Terminology Harmonization

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OVERVIEW OF CODE SYSTEMS AND TERMINOLOGY TOOLS

USING TERMINOLOGY IN ECQM DEVELOPMENT AND MAINTENANCE

IMPLEMENTING MEASURES AND TERMINOLOGY FROM A BIG DATA PERSPECTIVE
Overview of Code Systems and Terminology

Tools

Robert McClure MD
President MD Partners, Inc. – Consultancy
  NLM VSAC SME
  ONC Terminology SME
  Other guidelines and modeling

HL7
  Vocabulary WG Co-chair & HTA member
How and why do we encode?

Shared persistent meaning

Encoding

Convert something into a specific format

Health care: Represent clinical data using a standard code drawn from a shared code system

Encode once and use many places

• Primary clinical use
  • Shared clinical understanding
  • Simplifies searching and linking decision support

• Secondary
  • Payment
  • Care and resource use analysis

Natural Language Processing (NLP) may make this easier
How and why do we encode?

*Code systems provide accessible persistent meaning*

**Code System**

*HL7 definition in part*: collections of uniquely identifiable concepts with associated representations, designations, associations, and meanings.

- Concepts have unique **persistent** meanings
  - No homonymy (only one concept for an idea)
- Represent **stable** ontological knowledge
  - Support logical inference
- Are versioned to identify changes in content
Pneumococcal Pneumonia

SNOMED CT Ontology
Code Systems we use

Examples of different styles

SNOMED CT
- Open-world *reference* ontology using Description Logic

ICD
- Classification with strict hierarchy

LOINC
- Database with record identifiers

RxNorm
- Multi-level mapping thesaurus

CVX (Many, including from HL7)
- A list of useful ideas

UCUM
- Symbols and grammar – no concepts
### What code system should we use?

**CMS Measures Management Blueprint - Code systems by QDM datatype**

<table>
<thead>
<tr>
<th>General Clinical Concept</th>
<th>Quality Data Model Category</th>
<th>Quality Data Model Attribute</th>
<th>Clinical Vocabulary Standards</th>
<th>Transition Vocabulary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adverse Effect/Allergy/Intolerance</td>
<td>Device</td>
<td>Reaction</td>
<td>SNOMED CT</td>
<td>N/A</td>
</tr>
<tr>
<td>Adverse Effect/Allergy/Intolerance</td>
<td>Diagnostic Study</td>
<td>Reaction</td>
<td>SNOMED CT</td>
<td>N/A</td>
</tr>
<tr>
<td>Adverse Effect/Allergy/Intolerance</td>
<td>Intervention</td>
<td>Reaction</td>
<td>SNOMED CT</td>
<td>N/A</td>
</tr>
<tr>
<td>Adverse Effect/Allergy/Intolerance</td>
<td>Laboratory Test</td>
<td>Reaction</td>
<td>SNOMED CT</td>
<td>N/A</td>
</tr>
<tr>
<td>Adverse Effect/Allergy/Intolerance</td>
<td>Medication</td>
<td>Reaction</td>
<td>RxNorm</td>
<td>N/A</td>
</tr>
<tr>
<td>Adverse Effect/Allergy/Intolerance</td>
<td>Procedure</td>
<td>Reaction</td>
<td>SNOMED CT</td>
<td>N/A</td>
</tr>
<tr>
<td>Adverse Effect/Allergy/Intolerance</td>
<td>Substance</td>
<td>Reaction</td>
<td>SNOMED CT</td>
<td>N/A</td>
</tr>
<tr>
<td>Substance</td>
<td>Substance</td>
<td>N/A</td>
<td>SNOMED CT</td>
<td>N/A</td>
</tr>
<tr>
<td>Condition/Diagnosis/Problem</td>
<td>Condition/Diagnosis/Problem</td>
<td>N/A</td>
<td>SNOMED CT</td>
<td>ICD-9-CM, ICD-10-CM</td>
</tr>
<tr>
<td>Symptom</td>
<td>Symptom</td>
<td>N/A</td>
<td>SNOMED CT</td>
<td>N/A</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>
What code system should we use?

ONC Interoperability Standards Advisory (ISA)
Value Set Definitions & Expansions

All concepts fall within a defined scope:
• Equivalent with respect to context of use
• Set of allowed choices

A Value set is a collection of concept representations drawn from (one or more) code systems for a specific purpose.

Authored VS Definition Characteristics
• Identifier
• Purpose/scope
• Versioned
• Content Logical Definition (CLD)
  • not tied to a specific code system version
  • Used to create Expansion set(s)

Value Set Expansions
• Apply a code system version to a versioned value set CLD definition
• Yields the specific set of value set members for use from a specific code system version.

The update was generated by VSAC to align with code changes published by the code system of one or more member value sets.
VSAC

National Library of Medicine Value Set Authority Center

https://vsac.nlm.nih.gov/

NLM tooling to support the creation, maintenance, and distribution of Value Sets

Workflow (draft, review, publish)

Very soon code system query (Intensional) definitions (limited)

Search – compare - collaborate

• Authoring tools to support harmonization
• Alignment of value set content with context of use may be critical
VSAC Harmonization tools

Similarity
VSAC Harmonization tools

Overlap

 ![Screen shot of VSAC Harmonization tools interface showing Value Set Overlap with threshold values and results for a specific code system.](image-url)
4.0 Terminology Module

4.0.1 Introduction

The Terminology Module provides an overview and guide to the FHIR resources, operations, coded data types and externally-defined standard and FHIR-defined terminologies that are used for representing and communicating coded, structured data in the FHIR core specification and profiles. Collectively, these capabilities are used to provide the terminology service functionality required for supporting the use of coded data in FHIR resources throughout the specification as described in the other modules.

The terminology resources and their relationships are shown below:

The `ElementDefinition` type (shown with a dotted box) is described elsewhere in the specification in the Foundation and Conformance modules.
Health care terminology use Glossary

**Encoding** - Represent clinical data using a standard code drawn from a shared code system.

**Code system** – Curated collection of uniquely identifiable concepts with associated representations, designations, associations, and meanings.

**Value set definition** – An authored, maintained, versioned, computable code system query with defined metadata.

**Value set expansion** – The set of code system member concepts obtained when a value set definition version is applied to a code system version.

**FHIR** – HL7 product that supports rapid (fast) definition of health care focused shared (interoperable) computable application resources.

**Terminology map** – An artifact that links concepts from one code system to concepts in another system.

**Extending a value set** – Identifying concepts in other lists and code systems that represent the same scope and can be mapped to the value set content.
Using Terminology in eCQM Development and Maintenance
Crafting a Measure

*Separating what is terminology from what is logic*

Example: Atherosclerotic Cardiovascular Disease (ASCVD) Primary Prevention Guideline

<table>
<thead>
<tr>
<th>Population</th>
<th>Statin therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCVD risk 5–7.4% over 10 years</td>
<td>Use shared decision making. Consider treatment with a moderate-intensity statin.</td>
</tr>
<tr>
<td>ASCVD risk 7.5–14.9% over 10 years</td>
<td>Use shared decision making. Consider treatment with a moderate- to high-intensity statin.</td>
</tr>
<tr>
<td>ASCVD risk ≥ 15% over 10 years</td>
<td>Initiate or continue moderate- to high-intensity statin.</td>
</tr>
<tr>
<td>People with diabetes, aged 40–75, with ASCVD risk ≥ 7.5% over 10 years</td>
<td>Initiate or continue moderate-intensity statin. Consider use of a high-intensity statin.</td>
</tr>
<tr>
<td>People with diabetes, aged 40–75, with LDL cholesterol 70–189 mg/dL</td>
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Crafting a Measure

*Separating what is terminology from what is logic*

Terminology:

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Crafting a Measure

*Separating what is terminology from what is logic*

Logic:

```
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```
Using Terminology Within a Measure

Best Practices

Importance of incorporating feasibility findings into code selection
  • Where is the data typically captured?
  • Problem list, medications, flowsheets, etc.

Understanding of the Quality Data Model (QDM)

Choosing appropriate code system and/or hierarchy
  • Reference CMS Measures Blueprint
Using Terminology Within a Measure

Quality Data Model Guidance

Using our example, we know that Statin Therapy is found in the Medication record

- QDM datatypes:
  - Medication, Active
  - Medication, Administered
  - Medication, Discharge
  - Medication, Dispensed
  - Medication, Order
- Use RxNorm
  - “authoring guidance has encouraged measure developers not to include branded term types because changes in branded identifiers for any single “general drug” (such as a Semantic Clinical Drug [SCD]) occur throughout the year and, even with the inclusion of value set addendum releases, there can be value sets that are out of synch with some implementer system content”
Using Terminology Within a Measure

Quality Data Model Guidance

Using our example, we know that LDL-c is a laboratory test

- QDM datatypes:
  - Laboratory Test, Ordered
  - Laboratory Test, Performed
  - Use LOINC for the orderable lab test
  - Result is an attribute
  - Result is reported as an integer, so no codable concept is needed here
    - Remember, that is part of the logic of the measure
Aligning Terminology Needs

Assess the landscape for similar measures and value sets

Look for existing measures that use the same concepts

- ECQI Resource Center
- CMS Measures Inventory Tool
- CMS 105 (STK-6) Discharged on Statin Medication (The Joint Commission)
- CMS 347 Statin Therapy for the Prevention and Treatment of Cardiovascular Disease (Quality Insights of Pennsylvania)
Aligning Terminology Needs

CMS105 Discharged on Statin Medication

▲ Statin at Discharge

[“Medication, Discharge”: “Statin Grouper”]

Terminology

- valueset "Comfort Measures" using "1.3.6.1.4.1.33895.1.3.0.45"
- valueset "Discharge To Acute Care Facility" using "2.16.840.1.113883.3.117.1.7.1.87"
- valueset "Discharged to Health Care Facility for Hospice Care" using "2.16.840.1.113883.3.117.1.7.1.207"
- valueset "Discharged to Home for Hospice Care" using "2.16.840.1.113883.3.117.1.7.1.209"
- valueset "Emergency Department Visit" using "2.16.840.1.113883.3.117.1.7.1.292"
- valueset "Ethnicity" using "2.16.840.1.114222.4.11.827"
- valueset "Hemorrhagic Stroke" using "2.16.840.1.113883.3.117.1.7.1.212"
- valueset "Ischemic Stroke" using "2.16.840.1.113883.3.117.1.7.1.247"
- valueset "LDL-c" using "2.16.840.1.113883.3.117.1.7.1.215"
- valueset "Left Against Medical Advice" using "2.16.840.1.113883.3.117.1.7.1.308"
- valueset "Medical Reason" using "2.16.840.1.113883.3.117.1.7.1.475"
- valueset "Non-Elective Inpatient Encounter" using "2.16.840.1.113883.3.117.1.7.1.424"
- valueset "ONC Administrative Sex" using "2.16.840.1.113762.1.4.1"
- valueset "Patient Expired" using "2.16.840.1.113883.3.117.1.7.1.309"
- valueset "Patient Refusal" using "2.16.840.1.113883.3.117.1.7.1.93"
- valueset "Payer" using "2.16.840.1.114222.4.11.3591"
- valueset "Race" using "2.16.840.1.114222.4.11.836"
- valueset "Statin AllenC" using "2.16.840.1.113883.3.117.1.7.1.423"
- valueset "Statin Grouper" using "2.16.840.1.113762.1.4.1110.119"
Aligning Terminology Needs

CMS347 Statin Therapy for the Prevention and Treatment of Cardiovascular Disease

- Statin Ordered

  
  
  ["Medication, Order": "Low intensity statin therapy"]
  
  union ["Medication, Order": "Moderate intensity statin therapy"]
  
  union ["Medication, Order": "High intensity statin therapy"]

Terminology

- valueset "Annual Wellness Visit" using "2.16.840.1.113883.3.526.2.1363"
- valueset "Atherosclerosis and Peripheral Arterial Disease" using "2.16.840.1.113762.1.4.1047.21"
- valueset "Breastfeeding" using "2.16.840.1.113762.1.4.1047.73"
- valueset "CABC Surgeries" using "2.16.840.1.113883.3.666.5.694"
- valueset "Carotid Intervention" using "2.16.840.1.113883.3.117.1.7.1.204"
- valueset "Cerebrovascular disease, Stroke, TIA" using "2.16.840.1.113762.1.4.1047.44"
- valueset "Diabetes" using "2.16.840.1.113883.3.464.1.103.103.12.1001"
- valueset "End Stage Renal Disease" using "2.16.840.1.113883.3.525.3.353"
- valueset "Ethnicity" using "2.16.840.1.114222.4.11.837"
- valueset "Hepatitis A" using "2.16.840.1.113883.3.464.1.103.110.12.1024"
- valueset "Hepatitis B" using "2.16.840.1.113883.3.67.1.101.1.360"
- valueset "High intensity statin therapy" using "2.16.840.1.113762.1.4.1047.97"
- valueset "Hypercholesterolemia" using "2.16.840.1.113762.1.4.1047.100"
- valueset "Ischemic heart disease or coronary occlusion, rupture, or thrombosis" using "2.16.840.1.113762.1.4.1047.46"
- valueset "LDL Test" using "2.16.840.1.113883.3.464.1.103.199.11.1029"
- valueset "Liver Disease" using "2.16.840.1.113762.1.4.1047.43"
- valueset "Low intensity statin therapy" using "2.16.840.1.113762.1.4.1047.107"
- valueset "Moderate intensity statin therapy" using "2.16.840.1.113762.1.4.1047.98"
- valueset "Myocardial Infarction" using "2.16.840.1.113883.3.526.3.403"
Aligning Terminology Needs

Assess the landscape for similar measures and value sets

Look for existing value set(s)

- Value Set Authority Center
Aligning Terminology Needs

Assess the landscape for similar measures and value sets

Value Set Information

- Name: Statin Grouper
- Type: Grouping
- Code System: RXNORM

<table>
<thead>
<tr>
<th>Name</th>
<th>Code System</th>
<th>OID</th>
</tr>
</thead>
<tbody>
<tr>
<td>High intensity statin therapy</td>
<td>RXNORM</td>
<td>2.16.840.1.113762.1.4.1047.97</td>
</tr>
<tr>
<td>Low intensity statin therapy</td>
<td>RXNORM</td>
<td>2.16.840.1.113762.1.4.1047.107</td>
</tr>
<tr>
<td>Moderate intensity statin therapy</td>
<td>RXNORM</td>
<td>2.16.840.1.113762.1.4.1047.98</td>
</tr>
</tbody>
</table>
**Aligning Terminology Needs**

**CMS105 Discharged on Statin Medication**

### Encounter with Max LDL less than 70 mg per dL

TJC."Ischemic Stroke Encounter" IschemicStrokeEncounter
where Max(["Laboratory Test, Performed": "LDL-c"] Ldl
where Ldl.resultDateTime during Interval[Global."ToDate"(start of IschemicStrokeEncounter.relevantPeriod - 30 days), end of IschemicStrokeEncounter.relevantPeriod]
return Ldl.result as Quantity
)< 70 'mg/dL'

---

**Terminology**

- valueset "Comfort Measures" using "1.3.6.1.4.1.33883.1.3.0.45"
- valueset "Discharge To Acute Care Facility" using "2.16.840.1.113883.3.117.1.7.1.87"
- valueset "Discharged to Health Care Facility for Hospice Care" using "2.16.840.1.113883.3.117.1.7.1.388"
- valueset "Discharged to Home for Hospice Care" using "2.16.840.1.113883.3.117.1.7.1.1"
- valueset "Emergency Department Visit" using "2.16.840.1.113883.3.117.1.7.1.292"
- valueset "Ethnicity" using "2.16.840.1.114222.4.11.837"
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- valueset "Ischemic Stroke" using "2.16.840.1.113883.3.117.1.7.1.247"
- valueset "LDL-c" using "2.16.840.1.113883.3.117.1.7.1.219"
- valueset "Left Against Medical Advice" using "2.16.840.1.113883.3.117.1.7.1.308"
- valueset "Medical Reason" using "2.16.840.1.113883.3.117.1.7.1.473"
Aligning Terminology Needs

CMS347 Statin Therapy for the Prevention and Treatment of Cardiovascular Disease

**LDL Greater Than or Equal to 190 in Patient History**

- "Laboratory Test, Performed": "LDL Test"
- where LDL.result \(\geq\) 190 'mg/dL'
- and LDL.relevantPeriod starts before end of "Measurement Period"

**Tern**

- valueset "Annual Wellness Visit" using "2.16.840.1.113883.3.526.2.1363"
- valueset "Atherosclerosis and Peripheral Arterial Disease" using "2.16.840.1.113762.1.4.1047.7"
- valueset "Breastfeeding" using "2.16.840.1.113762.1.4.1047.73"
- valueset "CABG Surgeries" using "2.16.840.1.113883.3.666.5.694"
- valueset "Carotid Intervention" using "2.16.840.1.113883.3.117.1.7.1.204"
- valueset "Cerebrovascular disease, Stroke, TIA" using "2.16.840.1.113762.1.4.1047.44"
- valueset "Diabetes" using "2.16.840.1.113883.3.464.1003.103.12.1001"
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- valueset "Hepatitis B" using "2.16.840.1.113883.3.67.1.101.1.269"
- valueset "High intensity statin therapy" using "2.16.840.1.113762.1.4.1047.97"
- valueset "Hypercholesterolemia" using "2.16.840.1.113762.1.4.1047.100"
- valueset "Ischemic heart disease or coronary occlusion, rupture, or thrombosis" using "2.16.840.1.113883.3.464.1003.198.11.1029"
- valueset "LDL Test" using "2.16.840.1.113883.3.464.1003.198.11.1029"
- valueset "Liver Disease" using "2.16.840.1.113762.1.4.1047.42"
Aligning Terminology Needs

Assess the landscape for similar measures and value sets

Look for existing value set(s)

- **Value Set Authority Center**

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<tr>
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<th>Code System</th>
<th>Type</th>
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<tr>
<td>Complete Lipid Panel</td>
<td>LOINC</td>
<td>Extensive</td>
<td>NCQA</td>
<td>2.16.840.1.113883.3.464.1003.104.11.1035</td>
</tr>
<tr>
<td>Complete Lipid Panel</td>
<td>LOINC</td>
<td>Grouping</td>
<td>NCQA</td>
<td>2.16.840.1.113883.3.464.1003.104.12.1015</td>
</tr>
<tr>
<td>LDL Code</td>
<td>LOINC</td>
<td>Grouping</td>
<td>QIP</td>
<td>2.16.840.1.113883.3.600.872</td>
</tr>
<tr>
<td>LDL Code LOINC</td>
<td>LOINC</td>
<td>Extensive</td>
<td>QIP</td>
<td>2.16.840.1.113883.3.600.869</td>
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<tr>
<td>LDL Test</td>
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<td>Grouping</td>
<td>NCQA</td>
<td>2.16.840.1.113883.3.464.1003.138.12.1016</td>
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<td>LDL Test</td>
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<td>Extensive</td>
<td>NCQA</td>
<td>2.16.840.1.113883.3.464.1003.198.11.1029</td>
</tr>
<tr>
<td>LDL-C Laboratory Test</td>
<td>LOINC</td>
<td>Extensive</td>
<td>PCPI</td>
<td>2.16.840.1.113883.3.526.2.260</td>
</tr>
<tr>
<td>LDL-C Laboratory Test</td>
<td>LOINC</td>
<td>Grouping</td>
<td>PCPI</td>
<td>2.16.840.1.113883.3.526.3.1248</td>
</tr>
<tr>
<td>LDL-c</td>
<td>LOINC</td>
<td>Extensive</td>
<td>The Joint Commission</td>
<td>2.16.840.1.113883.3.117.1.7.1.215</td>
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</tbody>
</table>
Aligning Terminology Needs

*Similar value sets, different OIDs*

So now what?
- Found similar value sets with similar content
- TALK to the measure stewards
  - Can you harmonize?
  - If you cannot, why? There should be a good reason
eCQMs updated annually during annual updates cycle (AU)
Value sets get updated twice a year
  • Once during AU – published in May
  • Once during addendum – published in September
Helpful to have tooling to support value set maintenance
  • Rule-based value sets
  • Review rules ongoing to keep up-to-date
    • Should reflect information from the field as well as code system updates
Continue (or start) the harmonization conversation with other measure developers!!!
Implementing measures and terminology from a Big Data Perspective
Big Data Platform

Aggregate and normalize

Create and apply intelligence

Act and measure

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Understanding Data

Data Sources

- The full picture of the patient’s care is a combination of multiple disparate sources
- Sources contain discrete values:
  - Standardized codes
  - Proprietary codes
- Data sources, and the codes they use, are agnostic to value sets
- Value sets become a starting point for understanding performance
Making Value Sets Work

Real Data is Not Easy

Normalization

- **Curation = Expansion** of a value set to include all standard codes with synonymous, semantic meaning

Standardization

- **Mapping = Encoding** of a proprietary code to a standard code
Pneumococcal vaccine

**Vaccination codes**

CVX: 88
CVX: 111
NDC: 42874001301

**Procedure codes**

CPT: 90724
SNOMED: 434751000124102
CPT: 90660

**Encoding**

Proprietary EHR codes

166603079
207789903
2361

Proprietary EHR codes

EHR sending standards

NDC: 42874001301

Claims sources sending standards

CPT: 90724
SNOMED: 434751000124102
CPT: 90660
Code Expansion across Standard Terminologies
Illustration of Real-World Data

High Intensity Statin Medication

HealtheRegistries: Code Activity Details

Last Refresh: 11/2/2018 11:12:12 PM

Diabetes Mellitus -> Statin Therapy - Diabetic Group -> STATIN_THERAPY_HIGH_INTENSITY_MED

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<tr>
<th>Standard Code System Name</th>
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<th>EMR</th>
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## Illustration of Real-World Data

### Pneumococcal Vaccination

#### HealtheRegistries: Code Activity Details

_Last Refresh: 11/2/2018 11:12:12 PM_

Senior Adult Wellness -> Pneumonia Vaccination -> PNEUMOCOCCAL_VACCINE_VAC

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<thead>
<tr>
<th>Standard Code System Name</th>
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<tr>
<td>CPT-4 (HCPCS level I)</td>
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<td>CVX (CDC Vaccines administered)</td>
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<td>SNOMED CT</td>
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Thank you!

Questions?