Codes, Code Systems, and Value Sets

This document provides information about codes, code systems ⓘ, and value sets ⓘ used in quality measures ⓘ. Most CMS measures rely at least in part on the use of various standardized codes or code systems for classifying healthcare provided in the United States. This information supplements the information found in the *Blueprint*, Chapter 5, Measure Specification, and the supplemental materials *Electronic Clinical Quality Measures (eCQMs) Specification, Standards, and Tools* ⬀; *Composite Measures for Accountability Programs* ⬀; and *Cost and Resource Use Measures* ⬀.

1   CODE SYSTEMS/VOCABULARIES/TERMINOLOGIES

A code system is a managed collection of concepts wherein at least one internally unique code represents each concept. A code system may also include a language-dependent description. Some concepts are very specific and others can be quite general. Technically, terminology, vocabulary, and code system are not synonyms, but the measure development community often uses these phrases interchangeably. The Blueprint preferentially uses the term code system to describe the managed concept collections from which to draw value set content.

Some code systems have complex ideas that include multiple, nuanced sub-elements such as the International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM). Some have internal hierarchies built upon increasing specificity (IS-A) and may also include relationships among the concepts (e.g., caused-by or finding-site). While some code systems are broad in scope (e.g., SNOMED CT), most focus on a specific domain (e.g., laboratory tests for Logical Observation Identifiers Names and Codes [LOINC], medications for RxNorm) and therefore, only represent concepts within the domain. Many code systems overlap in coverage (e.g., ICD-10-CM and SNOMED CT); when they do, the overlap may not result in simple one-to-one mapping between the concepts. Each code system has an area of focused use that tends to shape crafting of the concepts and the relationships among these concepts. For example, the focus of ICD-10-CM is on disorders that cause mortality ⓘ and morbidity ⓘ. ICD-10-CM categorizes the disorders into unique groupings such that any single disorder will always be associated with only one ICD code and this categorization is useful for healthcare billing. Other code systems are multi-hierarchical such that the concepts capture multiple nuances and serve multiple purposes.

A code system authority, such as SNOMED International for SNOMED CT, should manage a code system. The code system authority is responsible for ongoing maintenance such as updates and corrections, and for content coherence and consistency. Code systems are a collection of concepts (ideas) with unique identifiers that exist in some sort of structure. The code system structure should provide each concept with a code-system-specific meaning, a concept identifier (a code), and a string description (the name, and a definition of the concept meaning). Code systems should ensure meaning permanence for all the concepts in the code system (Cimino, 1998 ⬀). For example, if the meaning of the concept changes, the code system may need to retire the old concept and introduce one or more new ones to better characterize the meaning. This provides consistency in data analysis and retrieval over time. Some local environments define their own code systems, making sharing outside the local institution difficult. Successful interoperability is dependent on either using common code systems for data capture or through mapping the local content to an interoperable code system.

1.1   ENCODING CLINICAL INFORMATION

Encoding refers to the use of code system concepts to represent clinical information. Not all useful information in a clinical record is encoded. There is significant value in simply providing free text to support clinician-to-clinician information exchange, particularly if the free text is in specifically identified

sections within the electronic health record (EHR)ⓘ. However, encoded content is critical to computable interoperability because it enables computer-based systems to find and operate upon data without human intervention. Encoding also benefits clinical interoperability by enabling clinicians from one organization to understand the meaning of transmission of information from another organization. That is not to say that encoding results in perfect representation of clinical information such that no review or human analysis is necessary; encoding of the nuances in clinical care is fraught with difficulty and almost always requires compromises in precision. The best approach for measure developers[1] is to reduce the number of mapping steps required by focusing on content that measured entities can easily capture during clinical care, where metrics that are useful in the care of the patient match those used in quality assessment and decision support systems.

In the past, measured entities used billing codes and manual review, chart abstraction, and communication between coding personnel and clinicians to clarify information used in clinical quality assessment. This practice helped overcome differences in understanding based on coding alone. Currently, the ability to compute quality measures and provide direct clinical decision support entirely from detailed encoded data increases documentation time and complexity for clinicians during the care process. The industry needs to consider tradeoffs among the alternatives as the industry learns how to best manage the demands of fully computable and interoperable information.

1.2 QUALITY DATA MODEL (QDM) CATEGORIES WITH RECOMMENDED CODE SYSTEMS ⌨

The Appendix provides guidance for the use of a recommended code system when there is a requirement for a noted clinical concept for an eCQMⓘ. The table includes general guidance for concepts in any quality measure as well as transitional vocabularies, where specified. The code system guidance indicates specific code system hierarchies, semantic types, or expected concept (code) attributes that characterize the concepts used for that specific QDMⓘ category. These codes are strongly recommended constraints on concept choices for use in the value sets needed, but the recommended approach may not provide the needed concept in all situations (e.g., when the recommendation for a laboratory result is SNOMED CT, but no SNOMED CT concept is available). However, in some cases the expected result is numeric and not encoded. There are restrictions for a LOINC observation result to have a normative list of LOINC answer codes, or the answer concept is new and not yet available in SNOMED CT. In these situations, measure developers should ask for guidance after considering the approach outlined.

1.3 USE OF SPECIFIC CODE SYSTEMS

1.3.1 International Classification of Diseases (ICD)

ICD represents patient information on claims records, data collection for use in performance measurement, reimbursement for medical claims, and more. In the United States, data submitted to CMS transitioned from ICD-9-CM to ICD-10-CM/Procedure Coding System (PCS) beginning October 1, 2015. It is generally a good practice not to change originally captured patient information (i.e., captured prior to October 1, 2015). There is not a simple method to crosswalk from ICD-9-CM to ICD-10-CM/PCS, so most legacy data using ICD-9-CM should remain archived in that form. The ICD-10 classification systems provide significant improvements through more detailed information and the ability for providers to capture additional advancements in clinical medicine, but the transition does create difficulties for monitoring trends when capturing data using both code systems.

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[1] VSAC uses the term value set author, but we use the term measure developer for consistency with other Blueprint documents.

ICD-10-CM/PCS [↗] consists of two parts:

- ICD-10-CM—Diagnosis classification system developed by the Centers for Disease Control and Prevention (CDC) National Center for Health Statistics (NCHS) for use in healthcare treatment settings in the United States. Diagnosis coding under this system uses three to seven alphanumeric characters and full code titles, but the format is the same as ICD-9-CM.
- ICD-10-PCS—Procedure classification system developed by CMS for use in the United States for inpatient hospital settings. The new procedure coding system uses seven alphanumeric characters, whereas the ICD-9-CM coding system uses three or four numeric digits.

Measure developers should not include codes not valid for clinical coding (e.g., ICD-10-CM Group Codes) in clinically-related value sets. Specifically, they should not use codes associated with sections or groups of codes in value sets, such as

- Codes for dermal burns. Use the fourth digit (0–9) to identify the percentage of body surface and the fifth digit to indicate the percentage with third degree burns.
    - T31.0, Burns involving less than 10% of body surface
    - T31.10, Burns involving 10-19% of body surface with 0-9% third-degree burns
    - T31.11, Burns involving 10-19% of body surface with 10-19% third-degree burns
    - T31.20, Burns involving 20-29% of body surface with 0-9% third-degree burns
    - T31.21, Burns involving 20-29% of body surface with 10-19% third-degree burns
    - T31.22, Burns involving 20-29% of body surface with 20-29% third-degree burns
- A09, Infectious Gastroenteritis and Colitis, unspecified—a standalone code and does not require additional digits to be valid.
- A08, Viral and Other Specified Intestinal Infections—a non-billable code that must have additional digits to be valid (e.g., *A08.11* [↗] Acute Gastroenteropathy Due to Norwalk Agent).

When a measure developer submits ICD-10-CM/PCS codes for consideration by the National Quality Forum (NQF) for measures that previously used ICD-9-CM codes, NQF has additional requirements. NQF outlines these requirements in the NQF document *Inclusion of ICD-10 Codes in Measures Using ICD-9 Codes* [↗].

You may find processes for requesting changes to ICD-10-PCS on the CMS website [↗] and processes for requesting changes to ICD-10-CM on the CDC NCHS website [↗]. Measure developers should account for contractual timelines when considering applying for new concepts.

There are different standardized groupings of ICD-10 codes such as the Agency for Healthcare Research and Quality (AHRQ) *Clinical Classification Software Refined for ICD-10-CM Diagnoses* [↗] (CCSR) for the Healthcare Cost and Utilization Project (HCUP) and the Medicare Severity Diagnostic Related Groups [↗] (MS-DRG) used for Medicare hospital payments. Measure developers may use these groupings in lieu of individual ICD-10 codes.

1.3.2   Current Procedural Terminology (CPT), Fourth Edition

CPT is a registered trademark of the American Medical Association (AMA) for the CPT, Fourth Edition (CPT4). The CPT Category I (CPT I) codes are a listing of descriptive terms and identifying codes for reporting medical services and procedures performed by physicians. The purpose of the terminology is to provide a uniform language that accurately describes medical, surgical, and diagnostic services, and thereby provides an effective means for reliable nationwide communication among physicians, patients, and third parties.

Each CPT category 1 code corresponds to a single procedure or service. The intent of CPT codes is not to transmit all possible information about a procedure or service; the intent is to identify the procedure or service. The CPT code for a name is unique and permanent.

CPT Category II (CPT II) codes, developed through the CPT Editorial Panel for use in performance measurement, serve to encode the clinical actions described in a measure's numerator ⓘ. CPT II codes consist of five alphanumeric characters in a string ending with the letter "F."

> 💻 eCQMs do not use CPT Category II codes.

CPT Category III (CPT III) codes are temporary alphanumeric codes for new and developing technology, procedures, and services. They are for data collection, assessment, and in some cases, payment of new services and procedures that currently do not meet the criteria for a CPT I code.

The AMA requires users to include a set of notices and disclosures when publishing measures using CPT codes. The current full set of notices and disclaimers includes

- copyright notice
- trademark notice
- government rights statement
- AMA disclaimer 🗗

There are annual updates to CPT codes. For questions regarding the use of CPT codes, contact the AMA CPT Information and Education Services at 800-634-6922 or at the AMA website 🗗. Measure developers should account for contractual timelines when considering applying for new concepts.

1.3.3   SNOMED CT

SNOMED International 🗗 owns and maintains SNOMED CT. SNOMED CT contains more than 357,000 healthcare concepts with unique meanings and formal logic-based definitions organized into hierarchies. A unique semantic type, included in parentheses, identifies each hierarchy in the fully specified name of every concept in the hierarchy. The Appendix includes these semantic type identifiers. The recommended semantic types noted in the table are strong guidance, but the measure developer may only find some conditions in the event or the situation hierarchy. The fully populated code system list with unique descriptions for each concept contains more than 957,000 descriptions. Approximately 1.37 million semantic relationships exist to improve the reliability and consistency of data retrieval.

SNOMED CT is a general clinical reference terminology, meaning its intent is to represent clinical concepts across many domains, which includes conditions, diagnoses, symptoms, and signs, all of which are a type of finding. SNOMED CT also represents procedures, observations, and some laboratory tests, drugs, and devices. The Appendix also notes concepts used for ancillary aspects for documentation of the domains. As a general reference terminology, the expectation is for SNOMED CT to provide many of the concepts needed for clinical information encoding, and unless otherwise noted, a specific terminology should be the primary source for standardized terminology encoding.

SNOMED International maintains the SNOMED CT technical design, core content architecture, SNOMED CT Core content, and SNOMED CT documentation. SNOMED CT content includes the technical specification of SNOMED CT and fully integrated multi-specialty clinical content. The core content includes the concepts table, description table, relationships table, history table, ICD-10-CM mapping, and Technical Implementation Guide.

In the United States, the National Library of Medicine (NLM) distributes SNOMED CT, which acts as the U.S. SNOMED CT Release Center. There are multiple SNOMED CT Release Centers across the globe and many, including the NLM, release a specific edition of SNOMED CT for use in their specific realm. *The U.S. Edition of SNOMED CT* contains the combination of the International Core (same in every edition of SNOMED CT) and a U.S.-specific extension that contains concepts only in use within the U.S. Thus, the *U.S. Edition of SNOMED CT* contains some SNOMED CT concepts that do not appear in other editions, such as those used in Canada or in the United Kingdom. Over time, promotion of realm-specific concepts may occur from the realm-specific edition to the International Core and then these concepts are available to all users. When this occurs, the concept identifier will not change. Only the *U.S. Edition of SNOMED CT* is available for use in the U.S.

There is no intent for SNOMED CT codes to transmit all possible information about a condition, observation, or procedure. The intent for SNOMED CT codes is to identify the condition, observation, or procedure. The SNOMED CT code for a concept is unique and permanent.

At times, there may be a need to request new SNOMED CT concepts. The measure developer should submit the request through the *US SNOMED CT Content Request System*⧉ (USCRS) of the NLM. The NLM evaluates the request and determines whether to include a useful addition only in the *U.S. Edition of SNOMED CT* or also to promote to the International Core. Measure developers must sign up for a Unified Medical Language System® (UMLS) Terminology Services account⧉ to log into the USCRS. Measure developers should account for contractual timelines when considering applying for new concepts. For information on obtaining the standard, contact *SNOMED International*⧉ or the NLM⧉.

🖳 *SNOMED CT-Specific Guidance for Measure Developers for Allergy Value Sets*

Use SNOMED CT to represent allergen drug class concepts only when following this guidance. Refer to RxNorm section 1.3.4 for additional guidance.

In addition to the required approach for representing medication allergen (or ingredient) substances using RxNorm ingredient type concepts noted, eCQMs can add SNOMED CT drug class concepts to represent medication allergens. If deemed appropriate by the measure developer for use in the measure, the expectation is for the drug class concept to include SNOMED CT drug class concepts only when the measure developer anticipates a general drug class concept in patient records as an indication that the patient is allergic to all drugs in the class.

Measure developers should

- Keep in mind that when using a drug class concept, this means that no drug in the class can be an expected therapy for the patient.
- Review all defined drugs for inclusion in the class when choosing to include the SNOMED CT drug class concept.
- Also define an RxNorm Allergy value set with the specific ingredient (IN) and precise ingredient (PIN) term types (TTY) drug ingredients that represent the drug class.

While not required, measure developers may create a grouping value set that groups both the RxNorm ingredient type allergy value set and the SNOMED CT drug class allergy value set into one grouping value set referenced in the measure. A grouping value set is a list of several value sets that share a common purpose and similar concepts. For CMS eCQMs, specifically, members of a grouping value set must have the same QDM Category, but the value set members of the grouping do not need to share the same code system. Using a grouping value set eases development and testing burden on EHR vendors.

Measure developers should use the CVX code set for coding vaccine-allergy-inducing entities.

Measure developers should use the SNOMED CT substance hierarchy for coding non-medication allergy-inducing entities.

1.3.4   RxNorm

The NLM produces RxNorm ⬏. As described by the NLM, RxNorm is a normalized naming system for generic and branded drugs and is a tool for supporting semantic interoperation between drug terminologies and pharmacy knowledgebase systems.

1.3.4.1   Purpose of RxNorm

Hospitals, pharmacies, and other organizations use computer systems to record and process drug information. Because these systems use many different sets of drug names, it can be difficult for one system to communicate with another. To address this challenge, RxNorm provides normalized names and unique identifiers for medicines and drugs. The goal of RxNorm is to allow computer systems to communicate drug-related information efficiently and unambiguously.

1.3.4.2   Scope of RxNorm

RxNorm contains the names of prescription and many over-the-counter drugs available in the United States. RxNorm includes generic and branded drugs including

- Clinical drugs, which are pharmaceutical products given to (or taken by) a patient with therapeutic or diagnostic intent.
- Drug packs, which are packs that contain multiple drugs, or drugs designed for administration in a specified sequence.

As noted on the _RxNorm Overview_ ⬏ page, radiopharmaceuticals, bulk powders, contrast media, food, dietary supplements, and medical devices such as bandages and crutches are generally out of scope for RxNorm.

1.3.4.3   RxNorm Term Types

RxNorm characterizes each concept in the code system as having a specific term type (TTY). TTYs are semantic tags that describe the type of information the concept conveys. You may find a list of all RxNorm TTYs in an appendix ⬏ of the RxNorm Technical Documentation. Subsequent sections of this document provide recommendations for specific TTYs when building value sets for specific uses.

1.3.4.4   RxNorm Use in Quality Measures

RxNorm is the recommended national standard for medication vocabulary for clinical drugs and drug delivery devices. The intent is for RxNorm to cover all prescription medications approved for human use in the U.S. Use RxNorm to reference a medication for administration, order, and dispensing. Measure developers should also use RxNorm to represent the object (i.e., the causative agent) of an allergy, adverse reaction, or intolerance due to a drug.

Because every drug information system commercially available today follows somewhat different naming conventions, there is a need for a standardized nomenclature for the smooth exchange of information. The goal of RxNorm is to allow various systems using different drug nomenclatures to share data efficiently at the appropriate level of abstraction. Each RxNorm clinical drug name reflects the active ingredients, strengths, and dose form comprising that drug. When any of these elements vary, creation of a new RxNorm drug name occurs as a separate concept.

Note that Blueprint content is the broadest interpretation of the RxNorm TTYs with which a measure developer could align, but some eCQM releases include value sets that focus on the minimum RxNorm identifiers needed for all general representations of the necessary drugs. While the Blueprint includes branded TTYs in the guidance, 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 sync with some implementer system content. Also, it provides for impartiality reducing the perception of branded drug favoritism. Given that RxNorm application content (and all drug information vendor products) can be used to map from the more stable general identifier to a branded identifier, and from other code systems such as National Drug Code (NDC) or proprietary code systems, the branded RxNorm TTYs were often not included under the assumption that if an implementer had a different identifier, the implementer could map to the included SCD RXCUI or generic pack (GPCK) RXCUI or any other TTY and ID according to the intention.

Find more information at the RxNorm website ⬀ .

1.3.4.5   Allergy Value Sets

Allergy/intolerance value sets, when drawn from RxNorm, should include only the IN or PIN TTY. Measure developers should also review the guidance provided in the SNOMED CT section 1.3.3.

Measure Developer Guidance

- Always consider including a measure expression that appropriately removes a patient from a numerator or denominatorⓘ populationⓘ when there is an expectation that the patient should have received a substance, but the patient has an allergy/intolerance to the expected substance.
- If there is an allergy/intolerance value set and a patient has an allergy/intolerance to any one of the substances, that will likely remove the patient from consideration for any substance in that value set.
- When needing an allergy/intolerance value set to discriminate between the individual active ingredients in compound medications, it may be reasonable to identify the individual active ingredients for those medications included in the value sets used for expected therapies and then create the allergy/intolerance value set using that list of ingredients.
- The allergy/intolerance value sets only indicate the substance/agent considered as the cause of the reaction. Do not use RxNorm or CVX to indicate the reaction.
- The naming convention for value sets used for allergy/intolerance is to end the value set name with the word allergen, (e.g., Antithrombotic Therapy Allergen and Beta Blocker Therapy Allergen).

1.3.4.6   Medication Value Sets

Medication value sets when used to represent administered, ordered, or recommended substances, must draw from RxNorm and include RxNorm concepts having TTYs.

- GPCK
- SCD

CMS prefers that value sets used to represent acceptable medications will only include the RxNorm TTYs listed. This preference is because measure developers can map any other drug representation to one of these using the RxNorm content and applications, which means that value sets should have any formulation that is appropriate for use. The expectation is that implementers map content found in

some EHR records to the most appropriate concept in the value set, preferably the concept with either a SCD or GPCK TTY.

However, when a measure requires identification of a single ingredient pharmacy-mixed admixture product with a strength not available as a RxNorm SCD, the measure developer may use the Semantic Clinical Dose Form Group (SCDG) term type for the ingredient as a direct reference code.

Measure developers may have some confusion between the use of dose formulation (strength) vs dose administration. For example, an antithrombotic value set did not contain all applicable RxNorm codes because some RxNorm codes represented nontherapeutic strengths for antithrombotic therapy if given as a single dose administration.

Therefore, when RxNorm codes exist to represent a strength potentially used to indicate a therapeutic dose, the measure developer should include all RxNorm codes representing those strengths in the value set. The value set purpose statement should include language to indicate intent using inclusion and exclusion criteria.

Example Inclusion criteria: "Includes concepts that represent medications to reach a therapeutic dose for anti-coagulation."

1.3.5   Logical Observation Identifier Names and Codes

LOINC[2] is a code system (i.e., set of identifiers, names, and codes) for clinical and laboratory observations, healthcare screening/survey instruments, and document type identifiers. Each LOINC record corresponds to a single observation of almost any type (i.e., observables) and is best known for concepts that represent laboratory tests. LOINC also includes representation of document types and thus, frequently represents a document section in consolidated clinical document architecture (C-CDA) and other templated exchange standards. There is no intent for LOINC codes to transmit all possible information about a test or observation; the intent is only to identify the observations. The LOINC code for a name is unique and permanent. Always transmit LOINC codes with a hyphen before the check digit (e.g., 10154-3). Transmit the numeric code as a variable length number, without leading zeros. LOINC codes are available for commercial use without charge, subject to the terms of a license that assures the integrity and ownership of the codes.

Special Situations with LOINC Survey/Evaluation Tools. Use LOINC to represent survey instrument questions (observations). In survey instruments, there is tight alignment between the question and the acceptable set of answers. Because of this, LOINC often also includes specific answer sets for the survey questions, called LOINC Answers (LA codes). When defining the set of answers specifically within the survey, the LA set is normative, which means only the specified LA codes are acceptable responses (values) for that LOINC observable. Defined normative LA sets can occur anywhere in LOINC, and because they are a requirement when defined, users of LOINC must look for and respect these restrictions.

Assignment of a LOINC code to most LOINC survey/evaluation tools for the overall tool is a type of LOINC Panel because that is the LOINC construct that collects other LOINC codes used together. In addition, LOINC curators assign a different LOINC code for each evaluation question/observation included in the survey or evaluation tool. In some cases, the LOINC survey will reuse observations defined in a different (usually related) survey. In many cases, the LOINC survey will include information on the ownership of the survey and indicate whether the individual observations are copyright

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[2] Regenstrief Institute and the Logical Observation Identifier Names and Codes Consortium copyright LOINC codes.

protected and whether survey users can use the independent observations outside of the complete survey instrument as a complete questionnaire. Many survey instruments include summary final scores (i.e., a LOINC observation) that are based on a sum of the values associated with the specified LA codes allowed for all the component questions. The measure developer should consider all elements of a LOINC tool before use. Take care when using LOINC observables with specified answer codes to determine whether there is a requirement for use of the LA codes and only use of that set.

There may also be a need to request new LOINC concepts. You can find instructions and tools to request LOINC concepts at the *LOINC* website↗. Measure developers should account for contractual timelines when considering applying for new concepts.

1.3.6   Other Important Code Systems

Best practice for encoding some data elementsⓘ is to use code systems that represent a specific type of information, particularly when the code system is in widespread use. When considering inclusion of data in a measure not already identified in the Appendix, determine whether a specific authoritative code system is in widespread use and consider including that code system into the measure.

Examples

- NHSN Healthcare Facility Patient Care Location (HSLOC in the *Value Set Authority Center* [VSAC])↗
- CVX↗ (for vaccines)
- CDT – *Code on Dental Procedures and Nomenclature*↗
- UCUM – *The Unified Code for Units of Measure*↗
- ICF—*International Classification of Functioning, Disability, and Health*↗
- Source of Payment Typology (National Association of Health Data Organizations [NAHDO])
- Health Level Seven International®ⓘ (HL7↗) (e.g., Administrative Gender, Discharge Disposition)

2   VALUE SETS

Value sets are a subset of concepts (represented by a code) drawn from one or more code systems, where the concepts included in the subset share a common scope of use. For a quality measure, use value sets to identify a set of concepts whereby any use of one of the concepts included may identify a patient of interest. Use value sets in quality measures to collect all the coded concepts that can occur in the clinical record (or administrative data) and to represent patients that should be in the same population for analysis.

2.1   USE OF VALUE SETS

Coded data elements in quality measures are bound to (i.e., may use) either

- A single specific code (drawn from a code system) directly referenced within the measure and, as such, is not in a value set; therefore, it is a direct reference code (DRC)ⓘ.
OR
- A value set (i.e., a set of codes) where each code is equivalent with respect to use in the context of that data element.

In quality measures, the patients identified using any of the codes in a value set are equivalent with respect to the measure data element using the value set.

2.2   CONSTRUCTING VALUE SETS

Measure developers should create value sets with the thoughtful input of subject matter experts familiar with the clinical or administrative information needed, combined with the input of terminology experts familiar with the code systems used. This work requires strong knowledge of current information capture (both electronic encoding and traditional textual material) and the workflow necessary to capture the expected information accurately. Find value set quality criteria on the VSAC Authoring Best Practices⬈ page.

2.3   REPRESENTING THE CODES FOR INCLUSION

When constructing a value set, the measure developer is actually constructing a value set definition⬈ (VSD) that may have multiple versions over time. A VSD describes the value set using metadataⓘ (section 2.5) and includes a *Content Logical Definition (CLD)* that identifies the specific concepts (i.e., codes) for inclusion in the value set expansion. A value set expansion is the actual list of codes, calculated using a specified expansion profile of code system versions and any predetermined retired (legacy) codes used with implementation of the value set. An expansion profile is a set of rules defined by a particular program, such as the CMS Clinical Quality Measures Value Sets Annual Update. For example, the "eCQM Update 2020-05-07" expansion profile applied a set of allowable code system versions, defined by CMS, as well as a set of desired legacy codes, approved by CMS. In the VSAC, a download of the value set expansion will include the concept code, text display (description), the code system name, identifier, and the code system version used for each member in the expansion set.

Many constructed VSDs enumerate each desired specific code, traditionally called an enumerated or *extensional* definition. An extensional value set is a set of concept codes and descriptors, in the form of an enumerated list, selected to serve a specific purpose. However, the best definition of many value sets is logically or intensionally using the structure of the specific code system (e.g., all the codes that are descendants of the condition Insulin Dependent Diabetes Mellitus). An intensional value set is a list of codes based on a logical statement that often has an algorithmic basis for selection of concepts. For example, "include all concepts that are children of a parent concept" in a hierarchical code system.

A simple enumeration of concepts is not always an ideal approach to define a value set. A comprehensive approach to quality measure development entails examination of complete code hierarchies in a code system to determine the levels of concept inclusion. VSAC provides tooling to support both extensional and intensional VSDs.

Value sets have a life cycle similar to many persistent objects. The VSAC is a tool suite developed by NLM to support the creation, maintenance, and retrieval of value sets. In addition to the life cycle⬈ noted in Figure 1, ongoing maintenance of value sets occurs when measure developers modify the content to address improvements in clinical understanding, changes in available coded concepts that occur with updates to the code system, and errors.
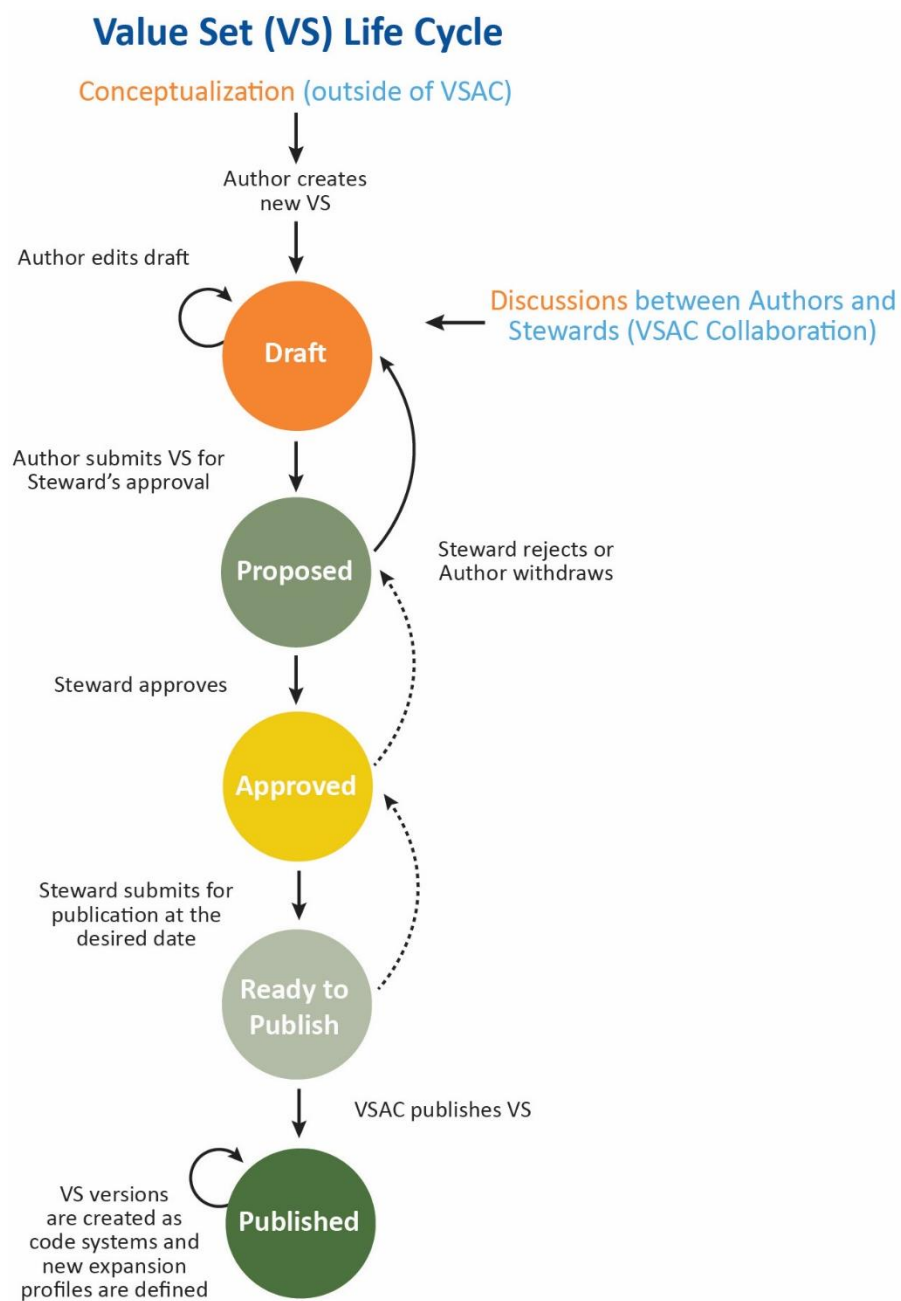
Figure 1. VSAC Value Set Life Cycle

2.4 DETERMINING THE VALUE SET CODE SYSTEM

Using the guidance noted in the Appendix, a value set may need concepts from more than one code system, which is particularly important when the data element is associated with transitional code systems that may be in use currently, but the ongoing intent of the measure is to use a different code system. In this case, quality measures may reference one single value set that groups each of the value sets using different code systems (e.g., SNOMED CT value set, ICD-9-CM value set, and ICD-10-CM value set) to capture the same scope. VSAC has defined a grouping mechanism for this scenario to create a parent value set for use in the measure. Measure developers define separate value sets for different

code systems, such as a Diabetes Mellitus SNOMED CT value set and a Diabetes Mellitus ICD-10-CM value set. They then define a Diabetes Mellitus Grouping value set that incorporates the two-code system-specific value sets and then use the grouping value set for the measure data element. The VSAC allows only one level of grouping; a grouping value set cannot include another grouping value set. Therefore, when developing eCQMs, use the Measure Authoring Tool (MAT) measure logicⓘ when there is a need for a combination of two value set groupings. As an example, link the codes for all patients with hematologic malignancies into one value set grouping with SNOMED CT and ICD-10-CM values and similarly group patients with primary immunodeficiencies and those with human immunodeficiency virus (HIV) infection. Use MAT measure logic clauses to identify patients that fall into any of these groups.

2.5   VALUE SET METADATA

When creating a value set, the measure developer must specify value set metadata that describe what the value set is meant to represent so that measure developers and implementers can use it properly in measures and so that others can find it and reuse it in different measures, where appropriate. The value set metadata must include a clear and complete name (measure developers may reuse the value set for another measure), the identifier, and the value set purpose (a required element) that should describe the scope or breadth of concepts for inclusion or exclusion, in text for other humans to read.

The required metadata for each value set includes Name and Value Set Purpose. The Value Set Purpose includes Clinical Focus (required), Data Element Scope (required), Inclusion Criteria (required), and Exclusion Criteria.

2.5.1   Name

The name of a value set is a crucially important and descriptive metadata element. Measure developers should adhere to specific naming guidelines to assure value set users, measure developers, and stewards can find value sets manually and through automated processing, to encourage reuse of the value sets and to discourage redundancy. The following guidelines will help you create concise, descriptive value set names that capture the purpose of each value set.

- When creating the value set name, avoid a long description yet capture critical, distinctive aspects of the membership criteria.
- Create the value set name to convey the specific distinguishing characteristics of the member concepts.
- Name the value set exactly for what it is, not what the measure developer wanted it to be. Avoid including descriptions of the intended, but not achieved, content. The measure developer should correct the name if not able to align the value set content with the initial name given to the value set. For example, if initially named "Oral Anticoagulants" when the intent was to capture only oral anticoagulants for chronic atrial fibrillation, change the name to "Oral Anticoagulants for Chronic Atrial Fibrillation" to align it with the intended purpose.
- Use a sufficiently descriptive name. Using the "Oral Anticoagulants" example, the value set name "Oral Anticoagulants" is not sufficiently descriptive because it does not describe the scope of the value set. The value set name "Oral Anticoagulants for Chronic Atrial Fibrillation" is a better name because it effectively describes the scope of the value set.
- Use correct spelling and grammar.
- Separate multi-word terms by spaces and not by any other characters.
- Use title case (capitalize first letters of all words, except prepositions, as in a title).

- Make unique value set names. Due to the uniqueness of the value set purpose and content, name redundancy should not occur.
- Never use the word "Other" as an alternative to another value set. Each value set name must be understandable independent of any other value set and describe the contents.
- Limit the value set name to as few words as possible, and no more than 128 characters.
- Certain characters are prohibited and VSAC provides a system warning if used: + * ? : - | ! " %
- Avoid abbreviations unless widely used in the medical literature.
- Do not include the name of the value set steward. The value set steward name is separate metadata bound to the value set and captured in the VSAC database.
- Avoid including the name of the QDM data element linked to the value set if the value set is referenced as part of a quality measure.
- Do not include the name of the quality reporting program that uses the value set unless it describes a primary distinguishing characteristic of the value set.
- Do not include the name of the code system used to obtain the concepts, unless it describes a primary distinguishing characteristic of the value set.
- Do not include the concept category that characterizes the context of use, unless it describes a primary distinguishing characteristic of the value set requirements. For example, only include the word "Procedure" when the context of the main focus is ambiguous.
- Do not include "camelCase" or other composite and delimited words or phrases.
- Avoid using code descriptors within the value set name.
- Do not use names of measure types or settings for the intent of the value set. For example, do not include "hospital measure," "process measure ⓘ," etc. Include this information in the value set Purpose statements.

2.5.2   Value Set Purpose

The Value Set Purpose is a multi-part, free-text, mandatory entry. The design of the Value Set Purpose is to provide a clear and comprehensive description of the constituent concepts of the value set. This important metadata element must describe how to use the concept in a clinical measure or in any other intended application. The VSAC does not automatically validate the Value Set Purpose so measure developers should spend time to make this text as informative as possible for human readers to understand the intent of the value set and how the measure developer put together the value set. To avoid redundancy, there should be only one value set for a given purpose. Measure developers should add a Value Set Purpose to value sets, whether they created or inherited the value set, if no Value Set Purpose is present.

The Value Set Purpose describes the intended content using four sub-parts that constitute the value set's purpose.

2.5.2.1   Clinical Focus

The Clinical Focus is a required free text statement describing the general focus of the value set including a description of the intended constituent concepts. This can be the information about clinical relevancy, or a statement about the general focus of the value set, such as a description of types of messages, payment options, or geographic locations. The statement should be a full sentence with end punctuation (period). Note that over the course of a value set's lifecycle, the measure developer should not change the clinical focus in any meaningful way.

- Format: The purpose of this value set is to [verb] concepts for/of [noun(s)].

- • Example: The purpose of this value set is to represent concepts for conjugated estrogen/medroxyprogesterone combination medications.

2.5.2.2   Data Element Scope

The Data Element Scope is a required free text statement describing how the data element relates to the value set to which it is bound. This context of use often constrains the semantic type of the allowed constituent concepts. The statement should be a full sentence with end punctuation (period).

- • Format: This value set may use a model element in the [QDM or other data model category].
- • Example: This value set may use a model element in the QDM category of Medication.

2.5.2.3   Inclusion Criteria

The Inclusion Criteria a required free text statement that describes what specific concept or code criteria the measure developer included and why. The statement should be a full sentence with end punctuation (period).

- • Format: Includes concepts that [verb] [description].
- • Example: Includes concepts that describe a medication specific to generic, prescribable esterified estrogen medication.

2.5.2.4   Exclusion Criteria

The Exclusion Criteria is an optional free text statement that describes what specific concept(s) or code criteria the measure developer would normally include, but specifically excluded and why. The statement should be a full sentence with end punctuation (period). It is good practice to populate this field with "No exclusions" if there are no exclusions.

- • Format: Excludes concepts that [verb] [description].
- • Example: Excludes concepts that describe branded and non-prescribable esterified estrogen medications in combination with other medication.

2.6   VALUE SET VERSIONING

The measure developer creates the value set definition to specify the value set content. The value set steward reviews and passes the value set definition and then publishes the value set definition. VSAC gives it a version identifier, known as "the value set definition version."

A value set definition version update occurs whenever the steward publishes a new version. Possible reasons for a new version is when there is a change in the value set's defined codes, grouping member value sets, or algorithmic logic (intensional), etc.

When there is an expansion of a published value set definition, the result is a "value set expansion version." The VSAC always makes available for use by value set users an expansion based on the current published value set definition version. That expansion version has the string identifier of "Latest" and the expansion content in Latest will change if the current value set definition changes to a new version and/or the code system version changes in a way to affect the constituent concepts.

2.7   INCLUDING HISTORICAL CODES

Some value sets may need to include concepts that are no longer active concepts in the code system of choice. This often occurs when a measure clause includes a value set that requires a look back period

that extends back more than a year or the length of time between code system updates, due to the fact that the entry of the newly retired codes into patient records occurred when they were still active codes. No measure developer should assume that owners of old patient records will update content to use current codes. Therefore, value sets for use to identify patients based on old record content need to include inactive legacy codes in the value set expansions and document the need for including such content in the purpose statements of the value set metadata section. Measure developers need to notify NLM/VSAC about any retired codes they need to use in a value set. (See the Updating Value Sets 🗗 section of the VSAC Support Center.) NLM/VSAC will then include the measure developer's specified retired codes as legacy codes within the expansion profile calculation applied to the specified eCQM Program Release.

2.8   VALUE SET MAPPING

Value sets use standard terminologies, whose use in quality measures is essential to support interoperability and the ability to compare measure results between measured entities. Most standard terminologies have regularly scheduled updates, which may add new concepts and deprecate other concepts. For deprecated concepts, measure developers must determine whether to keep legacy codes or identify new concepts to replace those codes. Value sets often use more than one standard terminology to express a data element, most commonly SNOMED CT and ICD-10-CM/PCS. There may be a need to map concepts in one terminology with the same concept in another terminology. Cross-terminology mapping can be complex and time-consuming. Matching concepts also occurs on the implementation side. Health Information Technology (IT)ⓘ vendors and end users may use different terminologies; drug databases are a good example.

Historically, cross-terminology mapping was a completely manual process. Automated mapping tools (e.g., Apelon Distributed Terminology System (DTS) 🗗 and *Usagi*🗗) have been developed and are constantly being refined. There is ongoing development of new techniques and tools (e.g., *Solor*🗗). However, no tool can connect 100% of the concepts, so some level of manual processing is necessary.

2.9   VALUE SET REUSE 🖥

To the extent possible, use existing value sets when developing eCQMs. The measure developer should examine the existing library of value sets to determine if any exist that define the clinical concepts described in the measure. If so, use these value sets rather than creating a new value set, promoting harmonizationⓘ and decreasing the time needed to research the various terminologies to build a new list.

A measure may reuse existing value sets or define new value sets. When selecting a value set for reuse, measure developers should be confident of the adequacy of the included set of codes for their purpose. When considering reuse, a measure developer may contact the original measure developer of a reusable value set to determine planned maintenance and clarify common needs.

When multiple value sets appear to represent the same concept, attempt to harmonize the value sets. Harmonization may require rethinking the intent and an assessment of the expertise needed to define and maintain the value set content. Discussion regarding the content and work toward a harmonized, single, usable value set should occur within the *VSAC Collaboration Tool*🗗.

As with value sets, measure developers may reuse DRCs. VSAC provides access to DRCs in current use to enable such reuse and collaboration. Measure developers can obtain a Representational State Transfer

(REST) application programming interface (API) Uniform Resource Locator (URL) for DRCs, for insertion into the MAT, in the Detail View of Browse Code Systems accessible from any VSAC web page.

3   VALUE SET AUTHORITY CENTER

The NLM provides the VSAC in collaboration with the Office of the National Coordinator for Health Information Technology (ONC) and CMS. Requiring a free UMLS license ⬀, the VSAC provides searchable and downloadable access to all official versions of value sets used by each of the eCQM releases used in CMS, as well as other programs (e.g., HL7 C-CDA for clinical document interchange) and other non-eCQM programs. Each value set consists of the codes (i.e., concept identifiers from specified code systems) and human-readable names (i.e., descriptions or terms), drawn from standard codes systems such as SNOMED CT, RxNorm, LOINC, and ICD-10-CM, used to identify quality measure-specific patient populations (e.g., patients with diabetes, clinical visit). The *VSAC Support Center* ⬀ provides online information about VSAC access, value set lifecycles and work flow, measure developer and steward roles, and best practices for value set development. In addition, the VSAC Support Center offers archived users' forums and release notes, and provides links to VSAC publications.

VSAC is the only authoritative tool to author value sets for eCQMs. VSAC now includes intensional definition functionality for measure developers to intensionally define value sets using logical criteria, or statements, which greatly increases value set accuracy and maintenance efficiency, and also greatly reduces burden on measure developers. For example, measure developers can specify all descendant codes of a hierarchical concept and expand them into an enumerated list of codes and terms. When defining value set code members using logical criteria like this, also known as an intensional definition, it is important to include this logic statement in the Purpose Statement section of the Value Set Metadata in VSAC. Tools other than VSAC exist, such as the *CDC Public Health Information Network Vocabulary Access and Distribution System (PHIN VADS)* ⬀ and some proprietary offerings, to help measure developers author and maintain quality measure value sets.

The key benefits of using VSAC include

- Serving as the authority and central repository for the official versions of value sets that support eCQMs adopted by CMS programs.
- Providing search, retrieval, and download capabilities through a web interface and APIs.
- Providing authoring and validation tools for creating new and revising published value sets.
- Hosting up-to-date versions of source vocabularies. The representative source vocabularies (not exhaustive) include SNOMED CT, RxNorm, LOINC, ICD-9-CM, and ICD-10-CM.
- Requiring a purpose statement for each value set, composed of clinical focus, data element scope, inclusion criteria, and exclusion criteria. These purpose statements ensure the clear clinical intent of value set and building criteria, used when evaluating the validity and accuracy of codes contained in the value set.
- Offering complete value set authoring guidance.

For more details, refer to the *VSAC* website ⬀.

4   VSAC COLLABORATION TOOL

The *VSAC Collaboration Tool* ⬀ is a companion tool to the VSAC value set authoring and maintenance environment. CMS expects that measure developers use the *VSAC Collaboration Tool* for most value sets to obtain input into the value set content from participating users and clinical expert colleagues. Measure developers and stewards can post value sets singly, in multiples, or per CMS measure from the VSAC authoring environment into the *VSAC Collaboration Tool*. This tool provides a central site for collaborative discussion and value set quality assurance analysis. In addition, the Collaboration Tool assists measure stewardsⓘ and their invited external collaborators in workflow management and document management. Measure developers and stewards can use their posted value set spreadsheets in the *VSAC Collaboration Tool* to review the terminology changes in expanded value sets using newer expansion profile calculations that contain newer code system versions. Although this functionality exists in VSAC for every value set, this feature in the *VSAC Collaboration Tool* enables quality review for all value sets within a measure. This feature supports the maintenance activity required of measure developers to keep value set content aligned with code system version changes and clinical knowledge enhancements. The *VSAC Collaboration Tool* requires a UMLS License Agreement ⬀ for each user and NLM provides an extensive Help section ⬀.

Because the focus of the *VSAC Collaboration Tool* is not solely on eCQM development, it is important to note that all value sets can benefit from utilization of the *VSAC Collaboration Tool*.

5   UNIQUE SITUATIONS FOR VALUE SET USE IN ECQMS 🖥

5.1   USE OF VALUE SETS TO ADDRESS NEGATION RATIONALE IN ECQMS

The concept of negation has three aspects: assurance that a certain condition does not exist (e.g., assertion that the patient has no known allergies, or that the patient takes no medications); lack of evidence that a condition does not exist (e.g., no information is available in the EHR about allergies or about medications taken); and that an action was intentionally not performed, with or without a reason (e.g., medication was not prescribed due to interaction with other medications a patient is taking). As a rule, in clinical practice, the assumption is the absence of information about a desired action in the medical recordⓘ indicates the action did not occur. However, action negation is an assertion of an intentional decision to avoid action. QDM calls this intentional assertion negation rationale; it addresses only the third definition.

QDM addresses negation rationale as an attribute of 34 QDM datatypes. By specifying negation rationale in a measure expression, the measure developer provides logic criteria requiring assertion that an action was not performed, most often requiring at least one of a set of specific reasons. Generally, measure developers use negation rationale as denominator exceptionsⓘ (i.e., if the EHR includes a documented medical reason not to perform an action, remove the patient from the denominator). Negation rationale may also serve as a denominator criterionⓘ (i.e., the expected numerator criteria if there is a medical reason to avoid the most common treatment).

The QDM documentation ⬀ on the *Electronic Clinical Quality Improvement (eCQI) Resource Center* describes how a measure developer can use negation rationale. Negation rationale is part of the current production version of QDM. Find a discussion about negation and methods for expressing negation with Clinical Quality Language (CQL)ⓘ on the CQL Formatting and Usage Wiki ⬀.

Measure developers should present negation rationale in measure logic as *not done*. Using negation requires two value sets or DRCs: one is the value set of concepts that would be expected to have been done (usually, this is the same value set or DRC used in the measure to identify patients with the applied therapy/action), whereas the other is a value set (or DRC) of the acceptable reason for avoiding the expected action.

Example

Medication, Administered Not Done: Angiotensin Converting Enzyme (ACE) Inhibitor for Medical Reason for Avoiding ACE Inhibitors

ACE Inhibitor is the value set of the expected medication for which documentation asserts no administration. Medical Reason for Avoiding ACE Inhibitors is the value set of acceptable reasons for avoiding administration of the expected medication. Only reasons included in the value set will meet the criteria for the measure.

5.2   VALUE SET REVIEW

There are several ways to share value sets with reviewers. The most straightforward way is to email the list of value set codes in a spreadsheet. Also use the *VSAC Collaboration Tool* to review and gather feedback. Notify reviewers that value set content often includes codes from code systems covered by intellectual property rights.

There are rules for value set development in the VSAC. The requirement is for all value sets to have specific metadata that describe the purpose and content they contain (refer to section 2.5, Value Set Metadata). Ensuring value sets have descriptive metadata significantly improves the likelihood that reviewers and later users of the value sets will understand the intent and provide valuable feedback about the content.

Additionally, reviewers evaluating value set content (i.e., the code descriptions) can best provide valuable feedback regarding the validity of the value set if the metadata provided are detailed. Evaluation based on the value set name alone is insufficient. The advantage of providing a Microsoft Excel spreadsheet for value set review is that it is simple, easy to browse for codes, and easy for the reviewer to document comments and feedback. Value sets exported from the VSAC include the metadata described in section 2.5. The disadvantage of providing a Microsoft Excel spreadsheet to review value sets is that a flat list of codes does not reflect the hierarchical structure of codes residing in their code system. Reviewers need to look up codes in their original code systems in order to understand the parent-child relationship and determine semantic relevance to the intent. VSAC provides a powerful tool called Browse Code Systems, located at the top of every VSAC web page. The Browse Code Systems tool enables any VSAC user (i.e., measure developer or non-measure developer) with a UMLS License to look up codes for reviewing a code's terms, synonyms, children, parents, and siblings. Users can also view a graphical interface tree for browsing hierarchical code systems. VSAC now has intensional definition functionality. When measure developers define their value set intensionally, they may download a Microsoft Excel spreadsheet from the VSAC Authoring Tool that includes the logical definition (e.g., all descendants of a code) as well as the expanded code list of that value set, which will be extremely helpful for reviewers in understanding the value set.

To overcome the disadvantages of a spreadsheet, link to the value sets directly within the NLM's VSAC system not only for authoring value sets, but also for reviewing value sets among developers, reviewers, and stewards. The *VSAC Support Center*'s Help Section ⬏ describes the features of VSAC, which has no login requirements and is available to anyone. The VSAC Repository, Authoring Tool, Collaboration Tool,

and Browse Code Systems require that all users obtain a UMLS Metathesaurus License ↗ to ensure that each user acknowledges and abides by code system licensing requirements. There is no charge for registration, and it is available for any user independent of nationality. With a UMLS license, all VSAC users can access and create value sets. Implementers must ensure that they comply with any specific code system implementation/use requirements. Some reviewers may find the registration process cumbersome for reviewing a small value set, but it is valuable.

5.2.1   Pre-MAT Value Set Review

The purpose of a value set review is to validate correct code selections meeting the clinical intent as well as the correct hierarchy in the code system. The quality assurance team, internal or external terminologist, and steward may review the value set, as the NLM is not involved in this review. The value set steward is the entity responsible for the final selection of codes based on the existing data and feedback from clinicians. The quality assurance team and terminologist focus on the areas listed in Table 1 and take the appropriate remedial action. It is acceptable to use a Microsoft Excel spreadsheet to capture and distribute the value set and codes as long as measure developers understand the limitations previously noted. The recommendation is, however, to use the NLM VSAC to author and review value sets.

Table 1. Value Set Review Areas and Remedial Actions

Area	Remedial Action
Value set duplication	Replace duplicate value sets with normalized value sets.
Clinical validity	Value sets must correspond to the intent and purpose of the clinical perspective.
Code list completeness	A value set should contain all the relevant codes for a specific data element.
Metadata completeness	Apply a common, desirable pattern implementing NLM VSAC guidance for value set metadata. Always include the required Purpose Statements.
Alignment of code system to the standards	Value sets must use recommended terminology systems for an extensional value set. Update code sets from transition vocabularies to those ideally desired.
Terminological correctness	Attention to selection of appropriate semantic type(s) is important based on the data element the value set uses, for example, SNOMED CT disease versus morphologic abnormality. Code system combinations should use a grouping value set approach.
Single and multiple concepts	Reuse value sets and combine with other value sets to create a grouping value set for representing a more general set of ideas. There is no allowance for nested grouping value sets.
Impact on measure logic size	Replace repeating identical logic that is a consequence of multiple similar value sets by using grouping value sets, which combine appropriate value sets.

5.2.2   Post-MAT Value Set Review[3]

The *VSAC Collaboration Tool* provides a quality assurance report for value sets associated with each measure. This report, located in the Value Set Site Content dashlet of a measure's collaboration site, is based on technical analysis of value sets provided before and after completion of MAT development. At this stage, do not focus the value set review on the clinical intent representation. Rather, focus on verification of successful capture of all codes in VSAC for use by the MAT. Harmonization may introduce new changes to value sets during the post-MAT value set review; therefore, these value sets need ad hoc reviews to ensure the proper changes are in place.

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[3] This activity only occurs as part of the program release process for the eCQM Annual Update.

5.2.3   NLM Value Set Review[4]

During the pre-eCQM release quality assurance process, to improve value set authorship, curation, and delivery, NLM performs quality assurance checks to compare the validity of value set codes and terms with the latest source vocabularies. As measure developers create their value sets within the VSAC Authoring Tool, the tool interactively assesses the code validity within a code system, as well as other quality assurance parameters. Measure developers should take proper actions, as specified by NLM, based on the analysis outcome. If the VSAC or NLM quality assurance teams identify value set deficiencies, measure developers should correct the value sets using the VSAC Authoring Tool.

6   KEY POINTS

Most CMS measures rely at least in part on the use of various standardized codes or code systems for classifying healthcare provided in the United States. Specific code systems relevant to measure development include ICD-10-CM, CPT, SNOMED CT, RxNorm, and LOINC. These systems encode content and enable computer-based systems to find and utilize data without human intervention.

Value sets are a subset of concepts (represented by a code) drawn from one or more code systems, where the concepts included in the subset share a common scope of use. Creating value sets requires thoughtful input of subject matter experts familiar with the clinical or administrative information needed, combined with the input of terminology experts familiar with the code systems used. The VSAC is a tool suite developed by NLM to support the creation, maintenance, and retrieval of value sets. CMS expects that measure developers use the VSAC for value set creation and maintenance.

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[4] This activity only occurs as part of the program release process for the eCQM Annual Update.

REFERENCES

Agency for Healthcare Research and Quality. (n.d.). *Clinical classifications software refined (CCSR) for ICD-10-CM diagnoses*. Retrieved March 22, 2021, from https://www.hcup-us.ahrq.gov/toolssoftware/ccsr/ccs_refined.jsp

American Dental Association. (n.d.). *Code on dental procedures and nomenclature (CDT code)*. Retrieved March 22, 2021, from https://www.ada.org/en/publications/cdt

American Medical Association. (n.d.). *AMA*. Retrieved March 22, 2021, from https://www.ama-assn.org

Apelon. (n.d.) *DTS 4.7.1*. Retrieved March 22, 2021, from http://www.apelondts.org/

Centers for Disease Control and Prevention. (n.d.-a). *ICD-10 coordination and maintenance committee.* National Center for Health Statistics. Retrieved March 22, 2021, from http://www.cdc.gov/nchs/icd/icd10_maintenance.htm

Centers for Disease Control and Prevention. (n.d.-b*). IIS: Current HL7 standard code set CVX—Vaccines administered*. Immunization Information Systems. Retrieved June 30, 2021, from https://www2a.cdc.gov/vaccines/iis/iisstandards/vaccines.asp?rpt=cvx

Centers for Disease Control and Prevention. (n.d.-c). *NHSN healthcare facility patient care location*. Public Health Information Network Vocabulary Access and Distribution System. Retrieved March 22, 2021, from https://phinvads.cdc.gov/vads/ViewCodeSystem.action?id=2.16.840.1.113883.6.259

Centers for Disease Control and Prevention. (n.d.-d) *PHIN vocabulary access and distribution system*. *PHIN Tools and Resources.* Retrieved March 22, 2021, from https://www.cdc.gov/phin/index.html

Centers for Medicare & Medicaid Services. (n.d.-a). *License for use of current procedural terminology, fourth edition ("CPT®").* Retrieved March 22, 2021, from https://www.cms.gov/apps/physician-fee-schedule/license-agreement.aspx

Centers for Medicare & Medicaid Services. (n.d.-b). *MS-DRG classifications and software*. Retrieved March 22, 2021, from https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/MS-DRG-Classifications-and-Software

Centers for Medicare & Medicaid Services. (n.d.-c). *Process for requesting new/revised ICD-10-PCS procedure codes*. Retrieved March 22, 2021, from https://www.cms.gov/Medicare/Coding/ICD10/newrevisedcodes.html

Centers for Medicare & Medicaid Services. (2020). *ICD-10.* Retrieved March 22, 2021, from https://www.cms.gov/Medicare/Coding/ICD10

Cimino, J. J. (1998). Desiderata for controlled medical vocabularies in the twenty first century. *Methods of Information in Medicine, 37*, 394–403. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3415631/pdf/nihms-396702.pdf

Clinical Quality Language Formatting and Usage Wiki. (n.d.). *Negation in QDM*. Retrieved March 22, 2021, from https://github.com/cqframework/CQL-Formatting-and-Usage-Wiki/wiki/Negation-in-QDM

Electronic Clinical Quality Improvement Resource Center. (n.d.). *QDM - Quality Data Model*. Retrieved March 22, 2021, from https://ecqi.healthit.gov/qdm

Health Services Platform Consortium. (n.d.). *Solor*. Retrieved March 22, 2021, from http://solor.io/

HL7 International. (n.d.-a). *HL7 specification: Characteristics of a value set definition, release 1*. Retrieved March 22, 2021, from http://www.hl7.org/implement/standards/product_brief.cfm?product_id=437

HL7 International. (n.d.-b). *HL7 v3 value set ParticipationMode*. Value Sets. Retrieved March 22, 2021, from http://hl7.org/fhir/R4/v3/ParticipationMode/vs.html

HL7 International. (n.d.-c). *Home*. Retrieved March 22, 2021, from http://www.hl7.org/index.cfm

HL7 International. (n.d.-d). *Value set*. HL7 FHIR release 4. Retrieved August 12, 2020, from http://hl7.org/fhir/R4/valueset-communication-category.html

ICD10Data.com. (2020). *2020 ICD-10-CM diagnosis code A08.11*. ICD-10-CM Codes. Retrieved July 13, 2020, from http://www.icd10data.com/ICD10CM/Codes/A00-B99/A00-A09/A08-/A08.11

National Association of Health Data Organizations. (n.d.). Source of payment typology. Retrieved March 15, 2021, from https://www.nahdo.org/sopt

National Quality Forum. (n.d.). *Inclusion of ICD-10 codes in measures using ICD-9 codes*. Retrieved March 22, 2021, from http://www.qualityforum.org/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=72793

Observational Health Data Science and Informatics. (n.d.). *Usagi*. Retrieved July 13, 2020, from https://www.ohdsi.org/web/wiki/doku.php?id=documentation:software:usagi

Office of the National Coordinator for Health Information Technology. (n.d*.). Interoperability standards advisory*. Retrieved March 22, 2021, from https://www.healthit.gov/isa/

Regenstrief Institute, Inc. (n.d.). *LOINC*. Retrieved March 22, 2021, from https://loinc.org/

Schadow, G. & McDonald, C. J. (n.d.). *The unified code for units of measure*. Retrieved March 22, 2021, from http://unitsofmeasure.org/trac

SNOMED International. (n.d.). *Home.* Retrieved March 22, 2021, from https://www.snomed.org

U.S. National Library of Medicine. (n.d.-a). *Appendix 5 – RxNorm term types (TTY).* Unified Medical Language System® (UMLS®). Retrieved March 22, 2021, from https://www.nlm.nih.gov/research/umls/rxnorm/docs/2019/appendix5.html

U.S. National Library of Medicine. (n.d.-b). *RxNorm overview.* Unified Medical Language System® (UMLS®). Retrieved March 22, 2021, from https://www.nlm.nih.gov/research/umls/rxnorm/overview.html

U.S. National Library of Medicine. (n.d.-c). *RxNorm technical documentation – Table of contents.* Unified Medical Language System® (UMLS®). Retrieved March 22, 2021, from https://www.nlm.nih.gov/research/umls/rxnorm/docs/index.html

U.S. National Library of Medicine. (n.d.-d). *SNOMED CT*. Retrieved March 22, 2021, from https://www.nlm.nih.gov/healthit/snomedct/index.html

U.S. National Library of Medicine. (n.d.-e). *UMLS Metathesaurus License.* UMLS Terminology Services. Retrieved March 22, 2021, from https://www.nlm.nih.gov/vsac/support/usingvsac/requestumlslicense.html

U.S. National Library of Medicine. (n.d.-f). *UMLS Terminology Services*. Retrieved March 22, 2021, from https://uts.nlm.nih.gov/home.html

U.S. National Library of Medicine. (n.d.-g). *US SNOMED CT content request service*. Retrieved March 22, 2021, from https://confluence.ihtsdotools.org/display/SCTCR/SNOMED+CT+Content+Request+Service

U.S. National Library of Medicine. (n.d.-h). *Value set authority center*. Retrieved March 22, 2021, from https://vsac.nlm.nih.gov/

U.S. National Library of Medicine. (n.d.-i). *Value set life cycle.* VSAC Support Center. Retrieved March 22, 2021, from https://www.nlm.nih.gov/vsac/support/authorguidelines/authoringworkflow.html

U.S. National Library of Medicine. (n.d.-j). *VSAC authoring best practices.* VSAC Support Center. Retrieved March 22, 2021, from https://www.nlm.nih.gov/vsac/support/authorguidelines/bestpractices.html

U.S. National Library of Medicine. (n.d.-k). *VSAC collaboration tool user's guide.* VSAC Support Center*.* Retrieved March 22, 2021, from https://www.nlm.nih.gov/vsac/support/vsaccollaboration/index.html

U.S. National Library of Medicine. (n.d.-l). *VSAC support center*. Retrieved March 22, 2021, from https://www.nlm.nih.gov/vsac/support/index.html

U.S. National Library of Medicine. (n.d.-m). *VSAC support center*. Updating value sets. Retrieved March 22, 2021, from https://www.nlm.nih.gov/vsac/support/authorguidelines/updatingvaluesets.html

World Health Organization. (n.d.). *International classification of functioning disability and health (ICF)*. Retrieved March 22, 2021, from http://www.who.int/classifications/icf/en/

APPENDIX. QDM CATEGORIES WITH ONC HEALTH INFORMATION TECHNOLOGY STANDARDS COMMITTEE (HITSC) RECOMMENDED VOCABULARIES[5]

General Clinical Concept	QDM Datatypes	QDM Attribute	Clinical Vocabulary Standards	Transition Vocabulary
Adverse Effect/Allergy/Intolerance	"Adverse Event"	*Code* (the causative agent of the adverse event)	Medication: RxNorm ingredient type or "term type" (TTY) Vaccine: CVX SNOMED CT Substance for drug class only Other causative agents: SNOMED CT (product, substance if not a product)	N/A
Adverse Effect/Allergy/Intolerance	"Adverse Event"	*Type* (the reaction)	SNOMED CT (disorders, findings)	N/A
Adverse Effect/Allergy/Intolerance	"Allergy/Intolerance"	*Code* (the causative agent of the allergy/ intolerance)	Medication: RxNorm ingredient type (TTY) Vaccine: CVX SNOMED CT Substance for **drug class only** Other causative agents: SNOMED CT (substance)	N/A
Adverse Effect/Allergy/Intolerance	"Intervention, Adverse Event" "Intervention, Intolerance"	*Type* (the reaction)	SNOMED CT (disorders, findings)	N/A
Care Experience	"Patient Care Experience"	*Code*	SNOMED CT (or LOINC if part of an Evaluation Tool)	N/A
Care Experience	"Provider Care Experience"	*Code*	SNOMED CT (or LOINC if part of an Evaluation Tool)	N/A
Substance	"Substance, Administered" "Substance, Order" "Substance, Recommended"	*Code*	SNOMED CT (substance if not a product)	N/A
Substance	"Substance, Administered" "Substance, Order" "Substance, Recommended"	*Negation rationale*	SNOMED CT (disorders, findings)	N/A

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[5] HITSC made these recommendations in 2012 and 2015 using program information and language current at the time and are consistent with the Interoperability Standards Advisory. With the adoption of the Quality Payment Program and other changes to quality reporting programs, updates to these recommendations will continue to evolve.

General Clinical Concept	QDM Datatypes	QDM Attribute	Clinical Vocabulary Standards	Transition Vocabulary
Care Goal	"Care Goal"	*Code*	SNOMED CT (disorders, findings)	N/A
Condition/Diagnosis/Problem	"Diagnosis"	*Code*	SNOMED CT (disorders, findings)	ICD-9-CM, ICD-10-CM
Condition/Diagnosis/Problem	"Diagnosis"	*Anatomical location site*	SNOMED CT (body structure)	N/A
Condition/Diagnosis/Problem	"Diagnosis"	*Severity*	SNOMED CT (qualifier)	N/A
Symptom	"Symptom"	*Code*	SNOMED CT (disorders, findings)	N/A
Symptom	"Symptom"	*Severity*	SNOMED CT (qualifier)	N/A
Encounter (any patient-provider interaction [e.g., telephone call, email] regardless of reimbursement status, status—includes traditional face-to-face encounters)	"Encounter, Order" "Encounter, Performed" "Encounter, Recommended"	*Code*	SNOMED CT (procedure)	CPT, Healthcare Common Procedural Coding System (HCPCS), ICD-9-CM Procedures, ICD-10-CM, ICD-10-PCS
Encounter (any patient-provider interaction [e.g., telephone call, email] regardless of reimbursement status, status—includes traditional face-to-face encounters)	"Encounter, Order" "Encounter, Performed" "Encounter, Recommended"	*Negation rationale*	SNOMED CT (disorders, findings)	N/A
Encounter (any patient-provider interaction [e.g., telephone call, email] regardless of reimbursement status, status—includes traditional face-to-face encounters)	"Encounter, Recommended"	*Reason*	SNOMED CT (disorders, findings)	N/A
Encounter (any patient-provider interaction [e.g., telephone call, email] regardless of reimbursement status, status—includes traditional face-to-face encounters)	"Encounter, Performed"	*Diagnoses*	SNOMED CT (disorders, findings)	ICD-9-CM, ICD-10-CM

General Clinical Concept	QDM Datatypes	QDM Attribute	Clinical Vocabulary Standards	Transition Vocabulary
Encounter (any patient-provider interaction [e.g., telephone call, email] regardless of reimbursement status, status—includes traditional face-to-face encounters)	"Encounter, Performed"	*Facility location*	Health Level Seven International® (HL7) HealthcareServiceLocation codes (HSLOC)	N/A
Encounter (any patient-provider interaction [e.g., telephone call, email] regardless of reimbursement status, status—includes traditional face-to-face encounters)	"Encounter, Performed"	*Admission source*	SNOMED CT (environment)	N/A
Encounter (any patient-provider interaction [e.g., telephone call, email] regardless of reimbursement status, status—includes traditional face-to-face encounters)	"Encounter, Performed"	*Discharge disposition*	SNOMED CT (environment)	N/A
Family History	"Family History"	*Code*	SNOMED CT (person)	N/A
Family History	"Family History"	*Relationships*	SNOMED CT (person, situation)	N/A
Device	"Device, Applied" "Device, Order" "Device, Recommended"	*Code*	SNOMED CT (physical object)	N/A
Device	"Device, Applied" "Device, Order" "Device, Recommended"	*Anatomical approach site*	SNOMED CT (body structure)	N/A
Device	"Device, Applied" "Device, Order" "Device, Recommended"	*Anatomical location site*	SNOMED CT (body structure)	N/A
Device	"Device, Applied" "Device, Order" "Device, Recommended"	*Reason*	SNOMED CT (disorders, findings)	N/A
Device	"Device, Applied" "Device, Order" "Device, Recommended"	*Negation rationale*	SNOMED CT (disorders, findings)	N/A

General Clinical Concept	QDM Datatypes	QDM Attribute	Clinical Vocabulary Standards	Transition Vocabulary
Physical Exam (definition of the components of the physical exam performed)	"Physical Exam, Order" "Physical Exam, Performed" "Physical Exam, Recommended"	N/A	LOINC	N/A
Physical Exam (expression of the answers/responses for the physical exam component)	"Physical Exam, Performed"	Result	SNOMED CT (disorders, findings) or LOINC Normative Responses	N/A
Laboratory Test (names)	"Laboratory Test, Order" "Laboratory Test, Performed" "Laboratory Test, Recommended"	Code	LOINC	N/A
Laboratory Test (names)	"Laboratory Test, Order" "Laboratory Test, Performed" "Laboratory Test, Recommended"	Reason	SNOMED CT (disorders, findings)	N/A
Laboratory Test (names)	"Laboratory Test, Order" "Laboratory Test, Performed" "Laboratory Test, Recommended"	Negation rationale	SNOMED CT (disorders, findings)	N/A
Laboratory Test (results)	"Laboratory Test, Performed"	Result	SNOMED CT (disorders, findings) or LOINC Normative Responses	N/A
Diagnostic Study Test Names	"Diagnostic Study, Order" "Diagnostic Study, Performed" "Diagnostic Study, Recommended"	Code	LOINC	HCPCS
Diagnostic Study Test Names	"Diagnostic Study, Order" "Diagnostic Study, Performed" "Diagnostic Study, Recommended"	Reason	SNOMED CT (disorders, findings)	N/A
Diagnostic Study Test Names	"Diagnostic Study, Order" "Diagnostic Study, Performed" "Diagnostic Study, Recommended"	Negation rationale	SNOMED CT (disorders, findings)	N/A
Diagnostic Study Test Results	"Diagnostic Study, Performed"	Result	SNOMED CT (disorders, findings) or LOINC Normative Responses	N/A
Units of Measure for Results	"Laboratory test, Performed" "Diagnostic Study, Performed"	Result (units)	UCUM – Unified Code for Units of Measure	N/A
Intervention	"Intervention, Order" "Intervention, Performed" "Intervention, Recommended"	Code	SNOMED CT (disorders, findings, procedures, regime/therapy)	CPT, HCPCS, ICD-9-CM Procedures, ICD-10-PCS

General Clinical Concept	QDM Datatypes	QDM Attribute	Clinical Vocabulary Standards	Transition Vocabulary
Intervention	"Intervention, Order" "Intervention, Performed" "Intervention, Recommended"	*Reason*	SNOMED CT (disorders, findings)	N/A
Intervention	"Intervention, Order" "Intervention, Performed" "Intervention, Recommended"	*Negation rationale*	SNOMED CT (disorders, findings)	N/A
Intervention	"Intervention, Performed"	*Result*	SNOMED CT (disorders, findings)	N/A
Procedure	"Procedure, Order" "Procedure, Performed" "Procedure, Recommended"	*Code*	SNOMED CT (procedures, regime/therapy)	CPT, HCPCS, ICD-9-CM Procedures, ICD-10-PCS
Procedure	"Procedure, Order" "Procedure, Performed" "Procedure, Recommended"	*Reason*	SNOMED CT (disorders, findings)	N/A
Procedure	"Procedure, Order" "Procedure, Performed" "Procedure, Recommended"	*Negation rationale*	SNOMED CT (disorders, findings)	N/A
Procedure	"Procedure, Performed"	*Result*	SNOMED CT (disorders, findings)	N/A
Assessment Instrument Questions (e.g., questions for assessing patient status used as part of clinical workflow, clinical outcome evaluation, social functional and emotional status, patient preference, experience, characteristics)	"Assessment, Order" "Assessment, Performed" "Assessment, Recommended"	*Code*	LOINC	N/A
Assessment Instrument Questions (e.g., questions for assessing patient status used as part of clinical workflow, clinical outcome evaluation, social functional and emotional status, patient preference, experience, characteristics)	"Assessment, Order" "Assessment, Performed" "Assessment, Recommended"	*Reason*	SNOMED CT (disorders, findings)	N/A

General Clinical Concept	QDM Datatypes	QDM Attribute	Clinical Vocabulary Standards	Transition Vocabulary
Assessment Instrument Questions (e.g., questions for assessing patient status used as part of clinical workflow, clinical outcome evaluation, social functional and emotional status, patient preference, experience, characteristics)	"Assessment, Order" "Assessment, Performed" "Assessment, Recommended"	*Negation rationale*	SNOMED CT (disorders, findings)	N/A
Assessment Instrument Answers/Responses (e.g., responses to questions for assessing patient status used as part of clinical workflow, clinical outcome evaluation, social functional and emotional status, patient preference, experience, characteristics)	"Assessment, Performed"	*Result*	SNOMED CT (disorders, findings) or LOINC Normative Responses	N/A
Categories of Function	"Assessment, Order" "Assessment, Performed" "Assessment, Recommended"	*Code*	ICF – International Classification of Functioning, Disability, and Health[6]	N/A
Communication	"Communication, Performed"	*Code*	SNOMED CT (disorders, findings)	CPT, HCPCS
Communication	"Communication, Performed"	*Category*	HL7 Value Set CommunicationCategory	N/A
Communication	"Communication, Performed"	*Medium*	HL7 v3 Value Set ParticipationMode	N/A
Communication	"Communication, Performed"	*Negation rationale*	SNOMED CT (disorders, findings)	N/A
Medications (administered, excluding vaccines)	"Medication, Active" "Medication, Administered" "Medication, Discharge" "Medication, Dispensed" "Medication, Order"	*Code*	RxNorm	N/A

[6] The HITSC Task Force recommended use of ICF; however, there is a fee associated with ICF. The Interoperability Standards Advisory recommends LOINC for observations and SNOMED CT for observation values.

General Clinical Concept	QDM Datatypes	QDM Attribute	Clinical Vocabulary Standards	Transition Vocabulary
Medications (administered, excluding vaccines)	"Medication, Active" "Medication, Administered" "Medication, Discharge" "Medication, Dispensed" "Medication, Order"	*Reason*	SNOMED CT (disorders, findings)	N/A
Vaccines	"Immunization, Administered" "Immunization, Order"	*Code*	CVX—Vaccines	N/A
Vaccines	"Immunization, Administered" "Immunization, Order"	*Code* (for procedure for administering a vaccine)	SNOMED CT (procedures)	CPT
Vaccines	"Immunization, Administered" "Immunization, Order"	*Reason*	SNOMED CT (disorders, findings)	N/A
Vaccines	"Immunization, Administered" "Immunization, Order"	*Negation rationale*	SNOMED CT (disorders, findings)	N/A
Patient Characteristic, Date of Birth	"Patient Characteristic Birthdate"	*Code*	Fixed to LOINC code 21112-8 (birth date); therefore, cannot be further qualified with a value set	N/A
Patient Characteristic, Expired	"Patient Characteristic Expired"	*Code*	Fixed to SNOMED CT code 419099009 (dead); therefore, cannot be further qualified with a value set	
Patient Characteristic, Sex	"Patient Characteristic Sex"	*Code*	ONC Administrative Sex – VSAC OID 2.16.840.1.113762.1.4.1	
Patient Characteristic, Ethnicity	"Patient Characteristic Ethnicity"	*Code*	CDC National Center for Health Statistics – VSAC OID 2.16.840.1.114222.4.11.837 Detailed Ethnicity: HL7 Terminology – VSAC OID 2.16.840.1.114222.4.11.877	N/A
Patient Characteristic, Race	"Patient Characteristic Race"	*Code*	CDC National Center for Health Statistics – VSAC OID 2.16.840.1.114222.4.11.836 Race Value Set: HL7 Terminology – VSAC OID 2.16.840.1.113883.1.11.14914	
Patient Characteristic, Preferred Language	"Individual Characteristic"	*Code*	RFC 5646	N/A
Patient Characteristic, Payer	"Patient Characteristic Payer"	*Code*	NAHDO Source of Payer Typology VSAC OID 2.16.840.1.114222.4.11.3591	N/A
Patient Characteristic	"Patient Characteristic, Clinical Trial Participant"	*Code*	SNOMED CT (findings)	N/A

General Clinical Concept	QDM Datatypes	QDM Attribute	Clinical Vocabulary Standards	Transition Vocabulary
Patient Characteristic	"Patient Characteristic, Clinical Trial Participant"	*Reason*	SNOMED CT (disorders, findings)	N/A
Patient Characteristic, Unspecified	"Patient Characteristic (unspecified)"	*Code*	SNOMED CT (disorders, findings)	N/A
Practitioner	QDM Entity Practitioner	*Specialty*	National Uniform Claim Committee (NUCC) Healthcare Provider Taxonomy	N/A