Developing Electronic Clinical Quality Measures (eCQMs) for use in CMS Programs

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What is an eCQM?

- Electronic clinical quality measures (eCQMs) are standardized performance measures derived solely for use in EHRs. Current CMS policy classifies eCQMs into the CMS Quality Strategy domains:

  - Clinical Processes / Effectiveness
  - Care Coordination
  - Patient and Family Engagement
  - Population and Public Health
  - Patient Safety
  - Efficient Use of Healthcare Resources

- The Meaningful Use Program provides financial incentives for Eligible Professional (EPs), Eligible Hospitals (EHs), and Critical Access Hospitals (CAHs) to report eCQMs.

  Note: eCQMs are not the only requirement to receive a financial incentive.

eCQMs are also referred to as “eMeasures” or electronic measures

Key Stakeholders and eCQM Tools

- Developing an electronic measure requires the involvement of many stakeholders and use of many measure development tools and resources*

- Stakeholders:
  - Healthcare Providers
  - Centers for Medicare & Medicaid Services (CMS)
  - Electronic Measures Issues Group (eMIG)
  - Federal Regulators
  - HL7
  - Measures Application Partnership (MAP)
  - Measure Developers
  - National Quality Forum (NQF)
  - National Library of Medicine (NLM)
  - Office of the National Coordinator for Health Information Technology (ONC)
  - Patients and the general public
  - Technical Expert Panel (TEP)

- Tools and Resources
  - Cypress Certification Tool
  - eCQM Library
  - CMS Measures Inventory
  - CMS Measures Management System (MMS) Blueprint
  - Health Quality Measures Format (HQMF) Standard
  - Measure Authoring Tool (MAT)
  - NQF Quality Positioning System
  - Quality Data Model (QDM)
  - Quality Reporting Document Architecture (QRDA) Standard
  - Value Set Authority Center (VSAC)
  - Bonnie for test driven development

*Definitions of these tools and resources and stakeholders are provided in the Appendix

Paper-Based vs. eCQM Measure Development

Paper-Based Measure Development

Measure developers…

- Develop measure narrative, numerator/ denominator in line with existing administrative data and/or data typically found in patient medical records (these can be paper or electronic charts).
- Create a list of code sets, data elements and abstraction definitions to represent the concepts within the measure.
- Solicit public comment on the measures.
- Measure developers conduct complete feasibility, reliability and validity testing.

eCQM Measure Development

Measure developers…

- Develop measure narrative, numerator/ denominator, workflow and logic, in line with existing standards (e.g., CMS Measures Management System (MMS) Blueprint
- Create value sets, collaborating with the **Value Set Authority Center** and clinical terminology (e.g. SNOMED-CT, LOINC) stakeholders as needed.
- **Use the Measure Authoring Tool (MAT)**
- Conduct complete feasibility, reliability and validity testing which can include working with EHR vendors to understand data element availability and implementation in the field.
- **Testing, Testing, Testing - for certification, implementation and new standards**
- Utilize **industry standards** – Healthcare Quality Measures Format (HQMF) and Quality Reporting Data Architecture (QRDA) based on the Quality Data Model (QDM)
- Solicit public comment on the measures

Output of the MAT

In order to report eCQMs, electronic specifications must be developed in the Measure Authoring Tool (MAT). Each component helps to accurately capture and calculate eCQMs:

HQMF XML

Description: A CQM written in Health Quality Measures Format (HQMF) syntax. HQMF is the industry (HL7) standard for representing a CQM as an electronic document.

Likely User: EHR system developers and administrators, analysts.

Use: To enable the automated creation of queries against an EHR or other operational data store for quality reporting.

Human-Readable

Description: The human-readable HTML equivalent of the XML file content.

Likely User: EHR users [suggest saying EPs, EHs)]

Use: To identify the details of the CQM in a human-readable format, so that the user can understand both how the elements are defined and the underlying logic of the measure calculation.

eCQM Components: Visual Basics

eMeasure Title	Cervical Cancer Screening		
eMeasure Identifier (Measure Authoring Tool)	124	eMeasure Version number	2
NQF Number	0032	GUID	42e7e489-790f-427a-a1a6-d6e807f65a6d
Measurement Period	January 1, 20xx through December 31, 20xx		
Measure Steward	National Committee for Quality Assurance		
Measure Developer	National Committee for Quality Assurance		
Endorsed By	National Quality Forum		
Description	Percentage of women 21-64 years of age, who received one or more Pap tests to screen for cervical cancer.		
Copyright	Physician Performance Measur for Quality Assurance (NCQA). The Measures are copyrighted (e.g., use by healthcare provic or distribution of the Measures sold, licensed or distributed fc		

Header *(partial)*

Body *(partial)*

Population criteria

- **Initial Patient Population** =
  - AND: "Patient Characteristic Birthdate: birth date" >= 23 year(s) starts before start of "Measurement Period"
  - AND: "Patient Characteristic Birthdate: birth date" < 64 year(s) starts before start of "Measurement Period"
  - AND: "Patient Characteristic Sex: Female"
  - AND:
    - OR: "Encounter, Performed: Office Visit"
    - OR: "Encounter, Performed: Face-to-Face Interaction"
    - OR: "Encounter, Performed: Preventive Care Services - Established Office Visit, 18 and Up"
    - OR: "Encounter, Performed: Preventive Care Services-Initial Office Visit, 18 and Up"
    - OR: "Encounter, Performed: Home Healthcare Services"
    - during "Measurement Period"
- **Denominator** =
  - AND: "Initial Patient Population"
- **Denominator Exclusions** =
  - AND: "Procedure, Performed: Hysterectomy with No Residual Cervix" ends before or during "Measurement Period"
- **Numerator** =
  - AND: "Laboratory Test, Result: Pap Test (result)" <= 2 year(s) ends before or during "Measurement Period"
- **Denominator Exceptions** =
  - None

Points to data criterion

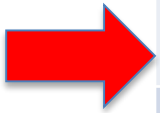
Data criteria (QDM Data Elements)

- "Encounter, Performed: Face-to-Face Interaction" using "Face-to-Face Interaction Grouping Value Set (2.16.840.1.113883.3.464.1003.101.12.1048)"
- "Encounter, Performed: Home Healthcare Services" using "Home Healthcare Services Grouping Value Set (2.16.840.1.113883.3.464.1003.101.12.1016)"
- "Encounter, Performed: Office Visit" using "Office Visit Grouping Value Set (2.16.840.1.113883.3.464.1003.101.12.1001)"
- "Encounter, Performed: Preventive Care Services - Established Office Visit, 18 and Up" using "Preventive Care Services - Established Office Visit, 18 and Up Grouping Value Set (2.16.840.1.113883.3.464.1003.101.12.1025)"
- "Encounter, Performed: Preventive Care Services-Initial Office Visit, 18 and Up" using "Preventive Care Services-Initial Office Visit, 18 and Up Grouping Value Set (2.16.840.1.113883.3.464.1003.101.12.1023)"
- "Laboratory Test, Result: Pap Test" using "Pap Test Grouping Value Set (2.16.840.1.113883.3.464.1003.108.12.1017)"
- "Patient Characteristic Birthdate: birth date" using "birth date LOINC Value Set (2.16.840.1.113883.3.560.100.4)"
- "Patient Characteristic Sex: Female" using "Female Administrative Sex Value Set (2.16.840.1.113883.3.560.100.2)"
- "Procedure, Performed: Hysterectomy with No Residual Cervix" using "Hysterectomy with No Residual Cervix Grouping Value Set (2.16.840.1.113883.3.464.1003.198.12.1014)"

Points to associated value set and OID

Quality Data Model (QDM)

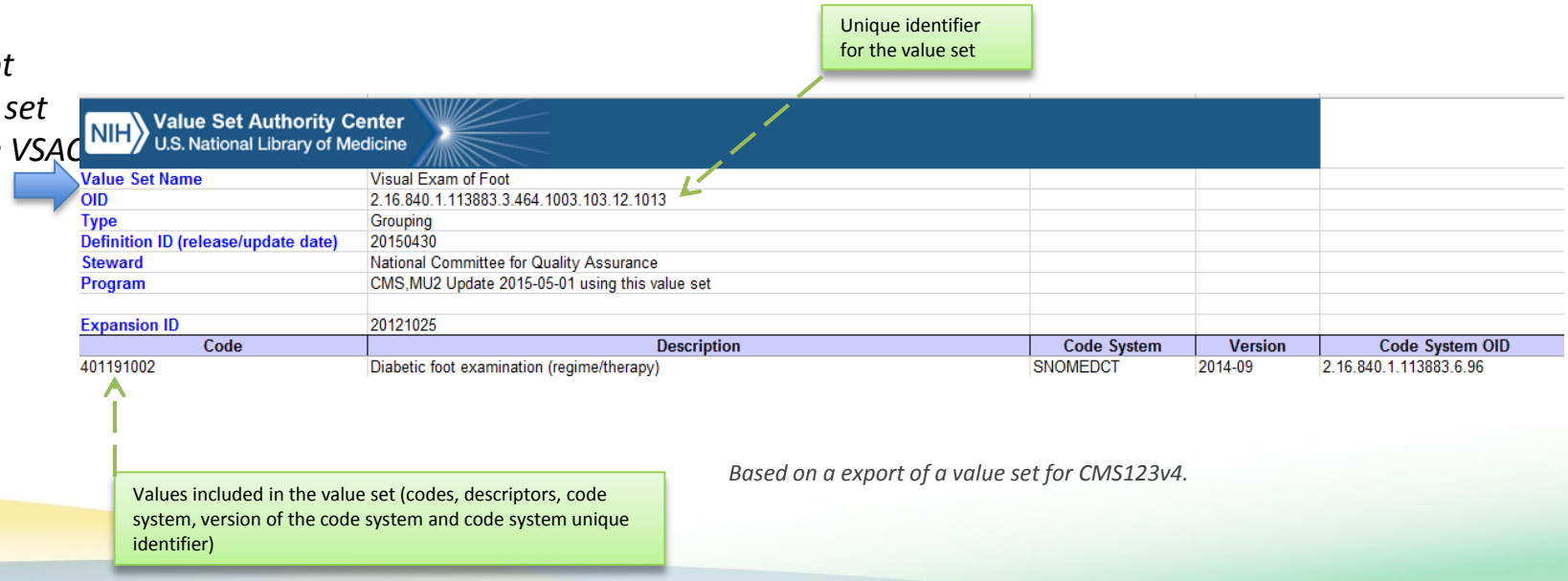
Quality Data Model Category	Quality Data Model Data type	Quality Data Model Attribute
Condition/ Diagnosis/ Problem	Diagnosis, active	N/A
Encounter (any provider interaction)	Encounter, performed	N/A
Laboratory test	Laboratory Test, order	N/A
Laboratory test	Laboratory Test, performed	Result
Diagnostic study test	Diagnostic Study, order	N/A
Diagnostic study test	Diagnostic Study, performed	Result
Procedure	Procedure, performed	N/A



Value Sets: Using the VSAC

- The Value Set Authority Center(VSAC) houses all measure value sets
- Value sets are can be newly-created or reused from those existing within the VSAC

Screenshot of a value set within the VSAC



Based on a export of a value set for CMS123v4.

Vocabularies Used in Building Value Sets

- There are specific vocabularies or terminologies that are used to identify clinical concepts identified by the data elements within an eCQM. These vocabulary requirements are based on the ONC Health Information Technology Standards Committee (HITSC) recommendations for standard and transition vocabularies.

- eCQMs include both standard and transition vocabularies to convey the intended clinical intent:
  - Standard- are primarily clinical vocabularies (as opposed to billing) and can serve more needs and for a longer period of time; however are not widely used.
  - Transition- allow for immediate use and least burdensome for eCQM reporting purposes while standard vocabulary use is not yet widespread.

Standard	Transition
•SNOMED CT •LOINC •RxNorm •CVX •PHIN/VADS	•ICD-9-CM •ICD-10-CM •ICD-10-PCS •CPT •HCPCS

(refer to appendices for details on each specific code set)

Vocabularies in Relation to Data Elements

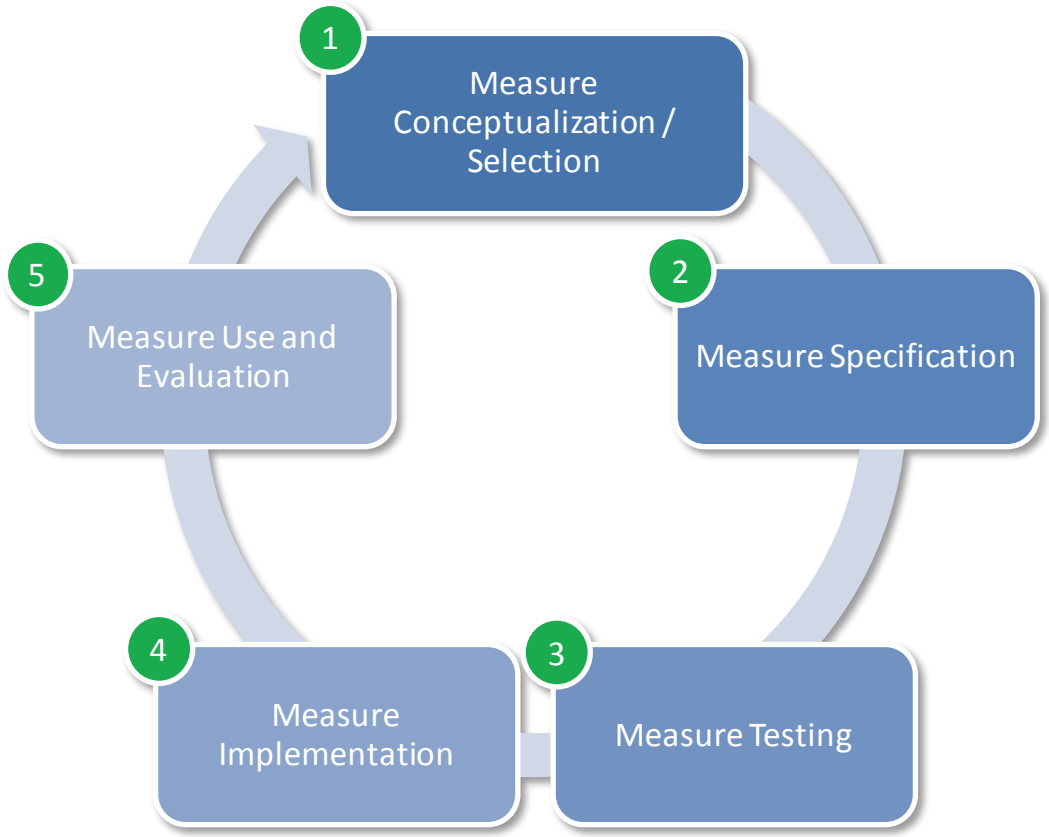
Quality Data Model Category	Quality Data Model Data type	Quality Data Model Attribute	Clinical Vocabulary Standards	Transition Vocabulary
Condition/ Diagnosis/ Problem	Diagnosis, active	N/A	SNOMED CT	ICD-9-CM, ICD-10-CM
Encounter	Encounter, performed	N/A	SNOMED CT	CPT, HCPCS, ICD-9-CM Procedures, ICD-10-PCS
Laboratory test	Laboratory Test, order	N/A	LOINC	N/A
Laboratory test	Laboratory Test, performed	Result	SNOMED CT	N/A
Diagnostic study test	Diagnostic Study, order	N/A	LOINC	HCPCS
Diagnostic study test	Diagnostic Study, performed	Result	SNOMED CT	N/A
Procedure	Procedure, performed	N/A	SNOMED CT	CPT, HCPCS, ICD-9-CM Procedures, ICD-10-PCS

Updates to Vocabularies and Standards

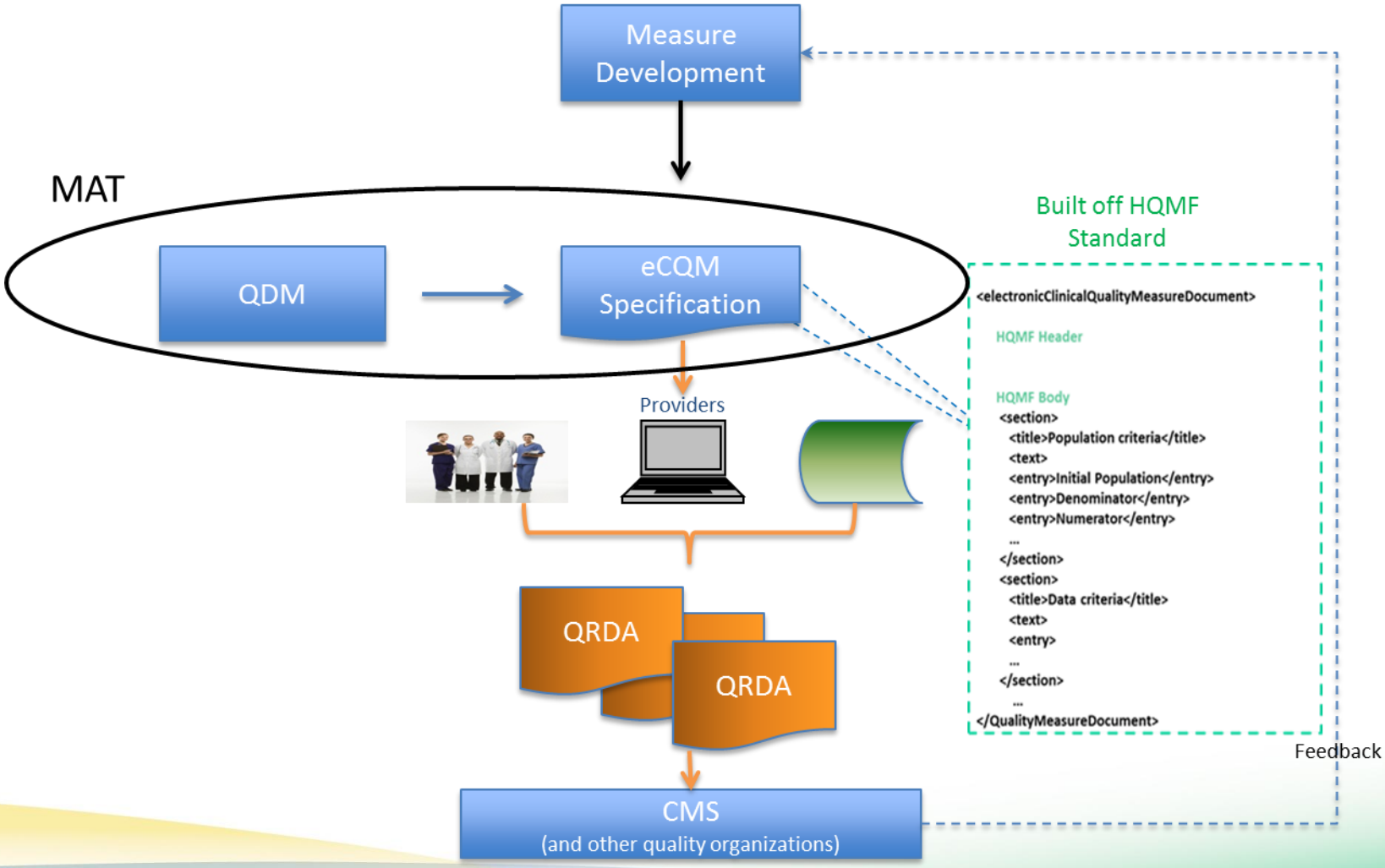
- Vocabularies and standards are updated by their respective owners
- CMS updates and utilizes vocabularies and standards for eCQMs in their quality reporting programs
- Vocabularies are updated:
  - Annually – SNOMED, LOINC, CPT
  - Monthly – RxNorm
- HQMF standard – International standard for authoring quality measures (maintained by HL7)

The eCQM Development Lifecycle

eCQM Development Lifecycle

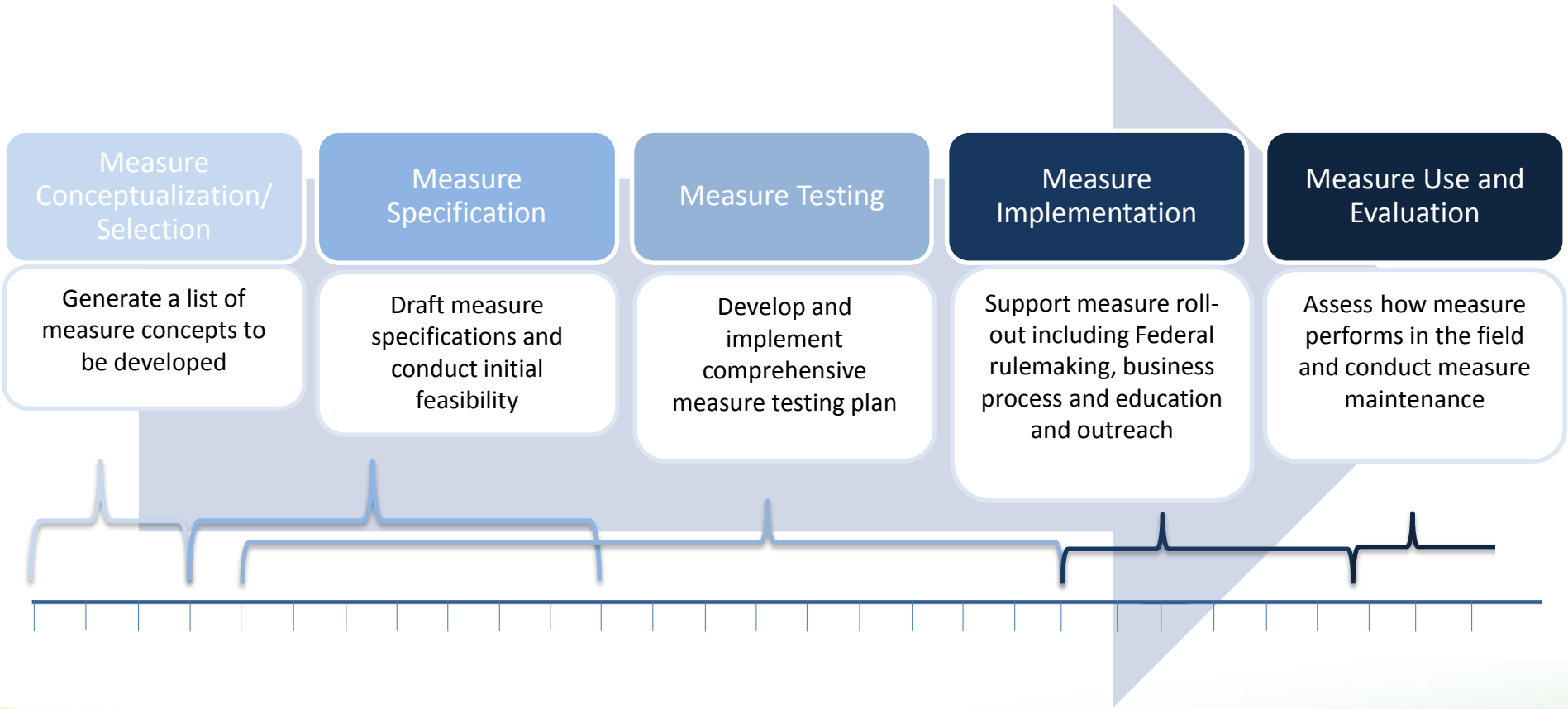


Intersection of QDM, HQMF and QRDA



To view eCQM packages:
http://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/eCQM_Library.html

eCQM Development Lifecycle



Questions?

Links to Resources

Measure Authoring Tool (MAT)

https://www.emeasuretool.cms.gov/web/guest/mat-home

Value Set Authority Center (VSAC)

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

Blueprint

https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/MMS/MeasuresManagementSystemBlueprint.html

Appendix

Key Stakeholders

Key Tools and Resources

Common Vocabulary Terminologies

Key Stakeholders

Stakeholder	Role in eCQM Development Process
Center for Medicare and Medicaid Services (CMS)	• CMS manages the meaningful use programs, including managing eCQM selection and development.
CMS Measures Management Contractor	• Provides technical support to measure developers in understanding the CMS MMS Blueprint processes, identifying measures for harmonization purposes, and interpreting NQF processes as they relate to measure development, endorsement and maintenance.
eMeasures Issue Group (eMIG)	• eMIG works to develop standards for measure developers to use in creating new quality measures and retooling current paper-based clinical quality measures.
Federal Regulators	• Several federal offices support CMS in posting the measure for public comment and confirming the final version published in the Federal Register.
Health Caregivers	• Providers of healthcare, including doctors, nurses and other medical professionals.
Health Level Seven International (HL7)	• HL7 is a standards development organization dedicated to providing a comprehensive framework and standards for the exchange, integration, sharing, and retrieval of electronic health information. The Quality Reporting Data Architecture (QRDA) and the Health Quality Measures Format (HQMF) are both published by HL7.
Measure Applications Partnership (MAP)	• MAP is a public-private partnership that reviews performance measures for potential use in federal public reporting and performance-based payment programs, while working to align measures being used in public- and private-sector programs.

Key Stakeholders, cont'd

Stakeholder	Role in eCQM Development Process
National Library of Medicine (NLM)	• NLM manages the Value Set Authority Center (VSAC) which publishes value sets for use in the eMeasure development process.
National Quality Forum (NQF)	• The NQF is a non-profit organization that reviews, endorses and recommends healthcare quality measures. NQF convenes the Measure Applications Partnership (MAP) a public-private partnership which reviews measures for potential use in public reporting and performance-based programs while also working to align measures being used in public and private-sector programs.
Office of the National Coordinator for Health Information Technology (ONC)	• ONC publishes regulations on EHR Standards and Certification Criteria.
Patients and the General Public	• Recipients of healthcare and those who are part of the healthcare system.
Technical Expert Panel (TEP)	• A group of experts (typically clinicians, statisticians, quality improvement, methodologists, or pertinent measure developers) who provide technical input to the measure contractor on the development, selection, and maintenance of measures for which CMS contractors are responsible.

Key Tools and Resources

Tool	Use in eCQM Development Process
CMS Measure Management System (MMS) and Blueprint	• A standardized approach to the development and maintenance of the quality measures used in CMS quality initiatives and programs, the MMS provides a set of business processes and decision criteria that CMS-funded measure developers (or contractors) follow to develop, implement, and maintain quality measures. The Blueprint requirements align with those cited by NQF for endorsement.
CMS Measures Inventory	• Database maintained by the CMS Measures Management contractor that contains details on the measures and measure concepts created for use in CMS programs along with statuses of the measures (e.g., archived, future, current, implemented, etc.). Developers can request input to identify measures and concepts that may require harmonization.
Cypress	• Cypress is a tool for testing Meaningful Use of EHRs and EHR modules. It is open source and freely available for use or adoption, and is the official testing tool for the 2014 EHR Certification program.
eCQM Library	• CMS maintains a list of eCQMs in use with CMS programs on its program website.
Health Quality Measures Format (HQMF)	• HQMF is the industry (HL7) standard for representing a CQM as an electronic document.

Key Tools and Resources, cont'd

Tool	Use in eCQM Development Process
Measure Authoring Tool (MAT)	• The MAT is a publicly available, web-based tool for measure developers to create e-Measures.
NQF Quality Positioning System (QPS)	• An online tool that allows users to search for NQF-endorsed measures.
Quality Data Model (QDM)	• The QDM is an information model that clearly defines concepts used in quality measures and clinical care and is intended to enable automation of EHR use. It provides a way to describe clinical concepts in a standardized format so individuals (i.e., providers, researchers, measure developers) monitoring clinical performance and outcomes can clearly and concisely communicate necessary information.
Quality Reporting Document Architecture (QRDA)	• QRDA is the standard for transmitting/reporting health care quality measurement information. QRDA Category I reports individual patient-level data, while QRDA Category III reports aggregate data from multiple patients. QRDA reports are then able to be transmitted from certified vendor systems to CMS and other quality organizations.
Value Set Authority Center (VSAC)	• The Value Set Authority Center (VSAC) currently serves as the central repository for the official versions of value sets that support Meaningful Use 2014 Clinical Quality Measures (CQMs). The VSAC provides search, retrieval and download capabilities through a Web interface and APIs.

Common Vocabulary Terminologies

Vocabulary	Standard/ Transition	Definition	Clinical Concepts
Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT)	Standard	A comprehensive clinical terminology developed by the College of American Pathologists.	• Adverse effects/ allergies/intolerances • Substances • Clinical findings • Communication artifacts (e.g., med list, clinical summaries) • Test results (diagnostic & laboratory) • Procedures • Devices/equipment • Settings • Interventions
Logical Observation Identifiers Names and Codes (LOINC)	Standard	A universal code system that facilitates exchange, pooling and processing of results.	• Assessment instruments and questions • Laboratory test and diagnostic study names • Staffing resources
RxNorm	Standard	A standardized nomenclature that provides names and identifiers for clinical drugs	• Medications administered (except vaccines) • Medication and ingredient adverse effects and intolerances

Common Vocabulary Terminologies, cont'd

Vocabulary	Standard/ Transition	Definition	Clinical Concepts
CVX	Standard	Vaccine coding system which identifies the type of vaccine product used.	• Vaccinations administered
CDC-Public Health Information Network (PHIN)/Vocabulary Access and Distribution System (VADS) **"PHIN VADS"**	Standard	Vocabulary system for accessing, searching, and distributing vocabularies used in public health and clinical care practice.	• Patient characteristics such as gender, date of birth, ethnicity, race, and payer.

Common Vocabulary Terminologies, cont'd

Vocabulary	Standard/ Transition	Definition	Clinical Concepts
ICD-9-CM (diagnoses) *International Classification of Diseases (ICD)*	Transition	an epidemiological classification used to identify diagnoses. -Not to be used for services on or after 10/1/2015	• Condition • Diagnosis • Problem • Family history
ICD-9-CM (procedures)	Transition	an epidemiological classification used to identify procedures. -Not to be used for services on or after 10/1/2014	• Inpatient Encounter • Intervention • Procedure
ICD-10-CM	Transition	Diagnosis classification system developed by the Centers for Disease Control and Prevention for use in all health care settings.	• Condition • Diagnosis • Problem • Family history
ICD-10-PCS	Transition	Procedure classification system developed by CMS for use only in inpatient hospital settings	• Inpatient Encounter • Intervention • Procedure

Common Vocabulary Terminologies, cont'd

Vocabulary	Standard/ Transition	Definition	Clinical Concepts
Current Procedural Terminology (CPT)	Transition	Provides a uniform language that describes medical, surgical, and diagnostic services provided by physicians.	• Encounter • Intervention • Procedure
Healthcare Common Procedure Coding System (HCPCS)	Transition	Health care procedure codes based on CPT covering specific items and services provided in the delivery of health care.	• Communication • Non-lab diagnostic study • Encounter • Intervention • Procedure