of “spontaneous abortion.”
CMT end user terminology component (2)

- Protects clinician end users from changes in standard terminology or coding schemes

- Example: Almost all diagnosis terms displayed to clinicians did not have to be changed or deleted for the transition from ICD9 to ICD10

- Neither ICD nor SNOMED has an inherent focus on end user usability

- CMT is a product of over two decades of actual user experience, and it continues to improve every month
CMT standard terminology component

- CMT maps and integrates national and international terminology standards, such as SNOMED CT, ICD-10, and LOINC

- CMT can be mapped to other terminology as needed, such as local (non-standard) terminologies used in clinical technology, or terms developed and used for patient safety or quality measurement

- CMT supports requirements for standard terminology in Meaningful Use and Health Information Exchange programs
SNOMED CT to ICD9 mapping example

ICD 781.2
Gait abnormality

78691002
Staggering gait

69021004
Cerebellar gait

55791005
Charcot’s gait

35136003
Retropulsion

62334008
Athetotic gait

63448001 Gait

22325002
Gait Abnormality
CMT administrative code component

- CMT supports Revenue Cycle, Charge Capture, and Risk Adjustment

- Administrative and financial coding is a by-product of the process for capturing patient care information — not a separate step
  - Diagnosis terms are mapped to ICD — clinicians pick a problem list and the same term is used for encounter diagnosis coding
  - Procedure terms are mapped to CPT4 or HCPCS codes
  - When a laboratory test order is resulted/completed, CPT4 administrative codes mapped to it are sent to the financial systems
CMT query and decision support component (1)

- CMT is built on SNOMED CT, the global language of health care.

- CMT leverages the internal structure of SNOMED CT, including poly-hierarchy and description logic (formal definitional attributes).

- CMT provides the ability to query different ways to identify subsets in terminology:
  - SNOMED CT logic improves precision and efficiency of queries
  - Supports decision support modules in KP HealthConnect®
  - Identifies patient cohorts for Population Care
  - Identifies KP HealthConnect® terminology to fulfill reporting or analytical criteria and specifications
CMT query and decision support component (2)

• Ability to easily identify patient cohorts for certain conditions for Population Care

• Ability to identify subsets for use as input criteria for KP HealthConnect® decision support modules, such as Best Practice Alerts, Reminders, etc.

• Ability easily to do precise queries, such as “find all conditions where causative organism is Aspergillus”

• Ability easily to do large aggregate queries, such as “find all patients with cardiovascular system disorders”
CMT request tracking component

- What happens when a desired clinical concept is not already present in KP HealthConnect®, such as a new medical diagnosis or a new regulatory requirement?

- Terminology request submission and release process:
  - Kaiser Permanente regions and business partners submit CMT requests for inclusion of concepts in KP HealthConnect®
  - Integration into published standards including SNOMED CT and LOINC, release schedule, quality assurance, and operational processes ensure availability of the requested terminology in HealthConnect®
Clinical terminology needs are dynamic

According to the latest SIRS report from IHTSDO: since 2011 (last 5 years), Kaiser Permanente submitted 28,589 new concepts to NLM (US NRC) and IHTSDO

New concept requests were in many recent KP submissions to IHTSDO and NLM:

- Top 2500 Problem List;
- Cardiology;
- Mental Health;
- Neurology;
- Musculoskeletal;
- Ophthalmology;
- Hem/Onc;
- Endocrine;
- ENT/GI/ID;
- Skin/Respiratory;
- OB/Gyn;
- Ortho Extremities;
- Hx of and FHx of;
- Ortho Non-Extremities;
- Injuries;
- Orthopedics;
- Pediatrics;
- Emergency Dept;
- Common Lab Procedures;
- Specimen Source;
- Specimen Type;
- Skin/Respiratory;
- ENT/GI/ID;
- Vaccinations;
- Endo/Uro/Neph;
- Radiology
Why “enterprise terminology”?

Internal:
- No one terminology meets all needs — standards meet specific needs
  - We must use many different terminologies, and we integrate or “converge” them in a central model in order to leverage the efficiencies of each terminology, and to provide interoperability
- None of the standard terminologies are ever “complete”; therefore, there is a need for new concepts or enterprise-specific concepts
  - Standard reference terminologies are updated slowly, e.g. 2x/year
- Having a central terminology management system eliminates duplication of effort and provides a common definition of data via common concepts/terms across the enterprise

External
- SNOMED CT and LOINC as standard terminology is the key to semantic interoperability.
- Enables receivers of external data to understand the intended meaning precisely.
How:
Staffing And Technology Cost Drivers For Terminology Management
## Enterprise terminology - staffing (full-time equiv.)

<table>
<thead>
<tr>
<th>Job / Role</th>
<th>SNOMED CT Support FTE</th>
<th>Total Support FTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certified Coder</td>
<td>0.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Nurse Modeler</td>
<td>4, Partial</td>
<td>4.0</td>
</tr>
<tr>
<td>Physician Modeler/ Terminologist</td>
<td>3.5</td>
<td>4.0</td>
</tr>
<tr>
<td>Production Support</td>
<td>2, Partial</td>
<td>4.0</td>
</tr>
<tr>
<td>Technical Engineer</td>
<td>4, Partial</td>
<td>4.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>19.0</strong></td>
</tr>
</tbody>
</table>
## Enterprise terminology - technology components

<table>
<thead>
<tr>
<th>Technology Component</th>
<th>Specific Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term Authoring / Editing Software</td>
<td>Hosting, Subscription, Support</td>
</tr>
<tr>
<td>Classification Coding Resources</td>
<td>Electronic Tool Subscription and Publications (CPT, ICD10)</td>
</tr>
<tr>
<td>Request Tool</td>
<td>Hosting, Licensing, Support</td>
</tr>
<tr>
<td>Hardware</td>
<td>64 bit Laptops for Modelers</td>
</tr>
<tr>
<td></td>
<td>Macbooks for Developers</td>
</tr>
<tr>
<td></td>
<td>Primary Servers for Test and Production</td>
</tr>
<tr>
<td></td>
<td>Backup Servers for Test and Production</td>
</tr>
<tr>
<td>Software</td>
<td>Microsoft Windows and Office Software</td>
</tr>
<tr>
<td></td>
<td>Office Software for Macbooks</td>
</tr>
</tbody>
</table>
Why:
Benefits Attributable To Using KP HealthConnect®
Including Enterprise Terminology Based On SNOMED CT
Our quality of care is up

Performance relative to national benchmarks

2014

Note: Placement of current status and starting points approximate
...and our malpractice cases are down.

As supported by KP HealthConnect.

Professional Liability Claims Per 100,000 Members

KP HC implementation began 2004
Taking accountability for patient populations

Clinical Outcomes in Southern California

<table>
<thead>
<tr>
<th>Metric</th>
<th>Improvement</th>
<th>Lives Saved Per Decade¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Pressure Control</td>
<td>38.9%</td>
<td>5,341 Lives</td>
</tr>
<tr>
<td>Colorectal cancer screening</td>
<td>30.2%</td>
<td>4,788 Lives</td>
</tr>
<tr>
<td>Cholesterol Control</td>
<td>21.8%</td>
<td>1,751 Lives</td>
</tr>
<tr>
<td>Blood sugar control</td>
<td>11.5%</td>
<td>1,088 Lives</td>
</tr>
<tr>
<td>Smoking Cessation</td>
<td>17.0%</td>
<td>955 Lives</td>
</tr>
<tr>
<td>Breast Cancer Screening</td>
<td>11.4%</td>
<td>570 Lives</td>
</tr>
<tr>
<td>Cervical Cancer Screening</td>
<td>5.9%</td>
<td>59 Lives</td>
</tr>
</tbody>
</table>

¹/ Based on NCQA Quality Dividend Calculator

Over 14,000 Lives Saved¹
Why:
Benefits Directly Attributable To Using Enterprise Terminology Based On SNOMED CT
Quality assessment and improvement proof point

- In 2015 Kaiser Permanente completed a production proof of concept using automated semantic technology (RDFox triple store using SPARQL with Datalog reasoning on SNOMED CT based logic model with simplified top level ontology) for the computation of diabetic control measures in a population of over 11,000 diabetic patients.
  - National Committee for Quality Assurance (NCQA) Healthcare Effectiveness Data and Information Set (HEDIS) Comprehensive Diabetes Care (CDC) national standard measures include calculation of the diabetic population denominator, plus 10 different numerator measures of care management and control (e.g. HbA1c control, treatment for diabetic neuropathy, retinal eye exams, etc.).
- The semantic technology approach **cost a small fraction** of the traditional approach despite buying all new hardware and software. Significant **cost savings were proven**.
- The automated data extracts and semantic logic calculations captured different results, different patients, in the same population. Detailed reconciliation at the individual record level proved in **every case the new methods produced more accurate results**.
  - Calculations of each numerator captured differences ranging from <4% to >12% of the diabetic patients.
  - Significant improvement in quality measures can have an immediate effect on quality of care and health.
- **Publication** of this study is in the peer review and editorial review process.
Discussion

“The difference between Theory and Practice is that in Theory, they are the same – but in Practice, they are not.”

- Disputed attribution