NATIONAL QUALITY FORUM

Quality Data Model

December 2012

Contents

National Quality Forum: Overview and Goals

The National Quality Forum (NQF) is a nonprofit organization that operates under a three-part mission to improve the quality of American healthcare by:

- Building consensus on national priorities and goals for performance improvement and working in partnership to achieve them;
- Endorsing national consensus standards for measuring and publicly reporting on performance; and
- Promoting the attainment of national goals through education and outreach programs.

NQF drives improvements in care by rigorously endorsing evidence-based measures of performance—focusing on measurement for accountability and quality improvement.

Measurement has the greatest impact on quality when it supports transparency and public reporting, but it also provides information to help clinicians and patients make improvements in care delivery. To date, quality measurement and public reporting have been thought of as secondary data uses rather than drivers of care. By adopting standardized performance measures and properly designing and building health information technology (IT), it will now be possible to capture performance data as part of the care process and provide immediate feedback and clinical decision support (CDS) to clinicians, patients, and other stakeholders to improve care.

Designing and building health IT to support performance improvement requires close collaboration between both the quality and health IT communities. NQF plays a key role in the quality community as the national standard-setting body for performance measures and as a neutral convener of multiple stakeholders. The goal is to provide input into the Department of Health and Human Services (DHHS) and others on national priorities and goals for improvement and on the selection of performance measures for use in payment and public reporting programs. In addition, NQF through HHS funding is building an HIT infrastructure and promoting effective quality measurement and improvement using health IT.

The Quality Data Model Framework

NQF's Health Information Technology Advisory Committee (HITAC) developed a framework to describe the breadth of information needed to measure health. The framework was envisioned to help drive the data platform to provide the information required to improve health from the perspective of measurement. The framework provides the basis for a common information model to describe data reusable for different purposes (a model of meaning).[1] It sets requirements based on the need to help drive future development of mechanisms to capture and access information for performance measurement. This framework helped to define the Quality Data Model (QDM).

The framework incorporates four domains of information to enable a broader reach for data: Individual Characteristics (encompassing the Behaviors, Social / Cultural Factors, Preferences, and Personal Resources), Health Related Experience (with the perspectives of patient, consumer, and care giver), Clinical Care Process (including proteomic and genomic data), and Community / Environmental Characteristics. Each of these dimensions has an individual consumer, a population (previously, community), and health system dimension – factors that can be attributed to the individual and factors that are influenced by local community and population demographics. It is likely that any comprehensive measure of health should address each of the dimensions. The information requirements for each dimension are grounded in sources such as EHRs, PHRs, HIEs, public health surveys, registries and other electronic sources.

[1] A model of meaning represents the underlying meaning in a way that is common to and reusable between different use cases. In contrast, a model of use represents the underlying meaning in a way that is determined by a limited set use cases. Excerpt from International Health Terminology Standards Development Organization (IHTSDO) Glossary, January 2012 International Release. Available at: http://www.ihtsdo.org/fileadmin/user_upload/doc/tig/glsct/glsct_ss_ModelOfUse.html#_c0cc3aca-4e72-40ba-af25-116e04a36fad, accessed 25 April 2012.

Individual Characteristics

Many of the following individual characteristics are interrelated (e.g., behaviors are impacted by social, cultural and other factors):

- *Behaviors* - Responses or actions that impact (either positively or negatively) health or health care. Included in this category are mental health issues, adherence issues unrelated to other factors or resources, coping ability, grief issues and substance use/abuse.
- *Social/Cultural Factors* - Characteristics of an individual related to family/caregiver support, education and literacy (including health literacy), primary language, cultural beliefs (including health beliefs), persistent life stressors, spiritual and religious beliefs, immigration status and history of abuse/neglect.
- *Resources* - Means available to a patient or consumer to meet health and health care needs. This would include caregiver support, insurance coverage, financial resources, and community resources to which the patient is already connected and receiving benefit.
- *Preferences* - Choices made by patients or consumers and their caregivers relative to options for care or treatment (including scheduling, care experience, and meeting of personal health goals) and the sharing and disclosure of their health information.

Health Related Experience

- Information collected from a consumer, patient and/or family member about their perception of the care they received or from a care giver about the care provided. Information collected for a whole-person approach to care including the elements of care coordination, communication, access to care, timeliness of care and information sharing.

Clinical Data

- All clinical information pertinent to a specific individual including aspects of care related to clinical capabilities, coordination, follow-up, access, timeliness, and thoroughness. Clinical data includes actions by any member of patient's care team, regardless of discipline, as well as factors impacting the degree of partnership demonstrated between the patient and the care team. Genetic and protein expression that have the potential to influence health status is also included as well as predisposition to disease, reaction to diagnostic testing or treatment, or adverse interaction with the environment due to genetic or proteomic expression factors. Examples include diseases associated with certain genes (e.g., Huntington's or cystic fibrosis) or variations in drug metabolism due to expressions of proteins in the Cytochrome P450 family.

Community / Environmental Characteristics –

- Any external circumstance impacting the efficacy and quality of health and health care. This would include specifics related to an individual's housing, the availability of community resources to which an individual is not already connected, or systemic issues such as provider availability or provider administrative and organizational issues.

The HITAC Health Information Framework is the conceptual platform on which the QDM structure is built. The goal of the framework is to encompass data from EHRs and other sources to manage measures of health for individuals, populations, health plan members, health system participants (or an individual provider's panel of patients), or employers. Information obtained from social media, hand-held and other devices will be increasingly significant for

measuring health and will serve to inform future quality measurement efforts. The QDM is a model to describe the information requirements, to enable easier access to data for quality measurement and improvement. The Framework is intended to encourage a more data-driven approach to health information applications to allow greater data sharing and transparency of health outcomes through measurement.

Performance Measurement: Information Needs and the Quality Data Model

Collecting and reporting accurate, comparative healthcare performance data is a complex and time-consuming process. Much of the information required to measure performance is collected during the process of routine care and is available in electronic health records (EHRs) and other clinical data sources. However, it has not been routinely available for export and use to report performance. Performance measures are most frequently developed based on routinely available sources of data and therefore are often based on claims and clinically enriched administrative data. Taking advantage of comprehensive clinical data contained in EHRs and other clinical applications, including personal health records (PHRs) requires that measures are specified to account for the way data are expressed in such products.

NQF, through the Health Information Technology Expert Panel (HITEP), a committee of health IT industry experts, established theQDM to enable expression of data for measurement. The QDM's development was based on a request by the American Health Information Community (AHIC) and the Office of the National Coordinator for Health Information Technology (ONC), with funding from the Agency for Healthcare Research and Quality (AHRQ).

The QDM (formerly referred to as the Quality Data Set or QDS) is an information model that defines concepts used in quality measures and healthcare. It is intended to enable automation of structured data capture in EHRs, PHRs, and other electronic clinical sources. It provides a structure to describe clinical concepts contained within quality measures in a standardized format so individuals (i.e., providers, researchers, or measure developers) monitoring clinical performance and outcomes can concisely communicate necessary information. The QDM also describes information so EHRs and other health IT systems can consistently interpret and easily locate data required for quality measurement.

The QDM helps bring the goals of Meaningful Use and the National Quality Strategy (NQS) into attainable reach when used for electronic quality measure development and clinical decision support (CDS). By helping to facilitate quality and performance measurement directly from EHRs, the QDM aggregates clinical data for quality reporting. The QDM also has the potential to bring real-time information and feedback to the point of care. The incorporation of this quality measurement and feedback into a provider's daily routine will help to increase the pace of healthcare improvement and better outcomes while also showing Meaningful Use of EHRs.

For more information about Meaningful Use, please visit:
https://www.cms.gov/EHRIncentivePrograms/30_Meaningful_Use.asp.

For more information about the QDM and NQF's HIT portfolio, please visit the Health IT Knowledge Base:
http://public.qualityforum.org/hitknowledgebase/Pages/Knowledge%20Base%20Home.aspx

QDM Feedback and Advisement

NQF's Health Information Technology Advisory Committee (HITAC) acts as an advisory body for QDM content and enhancements. The QDM subcommittee of HITAC meets on a monthly basis to provide oversight and guidance for the development of the QDM. In addition, the newly formed QDM User Group whose members have experience working with the QDM in developing and enhancing the 2014 CQMs meets monthly to research improvement opportunities for the QDM and make recommendations on future enhancements. The full HITAC provides the broad, multi-stakeholder input to the scope and content of the QDM. For more information about HITAC or the QDM User Group, please contact QDM@qualityforum.org.

QDM December 2012

The version of the QDM within this document reflects changes necessary to support the 2014 Clinical Quality Measures (CQMs) for Meaningful Use Stage 2[2]. This version aligns with the version of the QDM currently deployed in the Measure Authoring Tool (MAT)[3] which is QDM 2.1.1.1 (October 2012). The 2014 CQM's were developed using the MAT and the QDM 2.1.1.1 (October 2012) version.

Enhancements are incorporated into the QDM to enable expanding categories of measurement as well as the increasing levels of granularity needed for quality measurement. Enhancements through stakeholder feedback help to ensure the QDM includes data required to evaluate health care across broader contexts of care delivery. Future versions of the QDM will contain enhancements and updates that have been vetted through stakeholders and members of the QDM Subcommittee and User Group. These enhancements and updates will lead to future versions of the QDM that will align with the MAT update schedule.

NQF looks forward to working with our stakeholders to continue QDM development.

Release Schedule for Future Versions

Future updates of QDM will be released on an as-needed basis.

Upcoming Enhancements

In response to stakeholder feedback from the June 2012 comment period and user feedback from the 2014 Clinical Quality Measure development process, this version of the QDM structurally reflects the version of the QDM currently in the MAT. This is a purposeful tactic to enable a functional starting point for QDM iterations moving forward. The following future enhancements are currently under analysis for the next version of the QDM:

Functions/ Operators/ Time Relationships

Each measure must specify more detail than the data elements alone. Therefore, an expression language, or *syntax,* to apply QDM elements within a clause or a measure component must include the ability to relate each QDM data element to other QDM data elements in a statement. Such relationships include 1) functions, 2) operators, 3) time relationships and 4) general relationships. *Functions* specify sequencing (ordinality) and provide the ability to specify a calculation (subtract, add, divide, multiply, etc.) with respect to QDM elements and clauses containing QDM elements. *Operators* allow measure developers to compare two or more QDM elements logically or mathematically (AND, OR, >=, etc.) and also allow description of acceptable ranges of results for laboratory tests, diagnostic studies, and other QDM categories. *Time relationships* allow a measure developer to describe timing relationships among individual QDM elements to create clauses that add meaning to the individual QDM elements. *General relationships* allow measure developers to specify a non-temporal relationship between QDM elements. The definitions and guidance on these topics will be researched and recommended by stakeholders and members of the user group for future versions of the QDM.

Discharge Medications

During the 2014 CQM development process, the Eligible Hospital measure developers needed a solution to express the concept of discharge medications within the constructs of the QDM deployed in the MAT. A new datatype of the Medication category was added: *'Medication, discharge'*. To get the element added as quickly as possible to ensure on time delivery of the CQMs (eMeasures), attributes currently used for the 'Medication, active' element were added to this new datatype (except for negation rationale). Currently, the need for additional attributes to enable greater levels of specificity such as attributes like '*indication'* and '*instructions to patient'* are under evaluation.

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[2] Meaningful Use Stage 2 - 2014 Medicare and Medicaid Electronic Health Record (EHR) Incentive Program for Eligible Hospitals (EH) and Eligible Professionals (EP).

[3] The Measure Authoring Tool (MAT) is a web-based tool that allows measure developers to create standardized electronic measures (eMeasures). Please see http://www.qualityforum.org/MAT/ for more information.

Diagnosis types

During the 2014 CQM development process, the Eligible Hospital measure developers requested support for more granular representations of diagnoses in order to more closely align the intent of the clinical quality measure with EHR data workflow processes. This led to a discussion on the definitions of more granular representations of diagnosis, such as discharge diagnosis, principal diagnosis, primary and admitting diagnosis. Work is underway to develop definitions for these terms as well as recommendations on how these concepts should be added to the QDM to ensure appropriate representation of the concepts in Health Quality Measures Format (HQMF)[4] and Quality Reporting Document Architecture (QRDA.)[5]

Operator precedence

During the 2014 CQM development process, it was noted that a set way of processing the logical operators and functions was needed in the QDM. This is needed for consistent representation and processing of the logic in eMeasures. Similar to the way 'PEMDAS'[6] is used for mathematical operators, the QDM needs similar criteria for processing operators like 'FIRST' or 'AVERAGE'. Recommendations will be developed in accordance with HL7 HQMF standards. Both the QDM and HQMF R1[7] lack formal operator precedence. Work is underway to determine the best reference point for an operator precedence for the QDM. The following is the operator precedence that should be used when interpreting a single AND/OR statement in the 2014 eCQM's .

	Precedence Rules	Example FIRST : Occurrence A of Procedure Performed: abc (source: xyz) during the measurement period
1	First, evaluate that the data element's code is present in a matching QDM element's category value set	Select all procedures from a patient based on matching code as defined by the QDM element's value set "abc"
2	Filter to only include data elements that match QDM element's data type (active, ordered, resolved)	Only select procedures that were actually performed. Do not select procedures that were ordered, or recommended.
3	Filter data elements based on whether QDM element has the negation rationale attribute (procedure performed: abc (not done: reason not done))	Check whether the procedure was not done for a particular reason
4	Filter out data element's based on QDM attribute value set criteria (source, severity, facility location ...)	Only select procedures that have are from the right source, based on QDM attribute source value set "xyz"
5	Filter out data element's that do not meet temporal constraints (i.e. Starts After Start, During ...)	Only select procedures that occur within the measurement period
6	Filter out data elements that don't meet attribute comparison criteria	Example: Blood pressure (result<140/90)
7	Filter data elements by function (FIRST, SECOND, MOST RECENT)	Only select the first procedure data element matching all of the above criteria
8	Label data elements with a specific occurrence	Label the matching procedure as occurrence A so that it can be referenced in subsequent AND/OR statements or distinguished from another procedure matching the same criteria

[4]Health Quality Measures Format (HQMF) is a standard for representing a health quality measure as an electronic document. For more information on the HL7 standards, please visit http://www.hl7.org/implement/standards/index.cfm
[5]Quality Reporting Document Architecture (QRDA) is a standard for communicating health care quality measurement information. For more information on the HL7 standards, please visit http://www.hl7.org/implement/standards/index.cfm
[6] 'PEMDAS' is an order of operations in mathematics: parenthesis, exponents, multiply, divide, add, subtract
[7]Health Quality Measures Format (HQMF) R1 is a standard for representing a health quality measure as an electronic document. For more information on the HL7 standards, please visit http://www.hl7.org/implement/standards/index.cfm

Components of the QDM

The QDM consists of 1) criteria for data elements 2) relationships for relating data element criteria to each other, and 3) functions for filtering criteria to only include relevant data elements. The following section describes the different components of the QDM.

Data Element components

Category

A category consists of a single clinical concept identified by a value set. The category is the highest level of definition for a QDM element. The QDM currently contains 19 categories. Some examples include medication, procedure, condition/diagnosis/problem, communication, and encounter. See Table 1 for a list of 19 categories and their definitions.

Datatype

The *datatype* is the context in which each category is used to describe a part of the clinical care process. Examples of datatypes include '*Medication, active'* and *'Medication, administered'* when applied to the category *Medication*. See Table 2 for a complete list of the datatypes associated with each category in the QDM.

QDM Element

A *QDM Element* is a criterion for a data element matching a certain *category* and *data type.* A QDM element is a discrete unit of information used in quality measurement to describe part of the clinical care process, including both a clinical entity and its context of use. A QDM element can include criteria for any relevant meta data about a clinical or administrative concept relevant to quality measurement. The QDM element provides unambiguous definition and enables consistent capture and use of data for quality measurement. A QDM element may be defined for any given measure and reused when the same information is required for another measure. Reuse encourages standardization of quality measures and reduces computer programming requirements for new measures[8].

Attributes

An *attribute* provides specific detail about a QDM element. QDM elements have two types of attributes, *datatype specific* and *data flow* attributes.

Datatype specific attributes

Datatype specific attributes provide details about a QDM element based on its datatype. For example, medication dispensed and medication ordered both contain information about the dose, route, strength, and duration of a medication such as penicillin. A medication allergy, however, would contain information about the allergy type and allergy severity, and more. Because these attributes pertain to specific data types, they are called datatype-specific attributes. A list of additional datatype-specific attributes sorted by QDM category may be found in Table 3.

Data flow attributes

Data Flow attributes provide specific detail about where to find data represented by a *QDM element.* In order to identify the authoritative source for a QDM element in a particular use case, the electronic record requires additional related information, such as where to find information of that type and in that particular clinical context. For example, a diabetes medication order may be found in the medication orders, while diabetes medication allergy will be on the allergy list. Similarly, a clinician's account of an allergy may be found in an EHR

[8] NQF Health Information Technology Expert Panel II (HITEP II), *HIT Automation of Quality Measurement: Quality Data Set and Data Flow*. Washington DC: National Quality Forum; 2009.

allergy list, but a patient's account of an allergy will be found in a PHR allergy list. *Data flow attributes* allows a measure developer to clearly define in the specifications where the quality data should be found to achieve the intended meaning of the measure. The following three data flow attributes apply to all QDM elements.

Health Record Field - The health record field is the location within an electronic record where the data should be found. A problem list may be the preferred and only acceptable field where an active diagnosis of diabetes may be found. A family history may be the preferred health record field for family history of diabetes.

Source - The source is the originator of the quality data element. The source may be an individual or a device.

Recorder - The recorder is the individual or device that enters the data element into a health record field. The desired recorder also may be, but is not necessarily, the source of the data.

Code System

A *code system* is a collection of coded concepts with definitions from a particular taxonomy, vocabulary, or classification system[9]. Concepts from a code system are used in *value sets*. Specific code systems are used in applying the QDM to quality measures based on the recommendations of the HIT Standards Committee of the Office of the National Coordinator for Health Information Technology (ONC) and established certification rules for meaningful use. For example, ICD-9-CM, ICD-10, SNOMED-CT™, and CPT™ are examples of code systems. The concept of *diabetes* may be described in QDM with ICD-9-CM, ICD-10, and/or SNOMED-CT™.

Value Sets

Value set, (previously referred to as *code list*), is a set of values that contain specific codes derived from a particular *code system.* Value sets are used to define the set of codes that can possibly be found in a patient record for a particular concept. In QDM elements, value sets can be used to define possible codes for the QDM element's category or the QDM element's attributes. The 2014 CQM's use the NLM Value Set Authority Center (VSAC) as a repository for the associated value sets.[10]

Value Sets that define QDM Categories

It is important to note that a value sets that defines the QDM elements category does not define the QDM elements datatype. Here is an example of a very common QDM element

Diagnosis, Active: "value set A"

In this example, the value set defines which diagnosis the criteria is looking for. The codes in this value set should only indicate which diagnosis, not whether or not the diagnosis is active, inactive, or resolved since that is represented using different datatypes. In the following example, we look at a QDM element with an attribute

Laboratory Test, Result: "value set A" (result: "value set B")

In this example, *value set A* defines the category of the QDM element. Since the category is a Laboratory Test, *value set a* answers the question of which laboratory test. *Value set b*, on the other hand, defines the attribute result. *Value set b* should contain codes for different coded result values.

Value Sets that define QDM Attributes

Some QDM Attributes can be defined by value sets similar to how QDM Categories are defined by value sets.

[9] Value Set Consortium, *Value Set Definition and Binding Document*, Available at http://valuesets.org/wiki/index.php?title=Value_set_Definition_and_binding_document. Last accessed April 2011.
[10] The Value Set Authority Center provides downloadable access to all official versions of the vocabulary value sets contained in the 2014 Clinical Quality Measures. For more information, please visit https://vsac.nlm.nih.gov/

Value Set Groupings

Each value set contains codes from one code system. However, multiple value sets can be combined into one value set called a *value set grouping*. A *parent* value set may also contain *child* (or nested) value sets that define the same category. The approach is consistent with the HL7 definition for a value set as "a uniquely identifiable set of valid concept representations, where any concept representation can be tested to determine whether or not it is a member of the value set…A sub-value set is a sub-set of a 'parent' value set…When a value set entry references another value set, the child value set is referred to as a *nested value set.* There is no preset limit to the level of nesting allowed within value sets. Value sets cannot contain themselves, or any of their ancestors (i.e. they cannot be defined recursively)."[11] With respect to value sets, a *value* is a specific code defined by a given taxonomy. Values are included in value sets. In the context of QDM elements, some categories (e.g., laboratory test) have an attribute of "result." A result may be expressed as a value (numeric or alphanumeric).

QDM representation in HL7 Standards Health Quality Measure Format

QDM elements can be represented eMeasures using the HQMF R1 Draft Standard for Trial Use. QDM elements are represented in the HQMF R1 via predefined QDM-HQMF templates, formerly referred to as "QDM Patterns". The QDM-HQMF templates can be mapped to specific CDA templates in the QRDA Implementation Guide. The listing of all of the QDM-HQMF templates and the mapping to CDA templates will continue to be covered in different HL7 standards such as the QDM Based HQMF Implementation Guide and QDM based QRDA Implementation Guide. See supplement entitled *QDM December 2012 HQMF* for a listing of all QDM-HQMF Templates.

The QDM-HQMF templates represent the context described by a QDM element's *data type*. The QDM data types map to specific templates for Acts in the A_LocalEMeasureAct schema in the HQMF R1.

Since QDM elements are related using the HQMF Acts available in the A_LocalEmeasureAct schema, QDM elements are related using the ActRelationships available in this schema as well. Descriptions of these relationships are included in this document for convenience, but the definitions and usage for the relationships are specified in the HQMF R1 documentation.

QDM element attributes are also represented in eMeasures using QDM-HQMF templates. The templates used for each QDM *attribute* varies depending on how the attribute is used. Attributes can be used in the following three ways, each with their respective templates:

1) to explicitly state that QDM element has an attribute
2) to specify that a QDM element has an attribute and to compare the attributes value to another value
3) to specify that a QDM element has an attribute and to compare the attribute to codes in a value set

Quality Data Model: Full Description, Specificity, and Technical Detail

The QDM provides a method to describe a specific data element by clarifying the category of information (e.g. medication), the context or state in which it is expected to exist (e.g. medication, administered) , and any additional information or attributes needed to precisely identify it (e.g. medication dose). Figure 1 depicts a structural example of the QDM element:

[11] HL7 Domain and Value Set Definitions and Binding, http://wiki.hl7.org/index.php?title=Domain_and_Value_Set_Definitions_and_Binding. Last accessed December 2012

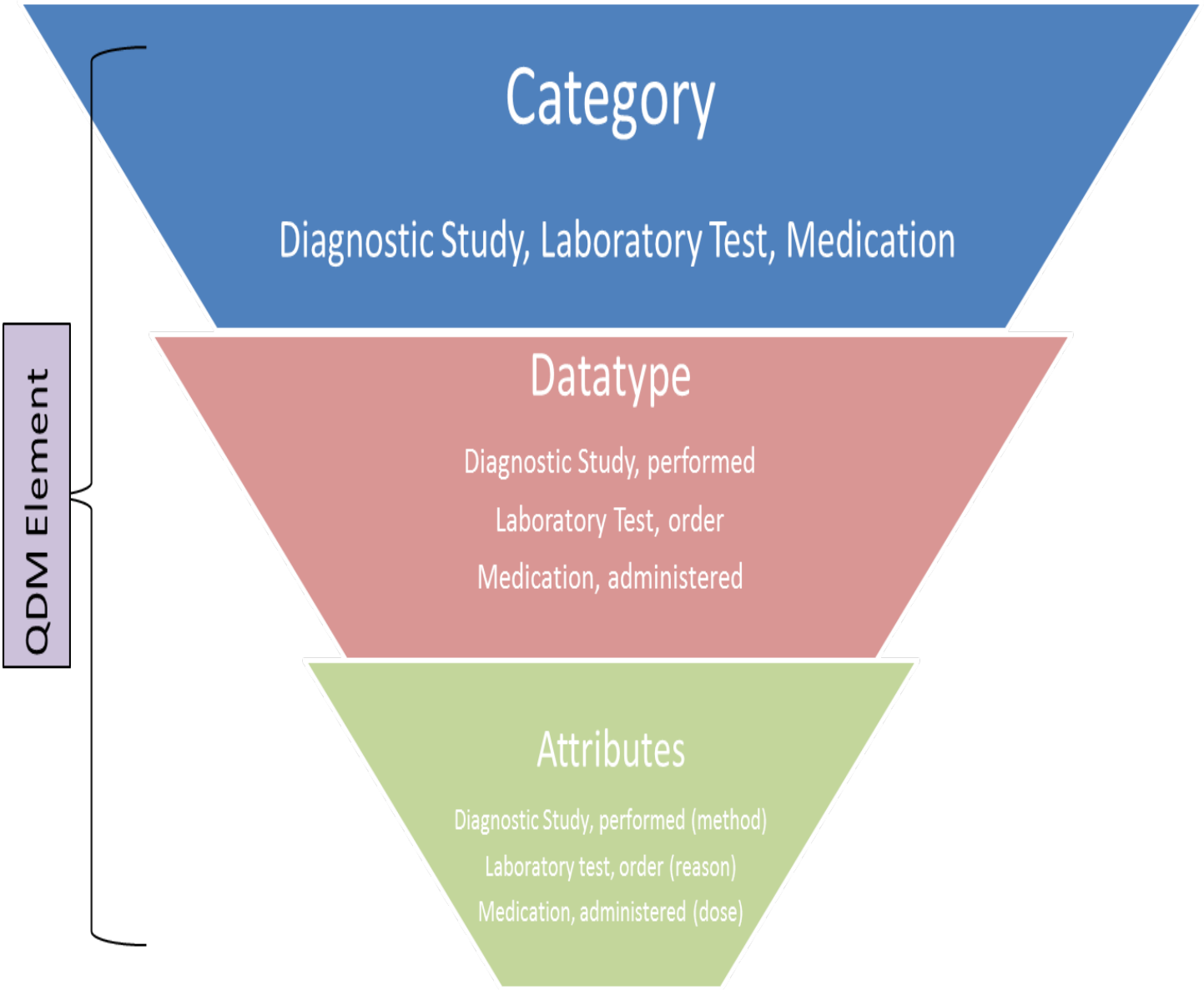

Figure 1. QDM Composition Diagram—This diagram depicts the components of a QDM element beginning with assigning a *category*, or the type of information desired. Next, the *datatype* or context of use that can be assigned to a category element and finally any *attributes* that can add precision to the definition of the data element are added.

In Figure 2, generic QDM elements are shown on the left while demonstrating use within a medication administration example on the right.

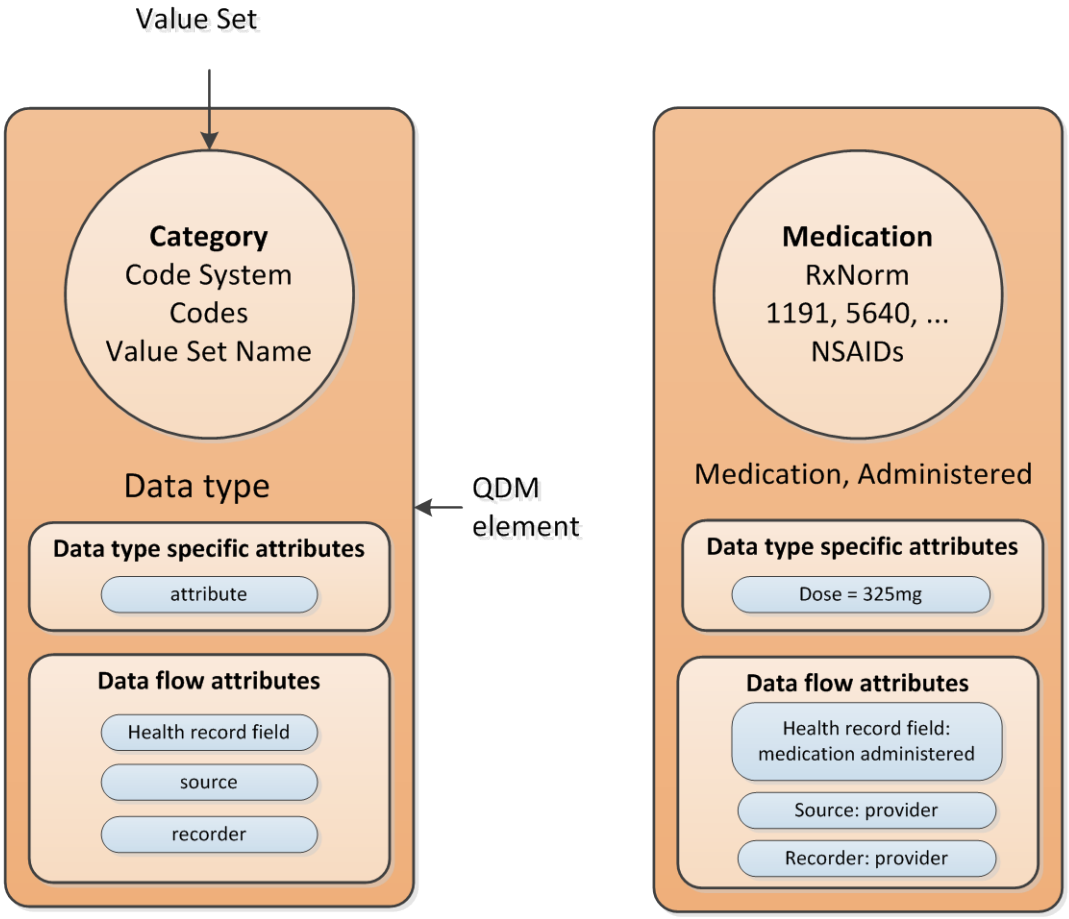

Figure 2. QDM Element Structure—The components of a QDM element are shown in the figure. The graphic on the left identifies the terms used for each component of the QDM element. The graphic on the right uses each of these components to describe a QDM element indicating "Medication, administered NSAIDs." Each QDM element is composed of a category, the datatype in which that category is expected to be used, and a value set of codes in a defined code system (vocabulary) to specify which instance of the category is expected. The boxes in the lower section of the QDM element specify individual attributes, or additional data to describe the QDM element. Attributes include data flow attributes (source, recorder and health record field) and datatype-specific attributes.

QDM Category Definitions

As referenced earlier, c*ategory* refers to a particular group of information that can be addressed in the health care setting. Certain categories are useful in quality measurement while others will pertain more to clinical decision support and other applications of the QDM. Definitions for each of the categories currently available in the QDM can be found in Table 1.

Table 1: QDM Category definitions

QDM Category Definitions	
Care goal	A defined target or measure to be achieved in the process of patient care; an expected outcome. A typical *goal* is expressed as a change in status expected at a defined future time. That change can be an observation represented by other QDM categories (diagnostic tests, laboratory tests, symptoms, etc.) scheduled for some time in the future with a particular value. A goal can be found in the plan of care (care plan). The plan of care (care plan) is the structure used by all stakeholders, including the patient, to define the management actions for the various conditions, problems, or issues identified for the target of the plan. This structure, through which the goals and care-planning actions and processes can be organized, planned, communicated, and checked for completion is represented in the QDM categories as a Record Artifact. A time/date stamp is required. Specifically, a care plan is composed of the following elements: • *Problem*, which is managed by other QDM standard categories (condition/diagnosis/problem) and their related data elements. • *Procedure*, which is managed by other standard categories and their related data elements. Note that procedures are a continuum of interventions ranging from actions patients can do for themselves or those that can be performed by others (caregivers or clinical professionals) to and including detailed complex surgical procedures requiring highly trained physicians, nurses, and state- of-the-art facilities. • *Goal,* which is what is expected to happen. • *Outcome,* which is what happened that can be shown by other QDM standard categories and their related data elements.
Individual Characteristics	Specific factors about a patient, clinician, provider, or facility. Included are demographics, behavioral factors, social or cultural factors, available resources, and preferences. *Behaviors* reference responses or actions that affect (either positively or negatively) health or healthcare. Included in this category are mental- health issues, adherence issues unrelated to other factors or resources, coping ability, grief issues, and substance use/abuse. *Social/cultural factors* are characteristics of an individual related to family/caregiver support, education and literacy (including health literacy), primary language, cultural beliefs (including health beliefs), persistent life stressors, spiritual and religious beliefs, immigration status, and history of abuse or neglect. *Resources* are means available to a patient to meet health and healthcare needs, which would include caregiver support, insurance coverage, financial resources, and community resources to which the patient is already connected and receiving benefit. *Preferences* are choices made by patients and their caregivers relative to options for care or treatment (including scheduling, care experience, and meeting of personal health goals) and the sharing and disclosure of their health information. In the quality data element the attribute *source* is used to indicate whether it relates to the patient or the provider.

QDM Category Definitions	
Communication	The transmission, receipt, or acknowledgement of information sent from a source to a recipient. This may include the provision of any communication from one clinician to another regarding findings, assessments, plans of care, consultative advice, instructions, educational resources, etc. It also may include the receipt of response from a patient with respect to any aspect of the care provided. Furthermore, it may include the provision of any communication from provider to patient. (e.g., results, findings, plans for care, medical advice, instructions, educational resources, appointments, result). A time and date stamp is required.
Condition/Diagnosis/Problem	A scientific interpretation of result, assessment, and treatment- response data that persists over time and tends to require intervention or management or a clinical feature that includes but is not limited to those treated, monitored, evaluated, or impacts other treatment or venues of care (e.g., encounters or lengths of stay). It is used to guide planning, implementation, treatment, and evaluation. A problem or condition includes, but is not limited to, acute, intermittent, or chronic conditions; diagnoses; symptoms; functional limitations; or visit- or stay-specific conditions.
Device	An instrument, apparatus, implement, machine, contrivance, implant, in-vitro reagent, or other similar or related article, including a component part, or accessory, intended for use in the diagnosis, cure, mitigation, treatment or prevention of disease and that is not dependent on being metabolized to achieve any of its primary intended purposes.[12]
Diagnostic study	Any kind of medical test performed as a specific test or series of steps to aid in diagnosing or detecting disease (e.g., to establish a diagnosis, measure the progress or recovery from disease, confirm that a person is free from disease).[13] The QDM defines *diagnostic studies* as those that are not performed in organizations that perform testing on samples of human blood, tissue, or other substance from the body. Diagnostic studies may make use of digital images and textual reports. Such studies include but are not limited to imaging studies, cardiology studies (electrocardiogram, treadmill stress testing), pulmonary-function testing, vascular laboratory testing, and others.
Encounter	An identifiable grouping of healthcare-related activities characterized by the entity relationship between the subject of care and a healthcare provider; such grouping is determined by the healthcare provider.[14] A *patient encounter* represents interaction between a healthcare provider and a patient with a face-to-face patient visit to a clinician's office, or any electronically remote interaction with a clinician for any form of diagnostic treatment or therapeutic event. Encounters can be billable events but are not limited to billable interactions. Each encounter has an associated location or modality within which it occurred (such as an office, home, electronic methods, phone encounter, or telemedicine methods). The *encounter location* is the patient's location at the time of measurement. Different levels of interaction can be specified in the value associated with the element while modes of interaction (e.g. telephone) may be modeled using the data flow attribute.

[12]Derived from the device definition of the U.S. Food and Drug Administration (FDA), Department of Health and Human Services, Washington DC; 2010. Available at http://www.fda.gov/. Last accessed July 2010.

[13] Canada Health Infoway EHR Glossary, https://www.infoway-inforoute.com/

[14] International Organization for Standardization (ISO), *Health Informatics – Requirements for an Electronic Health Record Architecture ISO/TS 18308*. Geneva, Switzerland: ISO; 2004. Available at www.iso.org/iso/home.htm. Last accessed May 2010.

QDM Category Definitions	
Experience	Information collected from a consumer, patient, or family member about their perception of the care they received or from a care giver about the care provided. Information collected includes the elements of care coordination, communication, whole-person approach to care, access to care, timeliness of care, and information sharing. Experience also encompasses the patient's outcomes with respect to care provided in the past. For example, a patient receiving chemotherapy who has not responded to first line medication treatment or who no longer responds to such therapy may require second tier treatment. Such a patient's *experience* of care is an important factor in defining subsequent treatment which can be driven by patient preference.
Functional Status	Specific to tools that evaluate an individual patient's actual physical or behavioral performance as an indicator of capabilities at a point in time. The *functional status assessment* can be used in measurement to determine change in physical or behavioral performance over time, or specific capabilities that cause a patient to be included or excluded from a *measurement* population. Examples include: Eastern Cooperative Oncology Group (ECOG) Performance Status, Edmonton Functional Assessment Tool (EFAT), Karnofsky Performance Scale, Katz Index of Independence in Activities of Daily Living, Palliative Performance Scale Version 2, the Medical Outcomes Study (MOS) Short Form Survey Instrument (SF-12), and the Asthma Quality of Life Questionnaire. Alternately, *risk assessment* refers to appraisals of health and well-being, providing information as to the risk for conditions or increased severity of illness (e.g., Braden Skin Scale, Morse Fall Risk Scale, etc.), whereas *physical exam* includes psychiatric examinations.
Intervention	An *intervention* is a course of action intended to achieve a result in the care of persons with health *problems* that does not involve direct physical contact with a patient. This category is included to help differentiate care provided to patients that does not involve direct hands-on activity. Examples include patient education and therapeutic communication.
Laboratory Test	A medical procedure that involves testing a sample of blood, urine, or other substance from the body. Tests can help determine a diagnosis, plan treatment, check to see if treatment is working, or monitor the disease over time.[15] Laboratory tests may be performed on specimens not derived from patients (electrolytes or contents of water or consumed fluids, cultures of environment, pets, other animals). The states will remain the same.
Medication	Clinical drugs or chemical substances intended for use in the medical diagnosis, cure, treatment, or prevention of disease. A medication contains a value derived from taxonomies such as RxNorm.
Physical Examination	The evaluation of the patient's body to determine its state of health. The techniques of inspection include palpation (feeling with the hands or fingers), percussion (tapping with the fingers), auscultation (listening), visual inspection, and smell. Measurements may include vital signs (blood pressure, pulse, respirations) as well as other clinical measures (such as expiratory flow rate, size of lesion, etc.). Physical exam includes psychiatric examinations.

[15] National Cancer Institute (NCI). Bethesda, MD: NCI; 2010. Available at www.cancer.gov/. Last accessed May 2010.

QDM Category Definitions	
Procedure	The definition of *procedure* is derived directly from HL7 and Canada Health Infoway: "An Act whose immediate and primary outcome (post-condition) is the alteration of the physical condition of the subject… procedure is but one among several types of clinical activities such as observation, substance-administrations, and communicative interactions…Procedure does not comprise all acts of whose intent is intervention or treatment."[16] A *procedure* may be a surgery or other type of physical manipulation of a person's body in whole or in part for purposes of making observations and diagnoses or providing treatment. [17]
Risk Category/ Assessment	Risk category assessments include tools and calculators that suggest vulnerabilities for any given patient. Distinct from functional status, risk categorization uses findings, observations, results, and sometimes judgments and patient-generated information for use within clinical care algorithms, clinical decision support, and severity analysis. A time and date stamp is required. Examples: Braden Score for Predicting Pressure Score Risk, Morse Fall Risk Scale, Pneumonia Severity Index.[18]
Substance	A chemical element and its compounds in the natural state or obtained by any manufacturing process (other than pharmaceutical drugs), including any additive necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent that may be separated without affecting the stability of the substance or changing its composition.[19] Substance may or may not have a code or be classified by a code system such RxNorm. Examples of a substance may include but are not limited to: environmental agents (e.g., pollen, dust) and food (e.g., vitamins).
Symptom	An indication that a person has a condition or disease. Some examples are headache, fever, fatigue, nausea, vomiting, and pain.[20] Also, symptoms are subjective of the disease perceived by the patient.[21] As an example to differentiate *symptom* from *finding*, the patient's subjective symptom of fever is distinguished from the temperature (a finding). For a finding, there is a source of either a temperature-measuring device, and there is a recorder of the device (electronically) or an individual (healthcare provider, patient, etc.).
System Characteristics	The configuration of an organization (e.g., nursing staff ratios; availability of durable medical equipment; health information technology infrastructure and capabilities, such as e-prescribing; access to care systems; or invasive-procedure capabilities. Those resources can be evaluated with respect to a facility or a community.

[16] HL7, http://www.hl7.org/documentcenter/public_temp_9D8B62D1-1C23-BA17-0C978A875D9E7083/wg/java/apidocs/org/hl7/rim/Procedure.html. Last accessed December 2012.
[17] Modified from Canada Health Infoway
[18] AHRQ, *Pneumonia Severity Index Calculator (PSI)*, Bethesda, MD: AHRQ. Available at: http://pda.ahrq.gov/clinic/psi/psiscalecalc.asp. Last accessed May 2010.
[19] European Chemicals Agency, *REACH-Registration, Evaluation and Authorization of Chemicals*, France; 2005. Available at www.prc.cnrs-gif.fr/reach/en/home.html. Last accessed May 2010.
[20] UMLS Dictionary, 2010. http://www.nlm.nih.gov/research/umls/ Last accessed December 2010.
[21] National Cancer Institute (NCI), Bethesda, MD; NCI 2010. Available at www.cancer.gov/ Last accessed May 2010.

QDM Category Definitions	
Transfer of Care	The different locations or settings a patient is released to, or received from, to ensure the coordination and continuity of healthcare. Such transfers involve a handoff process, whereby patient information and permanent or temporary medical devices or equipment are exchanged, and accountability and responsibility for patient care are transferred.[22] This may include the setting from which a patient is received or released (e.g., home, acute-care hospital, skilled nursing facility) to the current location.

QDM Elements

A *QDM Element* is a criterion for a data element matching a certain *category* and *datatype.* A QDM element is a discrete unit of information used in quality measurement to describe part of the clinical care process, including both a clinical entity and its context of use. Table 2 below describes the full list of QDM elements currently available along with associated attributes.

Table 2: QDM Elements

QDM Elements		
Category	**Datatype**	**Available Attributes**
Care Experience	Patient Care Experience	negation rationale
	Patient Care Experience	patient preference
	Patient Care Experience	provider preference
	Patient Care Experience	start datetime
	Patient Care Experience	stop datetime
	Provider Care Experience	negation rationale
	Provider Care Experience	patient preference
	Provider Care Experience	provider preference
	Provider Care Experience	start datetime
	Provider Care Experience	stop datetime
Care Goal	Care Goal	negation rationale
	Care Goal	patient preference
	Care Goal	provider preference
	Care Goal	related to
	Care Goal	start datetime
	Care Goal	stop datetime
Communication	Communication: From Patient to Provider	negation rationale
	Communication: From Patient to Provider	patient preference
	Communication: From Patient to Provider	provider preference
	Communication: From Patient to Provider	start datetime
	Communication: From Patient to Provider	stop datetime

[22] (i) Coleman E, Falling through the cracks: challenges and opportunities for improving transitional care for persons with continuous complex care needs, *J Am Geriatr Soc*,2003;51(4):549-555. (ii); Alem L Joseph M, Kethers S et al. ,Information environments for supporting consistent registrar medical Handover, *Health Inform Manage J* , 2008;37(1): 9-23; Anderson C D, Mangino RR, Nurse shift report: who says you can't talk in front of the patient?, *Nurs Ad Q*, 2006;30(2):112-122

QDM Elements		
Category	**Datatype**	**Available Attributes**
	Communication: From Provider to Patient	negation rationale
	Communication: From Provider to Patient	patient preference
	Communication: From Provider to Patient	provider preference
	Communication: From Provider to Patient	start datetime
	Communication: From Provider to Patient	stop datetime
	Communication: From Provider to Provider	negation rationale
	Communication: From Provider to Provider	patient preference
	Communication: From Provider to Provider	provider preference
	Communication: From Provider to Provider	start datetime
	Communication: From Provider to Provider	stop datetime
Condition/Diagnosis/Problem	Diagnosis, Active	negation rationale
	Diagnosis, Active	Laterality
	Diagnosis, Active	Ordinality
	Diagnosis, Active	patient preference
	Diagnosis, Active	provider preference
	Diagnosis, Active	Severity
	Diagnosis, Active	start datetime
	Diagnosis, Active	Status
	Diagnosis, Active	stop datetime
	Diagnosis, Family History	negation rationale
	Diagnosis, Family History	Ordinality
	Diagnosis, Family History	patient preference
	Diagnosis, Family History	provider preference
	Diagnosis, Family History	Severity
	Diagnosis, Family History	start datetime
	Diagnosis, Family History	Status
	Diagnosis, Family History	stop datetime
	Diagnosis, Inactive	negation rationale
	Diagnosis, Inactive	Ordinality
	Diagnosis, Inactive	patient preference
	Diagnosis, Inactive	provider preference
	Diagnosis, Inactive	Severity
	Diagnosis, Inactive	start datetime
	Diagnosis, Inactive	Status
	Diagnosis, Inactive	stop datetime
	Diagnosis, Resolved	negation rationale
	Diagnosis, Resolved	Ordinality
	Diagnosis, Resolved	patient preference
	Diagnosis, Resolved	provider preference
	Diagnosis, Resolved	Severity
	Diagnosis, Resolved	start datetime
	Diagnosis, Resolved	Status

QDM Elements		
Category	**Datatype**	**Available Attributes**
	Diagnosis, Resolved	stop datetime
Device	Device, Adverse Event	negation rationale
	Device, Adverse Event	patient preference
	Device, Adverse Event	provider preference
	Device, Adverse Event	Reaction
	Device, Adverse Event	start datetime
	Device, Adverse Event	stop datetime
	Device, Allergy	negation rationale
	Device, Allergy	patient preference
	Device, Allergy	provider preference
	Device, Allergy	Reaction
	Device, Allergy	start datetime
	Device, Allergy	stop datetime
	Device, Applied	negation rationale
	Device, Applied	anatomical structure
	Device, Applied	patient preference
	Device, Applied	provider preference
	Device, Applied	start datetime
	Device, Applied	removal datetime
	Device, Applied	Reason
	Device, Intolerance	negation rationale
	Device, Intolerance	patient preference
	Device, Intolerance	provider preference
	Device, Intolerance	Reaction
	Device, Intolerance	start datetime
	Device, Intolerance	stop datetime
	Device, Order	negation rationale
	Device, Order	patient preference
	Device, Order	provider preference
	Device, Order	Reason
	Device, Order	start datetime
	Device, Order	stop datetime
	Device, Recommended	negation rationale
	Device, Recommended	patient preference
	Device, Recommended	provider preference
	Device, Recommended	Reason
	Device, Recommended	start datetime
	Device, Recommended	stop datetime
Diagnostic Study	Diagnostic Study, Adverse Event	negation rationale
	Diagnostic Study, Adverse Event	patient preference
	Diagnostic Study, Adverse Event	provider preference
	Diagnostic Study, Adverse Event	radiation dosage

QDM Elements		
Category	**Datatype**	**Available Attributes**
	Diagnostic Study, Adverse Event	radiation duration
	Diagnostic Study, Adverse Event	Reaction
	Diagnostic Study, Adverse Event	start datetime
	Diagnostic Study, Adverse Event	stop datetime
	Diagnostic Study, Intolerance	negation rationale
	Diagnostic Study, Intolerance	patient preference
	Diagnostic Study, Intolerance	provider preference
	Diagnostic Study, Intolerance	radiation dosage
	Diagnostic Study, Intolerance	radiation duration
	Diagnostic Study, Intolerance	Reaction
	Diagnostic Study, Intolerance	start datetime
	Diagnostic Study, Intolerance	stop datetime
	Diagnostic Study, Order	Method
	Diagnostic Study, Order	negation rationale
	Diagnostic Study, Order	patient preference
	Diagnostic Study, Order	provider preference
	Diagnostic Study, Order	radiation dosage
	Diagnostic Study, Order	radiation duration
	Diagnostic Study, Order	Reason
	Diagnostic Study, Order	start datetime
	Diagnostic Study, Order	stop datetime
	Diagnostic Study, Performed	facility location
	Diagnostic Study, Performed	Method
	Diagnostic Study, Performed	negation rationale
	Diagnostic Study, Performed	patient preference
	Diagnostic Study, Performed	provider preference
	Diagnostic Study, Performed	radiation dosage
	Diagnostic Study, Performed	radiation duration
	Diagnostic Study, Performed	Reason
	Diagnostic Study, Performed	start datetime
	Diagnostic Study, Performed	stop datetime
	Diagnostic Study, Recommended	Method
	Diagnostic Study, Recommended	negation rationale
	Diagnostic Study, Recommended	patient preference
	Diagnostic Study, Recommended	provider preference
	Diagnostic Study, Recommended	radiation dosage
	Diagnostic Study, Recommended	radiation duration
	Diagnostic Study, Recommended	start datetime
	Diagnostic Study, Recommended	stop datetime
	Diagnostic Study, Result	Method
	Diagnostic Study, Result	negation rationale
	Diagnostic Study, Result	patient preference

QDM Elements		
Category	**Datatype**	**Available Attributes**
	Diagnostic Study, Result	provider preference
	Diagnostic Study, Result	radiation dosage
	Diagnostic Study, Result	radiation duration
	Diagnostic Study, Result	Reason
	Diagnostic Study, Result	Result
	Diagnostic Study, Result	Status
	Diagnostic Study, Result	start datetime
	Diagnostic Study, Result	stop datetime
Encounter	Encounter, Active	length of stay
	Encounter, Active	facility location
	Encounter, Active	negation rationale
	Encounter, Active	patient preference
	Encounter, Active	provider preference
	Encounter, Active	Reason
	Encounter, Active	admission datetime
	Encounter, Active	discharge datetime
	Encounter, Active	facility location arrival datetime
	Encounter, Active	facility location departure datetime
	Encounter, Order	facility location
	Encounter, Order	negation rationale
	Encounter, Order	patient preference
	Encounter, Order	provider preference
	Encounter, Order	Reason
	Encounter, Order	start datetime
	Encounter, Order	stop datetime
	Encounter, Performed	discharge status
	Encounter, Performed	length of stay
	Encounter, Performed	facility location
	Encounter, Performed	negation rationale
	Encounter, Performed	patient preference
	Encounter, Performed	provider preference
	Encounter, Performed	Reason
	Encounter, Performed	admission datetime
	Encounter, Performed	discharge datetime
	Encounter, Performed	facility location arrival datetime
	Encounter, Performed	facility location departure datetime
	Encounter, Recommended	facility location
	Encounter, Recommended	negation rationale

QDM Elements		
Category	**Datatype**	**Available Attributes**
	Encounter, Recommended	patient preference
	Encounter, Recommended	provider preference
	Encounter, Recommended	Reason
	Encounter, Recommended	start datetime
	Encounter, Recommended	stop datetime
Functional Status	Functional Status, Order	Method
	Functional Status, Order	negation rationale
	Functional Status, Order	patient preference
	Functional Status, Order	provider preference
	Functional Status, Order	Reason
	Functional Status, Order	start datetime
	Functional Status, Order	stop datetime
	Functional Status, Performed	Method
	Functional Status, Performed	negation rationale
	Functional Status, Performed	patient preference
	Functional Status, Performed	provider preference
	Functional Status, Performed	Reason
	Functional Status, Performed	start datetime
	Functional Status, Performed	stop datetime
	Functional Status, Recommended	Method
	Functional Status, Recommended	negation rationale
	Functional Status, Recommended	patient preference
	Functional Status, Recommended	provider preference
	Functional Status, Recommended	Reason
	Functional Status, Recommended	start datetime
	Functional Status, Recommended	stop datetime
	Functional Status, Result	Method
	Functional Status, Result	negation rationale
	Functional Status, Result	patient preference
	Functional Status, Result	provider preference
	Functional Status, Result	Reason
	Functional Status, Result	Result
	Functional Status, Result	start datetime
	Functional Status, Result	stop datetime
Individual Characteristic	Patient Characteristic	start datetime
	Patient Characteristic	stop datetime
	Patient Characteristic Birth Date	start datetime
	Patient Characteristic Birth Date	stop datetime
	Patient Characteristic Expired	Date
	Patient Characteristic Expired	Time
	Patient Characteristic Expired	Reason
	Patient Characteristic Clinical Trial Participant	start datetime

QDM Elements		
Category	**Datatype**	**Available Attributes**
	Patient Characteristic Clinical Trial Participant	stop datetime
	Patient Characteristic Clinical Trial Participant	Reason
	Patient Characteristic Payer	start datetime
	Patient Characteristic Payer	stop datetime
	Patient Characteristic Sex	start datetime
	Patient Characteristic Sex	stop datetime
	Patient Characteristic Sex	Reason
	Patient Characteristic Ethnicity	
	Patient Characteristic Race	
	Provider Characteristic	negation rationale
	Provider Characteristic	start datetime
	Provider Characteristic	stop datetime
Intervention	Intervention, Adverse Event	negation rationale
	Intervention, Adverse Event	patient preference
	Intervention, Adverse Event	provider preference
	Intervention, Adverse Event	Reaction
	Intervention, Adverse Event	start datetime
	Intervention, Adverse Event	stop datetime
	Intervention, Intolerance	negation rationale
	Intervention, Intolerance	patient preference
	Intervention, Intolerance	provider preference
	Intervention, Intolerance	Reaction
	Intervention, Intolerance	start datetime
	Intervention, Intolerance	stop datetime
	Intervention, Order	Method
	Intervention, Order	negation rationale
	Intervention, Order	patient preference
	Intervention, Order	provider preference
	Intervention, Order	Reason
	Intervention, Order	start datetime
	Intervention, Order	stop datetime
	Intervention, Performed	Method
	Intervention, Performed	negation rationale
	Intervention, Performed	patient preference
	Intervention, Performed	provider preference
	Intervention, Performed	Reason
	Intervention, Performed	start datetime
	Intervention, Performed	stop datetime
	Intervention, Recommended	Method
	Intervention, Recommended	negation rationale
	Intervention, Recommended	patient preference

QDM Elements		
Category	**Datatype**	**Available Attributes**
	Intervention, Recommended	provider preference
	Intervention, Recommended	Reason
	Intervention, Recommended	start datetime
	Intervention, Recommended	stop datetime
	Intervention, Result	Method
	Intervention, Result	negation rationale
	Intervention, Result	patient preference
	Intervention, Result	provider preference
	Intervention, Result	Reason
	Intervention, Result	Result
	Intervention, Result	start datetime
	Intervention, Result	stop datetime
	Intervention, Result	Status
Laboratory Test	Laboratory Test, Adverse Event	negation rationale
	Laboratory Test, Adverse Event	patient preference
	Laboratory Test, Adverse Event	provider preference
	Laboratory Test, Adverse Event	Reaction
	Laboratory Test, Adverse Event	start datetime
	Laboratory Test, Adverse Event	stop datetime
	Laboratory Test, Intolerance	negation rationale
	Laboratory Test, Intolerance	patient preference
	Laboratory Test, Intolerance	provider preference
	Laboratory Test, Intolerance	Reaction
	Laboratory Test, Intolerance	start datetime
	Laboratory Test, Intolerance	stop datetime
	Laboratory Test, Order	Method
	Laboratory Test, Order	negation rationale
	Laboratory Test, Order	patient preference
	Laboratory Test, Order	provider preference
	Laboratory Test, Order	Reason
	Laboratory Test, Order	start datetime
	Laboratory Test, Order	stop datetime
	Laboratory Test, Performed	Method
	Laboratory Test, Performed	negation rationale
	Laboratory Test, Performed	patient preference
	Laboratory Test, Performed	provider preference
	Laboratory Test, Performed	Reason
	Laboratory Test, Performed	start datetime
	Laboratory Test, Performed	stop datetime
	Laboratory Test, Recommended	Method
	Laboratory Test, Recommended	negation rationale
	Laboratory Test, Recommended	patient preference

QDM Elements		
Category	**Datatype**	**Available Attributes**
	Laboratory Test, Recommended	provider preference
	Laboratory Test, Recommended	Reason
	Laboratory Test, Recommended	start datetime
	Laboratory Test, Recommended	stop datetime
	Laboratory Test, Result	Method
	Laboratory Test, Result	negation rationale
	Laboratory Test, Result	patient preference
	Laboratory Test, Result	provider preference
	Laboratory Test, Result	Reason
	Laboratory Test, Result	Result
	Laboratory Test, Result	Status
	Laboratory Test, Result	start datetime
	Laboratory Test, Result	stop datetime
Medication	Medication, Active	cumulative medication duration
	Medication, Active	Dose
	Medication, Active	Frequency
	Medication, Active	negation rationale
	Medication, Active	Number
	Medication, Active	patient preference
	Medication, Active	provider preference
	Medication, Active	Refills
	Medication, Active	Route
	Medication, Active	start datetime
	Medication, Active	stop datetime
	Medication, Discharge	Dose
	Medication, Discharge	Frequency
	Medication, Discharge	Number
	Medication, Discharge	patient preference
	Medication, Discharge	provider preference
	Medication, Discharge	Refills
	Medication, Discharge	Route
	Medication, Discharge	start datetime
	Medication, Discharge	stop datetime
	Medication, Administered	Dose
	Medication, Administered	Reason
	Medication, Administered	Frequency
	Medication, Administered	negation rationale
	Medication, Administered	Number
	Medication, Administered	patient preference
	Medication, Administered	provider preference
	Medication, Administered	Refills

QDM Elements		
Category	**Datatype**	**Available Attributes**
	Medication, Administered	Route
	Medication, Administered	start datetime
	Medication, Administered	stop datetime
	Medication, Administered	Date
	Medication, Administered	Time
	Medication, Adverse Effects	Dose
	Medication, Adverse Effects	Frequency
	Medication, Adverse Effects	negation rationale
	Medication, Adverse Effects	Number
	Medication, Adverse Effects	patient preference
	Medication, Adverse Effects	provider preference
	Medication, Adverse Effects	Reaction
	Medication, Adverse Effects	Refills
	Medication, Adverse Effects	Route
	Medication, Adverse Effects	start datetime
	Medication, Adverse Effects	stop datetime
	Medication, Allergy	Dose
	Medication, Allergy	Frequency
	Medication, Allergy	negation rationale
	Medication, Allergy	Number
	Medication, Allergy	patient preference
	Medication, Allergy	provider preference
	Medication, Allergy	Reaction
	Medication, Allergy	Refills
	Medication, Allergy	Route
	Medication, Allergy	start datetime
	Medication, Allergy	stop datetime
	Medication, Dispensed	cumulative medication duration
	Medication, Dispensed	Dose
	Medication, Dispensed	Frequency
	Medication, Dispensed	negation rationale
	Medication, Dispensed	Number
	Medication, Dispensed	patient preference
	Medication, Dispensed	provider preference
	Medication, Dispensed	Refills
	Medication, Dispensed	Route
	Medication, Dispensed	start datetime
	Medication, Dispensed	stop datetime
	Medication, Intolerance	Dose
	Medication, Intolerance	Frequency
	Medication, Intolerance	negation rationale
	Medication, Intolerance	Number

QDM Elements		
Category	**Datatype**	**Available Attributes**
	Medication, Intolerance	patient preference
	Medication, Intolerance	provider preference
	Medication, Intolerance	Reaction
	Medication, Intolerance	Refills
	Medication, Intolerance	Route
	Medication, Intolerance	start datetime
	Medication, Intolerance	stop datetime
	Medication, Order	cumulative medication duration
	Medication, Order	Dose
	Medication, Order	Frequency
	Medication, Order	Method
	Medication, Order	negation rationale
	Medication, Order	Number
	Medication, Order	patient preference
	Medication, Order	provider preference
	Medication, Order	Reason
	Medication, Order	Refills
	Medication, Order	Route
	Medication, Order	start datetime
	Medication, Order	stop datetime
Physical Exam	Physical Exam, Finding	anatomical structure
	Physical Exam, Finding	Method
	Physical Exam, Finding	negation rationale
	Physical Exam, Finding	patient preference
	Physical Exam, Finding	provider preference
	Physical Exam, Finding	Reason
	Physical Exam, Finding	Result
	Physical Exam, Finding	start datetime
	Physical Exam, Finding	stop datetime
	Physical Exam, Order	anatomical structure
	Physical Exam, Order	Method
	Physical Exam, Order	negation rationale
	Physical Exam, Order	patient preference
	Physical Exam, Order	provider preference
	Physical Exam, Order	Reason
	Physical Exam, Order	start datetime
	Physical Exam, Order	stop datetime
	Physical Exam, Performed	anatomical structure
	Physical Exam, Performed	Method
	Physical Exam, Performed	negation rationale
	Physical Exam, Performed	patient preference
	Physical Exam, Performed	provider preference

QDM Elements		
Category	**Datatype**	**Available Attributes**
	Physical Exam, Performed	Reason
	Physical Exam, Performed	start datetime
	Physical Exam, Performed	stop datetime
	Physical Exam, Recommended	anatomical structure
	Physical Exam, Recommended	Method
	Physical Exam, Recommended	negation rationale
	Physical Exam, Recommended	patient preference
	Physical Exam, Recommended	provider preference
	Physical Exam, Recommended	Reason
	Physical Exam, Recommended	start datetime
	Physical Exam, Recommended	stop datetime
Procedure	Procedure, Adverse Event	negation rationale
	Procedure, Adverse Event	patient preference
	Procedure, Adverse Event	provider preference
	Procedure, Adverse Event	Reaction
	Procedure, Adverse Event	start datetime
	Procedure, Adverse Event	stop datetime
	Procedure, Intolerance	negation rationale
	Procedure, Intolerance	patient preference
	Procedure, Intolerance	provider preference
	Procedure, Intolerance	Reaction
	Procedure, Intolerance	start datetime
	Procedure, Intolerance	stop datetime
	Procedure, Order	Ordinality
	Procedure, Order	Method
	Procedure, Order	negation rationale
	Procedure, Order	patient preference
	Procedure, Order	provider preference
	Procedure, Order	Reason
	Procedure, Order	start datetime
	Procedure, Order	stop datetime
	Procedure, Performed	Method
	Procedure, Performed	negation rationale
	Procedure, Performed	Ordinality
	Procedure, Performed	patient preference
	Procedure, Performed	provider preference
	Procedure, Performed	Result
	Procedure, Performed	Reason
	Procedure, Performed	start datetime
	Procedure, Performed	incision datetime
	Procedure, Performed	stop datetime
	Procedure, Recommended	Ordinality
	Procedure, Recommended	Method

QDM Elements		
Category	**Datatype**	**Available Attributes**
	Procedure, Recommended	negation rationale
	Procedure, Recommended	patient preference
	Procedure, Recommended	provider preference
	Procedure, Recommended	Reason
	Procedure, Recommended	start datetime
	Procedure, Recommended	stop datetime
	Procedure, Result	Ordinality
	Procedure, Result	Method
	Procedure, Result	radiation dosage
	Procedure, Result	radiation duration
	Procedure, Result	negation rationale
	Procedure, Result	patient preference
	Procedure, Result	provider preference
	Procedure, Result	Reason
	Procedure, Result	Result
	Procedure, Result	Status
	Procedure, Result	start datetime
	Procedure, Result	stop datetime
Risk Category / Assessment	Risk Category Assessment	negation rationale
	Risk Category Assessment	patient preference
	Risk Category Assessment	provider preference
	Risk Category Assessment	start datetime
	Risk Category Assessment	stop datetime
	Risk Category Assessment	Result
Substance	Substance, Administered	Dose
	Substance, Administered	Date
	Substance, Administered	Time
	Substance, Administered	Frequency
	Substance, Administered	negation rationale
	Substance, Administered	Number
	Substance, Administered	patient preference
	Substance, Administered	provider preference
	Substance, Administered	Refills
	Substance, Administered	Route
	Substance, Administered	start datetime
	Substance, Administered	stop datetime
	Substance, Adverse Event	Dose
	Substance, Adverse Event	Frequency
	Substance, Adverse Event	negation rationale
	Substance, Adverse Event	Number
	Substance, Adverse Event	patient preference
	Substance, Adverse Event	provider preference
	Substance, Adverse Event	Reaction

QDM Elements		
Category	**Datatype**	**Available Attributes**
	Substance, Adverse Event	Refills
	Substance, Adverse Event	Route
	Substance, Adverse Event	start datetime
	Substance, Adverse Event	stop datetime
	Substance, Allergy	Dose
	Substance, Allergy	Frequency
	Substance, Allergy	negation rationale
	Substance, Allergy	Number
	Substance, Allergy	patient preference
	Substance, Allergy	provider preference
	Substance, Allergy	Reaction
	Substance, Allergy	Refills
	Substance, Allergy	Route
	Substance, Allergy	start datetime
	Substance, Allergy	stop datetime
	Substance, Intolerance	Dose
	Substance, Intolerance	Frequency
	Substance, Intolerance	negation rationale
	Substance, Intolerance	Number
	Substance, Intolerance	patient preference
	Substance, Intolerance	provider preference
	Substance, Intolerance	Reaction
	Substance, Intolerance	Refills
	Substance, Intolerance	Route
	Substance, Intolerance	start datetime
	Substance, Intolerance	stop datetime
	Substance, Order	Dose
	Substance, Order	Frequency
	Substance, Order	Method
	Substance, Order	negation rationale
	Substance, Order	Number
	Substance, Order	patient preference
	Substance, Order	provider preference
	Substance, Order	Reason
	Substance, Order	Refills
	Substance, Order	Route
	Substance, Order	start datetime
	Substance, Order	stop datetime
	Substance, Recommended	Dose
	Substance, Recommended	Frequency
	Substance, Recommended	Method
	Substance, Recommended	negation rationale
	Substance, Recommended	Number

QDM Elements		
Category	**Datatype**	**Available Attributes**
	Substance, Recommended	patient preference
	Substance, Recommended	provider preference
	Substance, Recommended	Reason
	Substance, Recommended	Refills
	Substance, Recommended	Route
	Substance, Recommended	start datetime
	Substance, Recommended	stop datetime
Symptom	Symptom, Active	Environment
	Symptom, Active	negation rationale
	Symptom, Active	Ordinality
	Symptom, Active	patient preference
	Symptom, Active	provider preference
	Symptom, Active	Severity
	Symptom, Active	start datetime
	Symptom, Active	Status
	Symptom, Active	stop datetime
	Symptom, Assessed	negation rationale
	Symptom, Assessed	Ordinality
	Symptom, Assessed	patient preference
	Symptom, Assessed	provider preference
	Symptom, Assessed	Severity
	Symptom, Assessed	start datetime
	Symptom, Assessed	Status
	Symptom, Assessed	stop datetime
	Symptom, Inactive	negation rationale
	Symptom, Inactive	Ordinality
	Symptom, Inactive	patient preference
	Symptom, Inactive	provider preference
	Symptom, Inactive	Severity
	Symptom, Inactive	start datetime
	Symptom, Inactive	Status
	Symptom, Inactive	stop datetime
	Symptom, Resolved	negation rationale
	Symptom, Resolved	Ordinality
	Symptom, Resolved	patient preference
	Symptom, Resolved	provider preference
	Symptom, Resolved	Severity
	Symptom, Resolved	start datetime
	Symptom, Resolved	Status
	Symptom, Resolved	stop datetime
System Characteristic	System Characteristic	negation rationale
	System Characteristic	start datetime
	System Characteristic	stop datetime

QDM Elements		
Category	**Datatype**	**Available Attributes**
Transfer of Care	Transfer From	negation rationale
	Transfer From	patient preference
	Transfer From	provider preference
	Transfer From	start datetime
	Transfer From	stop datetime
	Transfer To	negation rationale
	Transfer To	patient preference
	Transfer To	provider preference
	Transfer To	start datetime
	Transfer To	stop datetime

Datatype-Specific Attributes

Datatype-specific attributes provide a finer level of detail to certain datatypes within the QDM. Table 3 provides definitions for these attributes.

Table 3: Definitions for Datatype-specific attributes

Datatype-Specific Attributes	
Admission DateTime	The start date and time for the admission process.
Anatomical Structure	A particular anatomical part of a living thing.
Causative Agent	Agents that are identified as eliciting the adverse response in a patient.
Discharge DateTime	The end date and time for the discharge process.
Discharge Status	The disposition of the patient at the time of discharge; generally used in the 2010 retooling project to express exclusions (e.g., left against medical advice, expired).
Dose	The amount of therapeutic agent that was indicated to be given during a procedure, diagnostic test, or medication or substance administration.
Environmental Location	The setting in which an action or event takes place (e.g., home, school, work, etc.).
Facility Location	The particular location within a facility in which an encounter occurs. Examples include, but are not limited to, intensive care units (ICUs), non-ICUs, burn critical-care unit, neonatal ICU, and respiratory-care unit.
Facility Location Arrival DateTime	The date and time the patient presents to the location.
Facility Location Departure DateTime	The date and time the patient departs the location.
Frequency	Relates to rate of occurrence of a medication or procedure; generally in hours.
Health Record Artifact	A snapshot or set of data at a specific point in time derived directly from the clinical record that contains information about a patient and is communicated to another clinician or the patient. Health record artifacts are static snapshots of data. A few examples include clinical summaries, allergy lists, problem lists, and medication lists.
Infusion Duration	The total length of time for the infusion of a substance or medication. A derived attribute from the health records from infusion end time minus infusion start time.

Datatype-Specific Attributes	
Laterality	The left or right side of the body or body part or object of interest to the measure developer describing the QDM element. This attribute also includes anterior/ posterior, superior/ inferior, and medial/ distal as available criteria.
Length of Stay	The difference of the admission date/time and the discharge date/time.
Method	A procedure, technique or way of doing something especially in accordance with a definite plan.
Negation rationale	The reason a QDM element's criterion was not met. For example, '*Medication, Administered not done abc' (reason: 'Allergy*'). The 'allergy' value set provides reasons the medication was not administered.
Ordinality	The scale in which objects are ordered in terms of their qualitative value, as opposed to a ranking performed strictly numerically or quantitatively. For example, a clinical quality measure may only be interested in including patients with a principal diagnosis of congestive heart failure to evaluate care during a hospitalization. The measure developer can specify *Diagnosis active: congestive heart failure* with the attribute *ordinality: principal*.
Patient Preference	An individual's expression of desirability or value of one course of action, outcome, or selection in contrast to others.[23]
Provider Preference	Preference related to experience and education with treatment modalities in direct patient care.
Radiation Dosage	The total dosage of radiation received during a procedure or diagnostic test.
Radiation Duration	The elapsed time (duration) of radiation exposure during a procedure or diagnostic test.
Reason	The thought process or justification for an action or for not performing an action. In some measures, specific treatments are acceptable inclusion criteria only if a justified reason is present. Each of these measures uses a value set (often, but not exclusively, using SNOMED-CT™) to express acceptable justification reasons. Other measures specify reasons as justification for exclusions. Examples include patient, system, or medical-related reasons for declining to perform specific actions. Each of these measures also uses a value set to express acceptable justification reasons for declining to perform expected actions.
Related to	Pertaining to another subject or issue. Commonly used with the Care Goal category.
Result	The final consequences or data collected from a sequence of actions or events, or observable entities, including, but not limited to, procedures, laboratory tests, physical examinations, or diagnostic tests. There are three sub-attributes that can be expressed for a result: 1) is *valued*, meaning that a result is present in the electronic record but any entry is acceptable, 2) is *numerica*l, combined with a mathematical operator (e.g., LDL >= 100 mg/dL, or systolic blood pressure is **<** 140 mmHg), and 3) is one of a *specific set of elements* in a value set (e.g., chest X-ray result = <findings consistent with pneumonia>).
Route	Refers to the path by which a therapeutic agent or substance is taken into the body systems, such as intradermally, intrathecally, intramuscularly, intranasally, intravenously, orally, rectally, subcutaneously, sublingually, topically, or vaginally.
Severity	The degree of illness or symptoms and risk of disease manifested by a patient, based either on clinical data from the medical records or on hospital discharge/billing data.
Status	The particular stage of the subject within a defined process (e.g., whether a patient is *discharged*, a test is *completed*, a medication is *discontinued* or is *on hold*, or a report is *finalized*.)
Start DateTime	The time the related data element starts.
Stop DateTime	The time the related data element stops.

[23] MeSH Dictionary 2012; http://www.nlm.nih.gov/cgi/mesh/2012/MB_cgi?mode=&term=Patient+Preference&field=entry. Last accessed December 2012.

Referring to QDM elements

Referring to a Specific Occurrence of a QDM Element

When a QDM element is used in a measure, the intended interpretation assumes the measure is looking for any instance of a concept that matches the QDM elements criteria. For example, the QDM element '*Diagnosis, Active: diabetes'* should be interpreted as any diagnosis with a code matching the '*diabetes*' value set.

In some cases, a measure may refer to the same instance throughout the measure logic. This is indicated in the QDM through labeling instances of a data element as a "*specific occurrence"*. For example, the QDM element '*Occurrence A of Diagnosis, Active: diabetes'* should be interpreted as a specific instance of a diagnosis with a code matching the '*diabetes*' value set. If '*Occurrence A of Diagnosis, Active: diabetes*' is used multiple times in a measure, then each time it is referring to the same instance. Each occurrence of a given QDM element is distinguished with a unique letter. For example, if there were two occurrences of the QDM element '*Diagnosis, Active: diabetes*' the two occurrences would be distinguished as '*Occurrence A of Diagnosis, Active: diabetes'* and '*Occurrence B of Diagnosis, Active: diabetes*'.

Example Measure Using Expression Language (Syntax)

The following are examples of measure concepts that account for longitudinal, care coordination, or patient-centered measures. None of the following measures have been developed, reviewed, or endorsed by NQF. The purpose of providing these examples is to show how the QDM and the expression language can be used to describe new areas of measurement.

Hypertension: These examples are provided to show how the QDM can be used to express required measure criteria. The examples do not explore all of the clinical permutations or appropriateness of measure design, which requires detailed clinical evaluation and may be managed using a composite measure approach bringing together several workflows in a hierarchical or sequential manner.

a. Initial Diagnosis of Diastolic BP greater than 90 mmHg the patient is 18 years of age or greater:
    - The QDM elements for the example are (items in parentheses are attributes):
        - '*Patient Characteristic birth date'*
        - '*Diagnosis, Active: hypertension* (start datetime)'
        - '*Physical Exam, Finding: diastolic blood pressure* (result >= 90 mmHg)'
    - Application of the expression language:
        - Population:
            - AND: '*Patient Characteristic birth date'* >= 18 years starts before start of 'measurement period'
        - Denominator:
            - AND: FIRST '*Diagnosis, Active: hypertension'* starts before or during 'measurement period'
            - AND: '*Physical exam, finding: diastolic blood pressure* (result >= 90 mmHg)' starts concurrent with FIRST '*Diagnosis, Active: hypertension'*
        - Numerator:
            - AND: FIRST '*Physical Exam, finding*: *diastolic blood pressure* (result < 90 mmHg; start datetime)' minus FIRST '*Diagnosis, Active: hypertension* (start datetime)'

General meaning of the description

Provide the time from the initial entry of hypertension active diagnosis that is associated with an elevated diastolic blood-pressure result to the first diastolic blood-pressure reading of < 90 mmHg that occurs after the initial entry of hypertension active diagnosis. The challenge with this measure is to determine when the diagnosis of hypertension was actually determined and whether it is recorded. That is a workflow and implementation issue. The denominator components of active hypertension diagnosis and elevated diastolic blood pressure may seem redundant; however, including both components ensures that there is an elevated value for which to expect improvement. A patient with controlled hypertension presenting to a new community with no prior electronic record information is therefore not included.

b. Time from initial visit to achievement of diastolic BP less than 90 mmHg based on blood pressure and the patient is 18 years of age or greater:
    - QDM elements
        - '*Patient Characteristic birth date'*
        - '*Encounter, Performed: ambulatory or inpatient encounter* (start datetime)'
        - '*Physical Exam, finding: diastolic blood pressure* (result >= 90 mmHg)'
        - '*Diagnosis, Active: hypertension* (start datetime)'
    - Application of expression language:
        - Population:
            - AND: '*Patient Characteristic birth date*' >= 18 years starts before start of 'measurement period'
        - Denominator:
            - AND: FIRST '*Encounter, Performed: ambulatory or inpatient encounter* (start datetime)' during the 'measurement period'
            - AND: '*Diagnosis, Active: hypertension* (start datetime)' starts before or during FIRST '*Encounter, Performed: ambulatory or inpatient encounter*'
            - AND: '*Physical exam, finding: diastolic blood pressure*' (result >= 90 mmHg during FIRST '*Encounter, Performed: ambulatory or inpatient encounter*'
        - Numerator:
            - DATEDIFF: FIRST '*Physical exam, finding: diastolic blood pressure* (result < 90 mmHg; start datetime)' and FIRST '*Physical exam, finding: diastolic blood pressure* (result > 90 mmHg; start datetime)'

    General meaning of the description

    Provide the time from the initial patient visit with an entry diagnosis of hypertension and an elevated diastolic blood pressure at intake to the first diastolic blood-pressure reading of < 90 mmHg that occurs after that visit. Time takes on a new meaning when considered in the context of workflows. A start time equates to a trigger event while the end time equates to task completion and, if successful, attainment of a goal. This is described as an individual patient measure with a unique value for each patient.

For more information on the QDM, visit http://www.qualityforum.org/QualityDataModel.aspx. Questions related to the QDM can be sent to: QDM@qualityforum.org

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