Integrating the Healthcare Enterprise

IHE Quality, Research and Public Health (QRPH)

White Paper

Electronic Clinical Quality Measure (eCQM) Standards Landscape

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Foreword

This is a white paper of the IHE Quality, Research and Public Health (QRPH) domain.

This white paper is published on February 6, 2018. Comments are invited and can be submitted at http://ihe.net/QRPH_Public_Comments.

General information about IHE can be found at www.ihe.net.

Information about the IHE Quality, Research and Public Health domain can be found at ihe.net/IHE_Domains.

Information about the organization of IHE Technical Frameworks and Supplements and the process used to create them can be found at http://ihe.net/IHE_Process and http://ihe.net/Profiles.

The current version of the IHE Quality, Research and Public Health Technical Framework can be found at http://ihe.net/Technical_Frameworks.

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1 Introduction

This document explains the lifecycle of clinical quality measures (CQM) and the complexity of the electronic clinical quality measure (eCQM) landscape. It presents a vision for decreasing the reporting burden on healthcare providers and health information system vendors using interoperable data sharing.

1.1 Purpose of the eCQM Standards Landscape White Paper

This white paper introduces technical solutions to reduce administrative burden of quality measure data collection and reporting on hospitals and state public health organizations. Quality measurement is important to improving the processes and outcomes in health care. In recent years, providers' burden of reporting quality measures has increased. A 2008 report from the Robert Wood Johnson Foundation titled, Reducing the Administrative Burden of Health Care Quality Reporting, states, "Quality measurement and reporting have the potential to improve quality of care and reduce health care costs, but can also cause administrative burden on hospitals."[1]

Quality Measure

A quality measure is a tool used to measure performance against a recognized standard of care.

State Public Health Organizations operate in a complex environment. They need data, which requires supporting the measurement of the processes and outcomes associated with public health programs. Standards encourage program efficiency and consistency across multiple state-run programs. Program staff often lack knowledge of standards. Staff rarely have experience with emerging technologies to implement changes in the existing environment.

1.2 Intended Audience

This white paper is for general application in the United States (U.S.). The intended audience includes public health organization staff and hospital administrators, implementers and agencies adopting a measure, and data providers. All parties, whether distributing or receiving data, should understand the CQM ecosystem.

The examples in this white paper focus on the Early Hearing Detection and Intervention (EHDI)-1a Newborn Hearing Screening measure. These examples connect the EHDI information to the broader CQM and eCQM standards landscape.

In general, the white paper assumes the reader has minimal knowledge of eCQMs and eCQM standards. The content assumes a novice audience for this subject.

[1] Robert Wood Johnson Foundation. (2008, December). *Reducing the Administrative Burden of Health Care Quality Reporting*. Retrieved from http://www.hcfo.org/publications/reducing-administrative-burden-health-care-quality-reporting.html

Unless otherwise stated, the term "provider" refers to the individuals (e.g., doctors) and the institutions (e.g., hospitals) responsible for providing clinical healthcare services. Implementers apply health information technology (IT) and clinical quality measures. While an implementer may also be a provider, the term implementer refers to this more technical role.

2 Overview

CQMs are tools that measure and track the quality of healthcare delivery and services. CQMs help healthcare practitioners plan for improvement. They assess the entire healthcare continuum, from individual clinicians to health insurance providers, by using data on clinicians' delivery of high-quality care or progress towards long-term quality goals. They help drive healthcare quality to improve decision-making process and are used by public health agencies to monitor and improve population health. Measuring and reporting CQMs encourages effective, safe, efficient, patient-centered, equitable, and timely health care.[2]

Reliable, valid, and standardized measures provide accurate information and comparison. Additionally, measures performed consistently, regardless of who performs the measurement, with defined data elements can be applied across providers and institutions.

Definitions

Measure Steward

A measure steward is an individual or organization that owns a measure and is responsible for maintaining it. Measure stewards may also be measure developers, but not necessarily.

Measure Developer

The measure developer is an individual or organization that plans, creates, and maintains a measure.

One unintended consequence of healthcare reform is the growing administrative burden on physicians. An article titled, US Physician Practices Spend More Than $15.4 Billion Annually to Report Quality Measures, published in Health Affairs in March 2016 explains,

"The number of quality measures directed at US healthcare providers by external entities, such as Medicare, Medicaid, and private health insurance plans has increased rapidly during the past decade. These measures, such as rates of mammography screening for women or of testing for cholesterol or hemoglobin A1c levels for diabetes, are used to provide publicly reported information for patients and as a basis for financial 'pay-for-performance' incentives to physicians. At least 159 measures of outpatient physician care are now publicly available. The movement toward accountable care organizations, the federal Sustainable Growth Rate "fix" legislation, and the private-sector Catalyst for Payment Reform coalition will further emphasize measurement of physician performance."[3]

The need to reduce the burden of quality measure reporting is widely acknowledged. The first step toward improvement is

[2] CMS. (2015). Clinical Quality Measures Basics. Retrieved on 4/3/2017 from https://www.cms.gov/regulations-and-guidance/legislation/ehrincentiveprograms/clinicalqualitymeasures.html

[3] Casalino, LP, Gans, D., Wber, R., Cea, M., tuchovsky, A., Bishop, TF., Miranda, Y., Frankel, BA., Ziehler, KB., Wong, MM., Evenson, TB. US Physician Practices Spend More Than $15.4 Billion Annually To Report Quality Measures. *Health Aff.* 2016 March; 35(3): 401-406.

understanding the process. This basic understanding supports the ability to propose, identify, and/or recognize solutions that will lead to improvement.

2.1 The Big Picture

Management expert Peter Drucker said, "You can't manage what you don't measure." Through regular data collection, implementers can assess if the correct processes are being performed and desired results are being achieved. Performance analysis and measurement are important for quality improvement, transparency, accreditation, and payment purposes.

eCQMs are electronically specified clinical quality measures. Electronic capture of quality measurement data is increasingly common and often required. Many organizations consider the entry and creation of quality measurement data as separate from delivering patient care. Providers consider clinical care data in EHRs distinct from quality measures data.

> "On average, physicians and staff spent a total of 15.1 hours per physician per week dealing with quality measures, with the average physician spending 2.6 hours per week and other staff spending 12.5 hours. By far the most time — 12.5 hours of physician and staff time per physician per week — was spent on 'entering information into the medical record ONLY for the purpose of reporting for quality measures from external entities.' The time spent by physicians and staff translates to an average cost to a practice of $40,069 per physician per year."[4]

Chart-abstracted measures, or "paper measures," are not electronic. Chart-abstracted measures require a manual, human intervention to capture the necessary information for the measure. The chart abstraction process records, interprets, and calculates.

eCQMs contain data elements and logic in a format that a machine can process. Computers gather eCQM data from an electronic source, processing the information based on measure logic and specifications. The eCQM process records and calculates.

While an eCQM can only pull electronic data from structured data fields, chart-abstracted measures can use both structured and unstructured data from the paper record and electronic record.

Chart-abstracted measures are defined in a way that humans can follow—using logic flow charts—to make population determinations. They often have much less precise logic than a computer requires. eCQMs are defined with the logical rigor required for machine processing.

Human abstractors make inferences from multiple data sources. eCQMs cannot because chart-abstracted measures require manual chart review.

[4]Casalino, LP, Gans, D., Wber, R., Cea, M., tuchovsky, A., Bishop, TF., Miranda, Y., Frankel, BA., Ziehler, KB., Wong, MM., Evenson, TB. US Physician Practices Spend More Than $15.4 Billion Annually To Report Quality Measures. *Health Aff.* 2016 March; 35(3): 401-406.

2.2 Issues with the Current State

As eCQMs replace chart-abstracted measures, more and more quality measure programs are expanding electronic reporting. According to a recent CMS report, eCQMs "will ultimately reduce burden on hospitals as compared with chart-abstracted data reporting and improve patient outcomes by providing more robust data to support quality improvement efforts…measures available now and those being developed for the future are increasingly based on electronic standards".[5]

For CMS's Hospital IQR Program, the calendar year 2017 reporting period is the first time the number of eCQMs is greater than chart-abstracted.[6]

Important Note:

Organizations that have developed measures and/or support these reporting programs, are not necessarily the entity who receives or uses the data. For example, the CDC developed and maintains the EHDI-1a measure, but does not collect its associated data. However, data for this measure is reported to CMS, TJC, and some state programs, for use in quality tracking, improvement, and payment.

However, widespread eCQM implementation faces challenges. The financial burden of new software, workflow changes that disrupt productivity, and implementation training are significant and may affect providers, implementers, and receiving entities.

Numerous federal, state, and private (commercial) programs have quality measure reporting requirements that affect providers. The following are examples.

- CDC
  - EHDI reporting
  - National Healthcare Safety Network (NHSN)
- Centers for Medicare & Medicaid (CMS)
  - Core Set of Children's Health Care Quality Measures
  - Hospital Inpatient Quality Reporting (IQR) Program
  - Medicare and Medicaid EHR Incentive Programs - Meaningful Use

[5]CMS. (2016). Fiscal Year 2017 Hospital Inpatient Prospective Payment System Final Rule. Available at https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/FY2017-IPPS-Final-Rule-Home-Page.html

[6] CMS. (2016). Fiscal Year 2017 Hospital Inpatient Prospective Payment System Final Rule. Available at https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/FY2017-IPPS-Final-Rule-Home-Page.html

  - Physician Quality Reporting System (PQRS)[7]
  - Quality Payment Program - Merit-based Incentive Payment System (MIPS)
- CMS Innovation Center – Patient Centered Medical Home (PCMH)
- The National Committee for Quality Assurance (NCQA) - Healthcare Effectiveness Data and Information Set (HEDIS)
- The Leapfrog Group
- The Joint Commission (TJC) Oryx reporting
- Accountable Care Organizations

These entities can have unique reporting requirements, which creates overlapping work and increases the reporting burden on providers.

Storing and retrieving data in EHR systems may cause problems for eCQM collection. An eCQM may need data that are not documented or available as discrete (i.e., structured) data within the EHR. Interoperability issues between systems also affect timely exchange of information and clinical decision support. One EHR or hospital system may not contain all necessary data to compute an eCQM. The data may be across multiple EHRs/systems, making it difficult if not impossible to correctly tally the results.

Interoperability can improve patient safety and service quality. eCQMs have a positive impact on the quality and accuracy of clinical information; reduce medical errors; save time and money; and contribute toward the creation and maintenance of a comprehensive, longitudinal electronic patient health record. By exploring and addressing barriers, the industry could realize the full potential of eCQM technology.

2.3 Vision for the Future

In this paper, we will describe how interoperable clinical care data addresses barriers by shifting the ever-increasing burden of quality reporting off the care providers. Interoperability means that data produced as a byproduct of care delivery can be used also for quality measures. Externalizing the tasks of measuring and tracking quality to a different system specializing in that function allows clinical systems to focus on providing care. The information required for quality measurement can be collected during care delivery, and be standardized to enable efficient data exchange across disparate systems. To accomplish this, measures, standards, tools, and workflows may need to be changed.

Health standards and eCQMs depend on each other. eCQMs rely on health standards for syntax, structure and format, and a common language to produce electronic data. Historically, health standards organizations like HL7®[8] created the standards for clinical document and reporting

[7] The Medicare EHR Incentive Program and PQRS programs are “sunsetting” and being replaced with the Quality Payment Program.

[8] HL7 is the registered trademark of Health Level Seven International.

architecture that can be used for quality data exchange and reporting as well, and measure stewards and measure developers created the measures that produce the electronic data for the architecture.

However, aligning updates and changes in health standards and eCQMs are an emerging challenge as there are many interdependencies to consider when maintaining eCQMs. For example, when the IHE Quality, Research and Public Health (QRPH) Technical Framework Supplement – Quality Measure Execution -Early Hearing (QME-EH) Profile was released, it referenced an older version of the EHDI-1a Newborn Hearing Screening measure because the measure update did not occur prior to publishing. Likewise, versioning of the Quality Reporting Document Architecture (QRDA) Category I release occurred prior to publishing the QME-EH Profile. In general, versioning affects every elemental part of the broad eCQM ecosystem. New capabilities to manage the complexity of the eCQM environment could be helpful.

In the future, managing the use and maintenance of eCQMs may require considerable planning and orchestration. Continuous improvement efforts could focus on reducing the burden of creating, sustaining, collecting, computing, and reporting of CQMs.

2.4 Expected benefits

eCQMs support public reporting, provider incentive, and accreditation and certification programs to increase provider accountability and promote informed consumer choice. Healthcare providers that calculate and submit eCQMs eliminate the need for costly manual data abstraction and can directly improve regulatory compliance and quality and generate returns on investment. Aligning requirements of different quality programs will decrease the reporting burden on providers. Collecting and reporting quality measure data through EHRs promotes consistency, uniformity, and comparability through standardization. In addition to reporting to external agencies, providers use quality data internally to measure improvement.

This white paper summarizes the processes, standards, and technologies involved in the development, use, and maintenance of eCQMs. It supports healthcare quality measurement and the improvement activities focused on reducing the burden of quality reporting.

The National Academy of Medicine, formerly the Institute of Medicine, defines the learning health system (LHS) as the alignment of "science, informatics, incentives, and culture … for continuous improvement and innovation, with best practices seamlessly embedded in the delivery process and new knowledge captured as an integral by-product of the delivery experience."

LHSs have several core attributes, including a consistent emphasis on a collaborative approach for sharing data to drive improvement and efficiency in clinical practice and patient care. A key component to this is

> "the creation of systems linked by a common EHR and shared databases. This interconnected system in turn can be supported by new methods of clinical research and data analysis and would rely on modern information technology and informatics to

> manage and communicate data that would help guide the decisions made by health systems, care providers, and patients and their families."[9]

Clinical quality measures are the natural extension of the LHS. They provide the data necessary to identify improvements, monitor the processes, and maintain evaluation. Through an iterative measure maintenance approach, measures can adapt and evolve with, and through, the LHS. Quality reporting is a key driver of continuous quality improvement for the healthcare system.

[9] Institute of Medicine. The Learning Healthcare System: Workshop Summary. Olsen L, Aisner D, McGinnis JM, eds. Washington, DC: National Academies Press; 2007. Available at: https://www.ncbi.nlm.nih.gov/pubmed/21452449. Accessed April 4, 2014.

3 Key Components

Sections 3.1 through 3.4 covers the key components in the lifecycle of a CQM including measure creation, testing, and maintenance. These concepts apply to all forms of quality measures including paper-based and eCQMs. A basic understanding of these components is crucial to recognizing and identifying potential solutions to the current challenges within the eCQM landscape. Standards and technologies that only apply to eCQMs are discussed in Sections 3.5 and 3.6.

3.1 Quality Reporting

Quality measures can cover anything from federal payment programs to internal process improvement. Quality measures continuously gather and assess data for performance and outcome measurement. Providers and healthcare organizations have to follow many reporting requirements. For example, a provider may submit its measurement data to assess adherence to internal benchmarks, submission to an accreditation organization, a state registry, a surveillance registry, and multiple payers for reimbursement purposes.

3.1.1 Reporting Period vs Measurement Period

The reporting period is the same as the performance period. Typically, eligible professional and clinician (outpatient) measures reference the performance period, whereas hospital (inpatient) measures reference the reporting period. The reporting and performance periods refer to the calendar year that the data are reported.

The measurement period refers to the timeframe that the CQM applies and will be calculated. Each measure has a specified measurement period.

The reporting period differs from the measurement period. The reporting period determines the reporting program. The measurement period is built into the measure itself. They can be, and often are, the same, as is the case for the CMS reporting programs.

3.2 Measure Types

Measures are based on scientific evidence about processes, outcomes, perceptions, or systems that relate to high-quality care. They can be classified in many ways, including measurement domain, how the information is captured and evaluated, how the patient population is defined, and how the measure is scored. These are discussed in more detail below.

Measure Components: Population Criteria

Initial Population (IP): the group of patients the measure is designed to address.

Denominator: subset of the IP; may be the same as the IP, or denominator criteria can further refine the patient population.

Denominator Exclusions: used to exclude patients from the denominator when the clinical action would not be appropriate and the patient would otherwise meet the denominator criteria (e.g., EHDI-1a denominator exclusion for patient expired during encounter).

Denominator Exceptions: valid reasons cases are excused from numerator, even when they meet denominator criteria. Allow for clinical judgment in three categories: medical reasons, patient reasons, and system reasons.

Numerator: subset of the denominator population for whom a process or outcome of care occurs. Known as the measure focus, it represents a clinical action that meets the measure requirements.

Numerator Exclusions: instances that should not be included in the numerator data. Only used in ratio and proportion measures.

Note: not all CQMs have exclusions or exceptions.

3.2.1 Patient-based vs. Episode of Care Measures

The first decision when writing a measure is determining the patient population.

Patient-based measures evaluate the care of an individual patient and assign that patient to one or more measure populations. Patient-based measures evaluate all information in the patient's medical record against the measure criteria. The criteria for inclusion of a patient in a measure population may require that conditions be satisfied during multiple episodes of care—for example, a diagnosis occurring in one episode of care and treatment happening in a subsequent episode of care.

Episode of care measures assess the quality of care from a patient-provider encounter. Episode of care measures assign each episode of care to one or more measure populations. All CMS and EHR Incentive Program eligible hospital measures, and some of the eligible professional/eligible clinician measures, are episode of care measures.[10] The measure population identifies the episode of care designated by a specific occurrence.

Measure Components: Data Criteria

QDM Data Elements: value (code) sets used to represent the clinical concepts of an eCQM.

Supplemental Data Elements: standard value (code) sets used in all eCQMs, in addition to the QDM data element value sets. The supplemental data elements represent ethnicity, payer, race, and administrative sex.

3.2.2 Structure Measures

Structural measures assess the characteristics of a provider's capacity, systems, and procedures related to care delivery. These measures can either focus on organizations or individual clinicians. They most often apply to quality assurance, certification, and accreditation. For example, does the organization have the system capability to transmit newborn hearing screen results to the EHDI Coordinator electronically?

3.2.3 Process Measures

Process measures assess whether actions contributed to outcomes. In healthcare, they measure adherence to standards of care and clinical guidelines. In other words, they evaluate whether the provider followed the clinical process.

For example, the EHDI-1a Newborn Hearing Screening measure is a process measure under the CDC EHDI program. It measures the proportion of newborns who receive hearing screening prior to discharge at birth.

3.2.4 Outcome Measures

Outcome measures assess the care processes or interventions in terms of how they affect health. They evaluate patient health based on the care received. For example, an outcome measure

[10] CMS/ONC (2016, April 6). Electronic Clinical Quality Measure Logic and Implementation Guidance, v1.12. Available at https://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/Downloads/eCQM_LogicGuidance_v112_April2016.pdf

evaluates whether children receive early intervention and services for hearing loss following failed infant hearing screening.

3.2.5 Patient Experience Measures

Patient experience measures assess the patient's perception of, and participation in, their health decisions and care. For example, patient satisfaction surveys, like the Consumer Assessment of Healthcare Providers and Systems (CAHPS), are a series of patient surveys rating experiences in various healthcare settings.

3.2.6 Electronic Measures Converted from Chart-Abstracted Measures

As the transition to electronic measures progresses, some programs accept both chart-abstracted and electronic versions of measures to allow providers flexibility in meeting reporting requirements. Some measures no longer maintain the chart-abstracted version.

Many eCQMs began as chart-abstracted measures. A measure developer converted the technical measure specifications from a human-processing description to a machine-processing description using the logic expressions of QDM. This is known as a retooled or reengineered measure.

3.2.7 De Novo Electronic Measures

Measures do not need to be chart-abstracted before being defined as an electronic measure. Some measures begin as eCQMs. These are referred to as de novo measures, meaning new or from the beginning. They rely on the logic and expressions available in the Health Quality Measure Format (HQMF) standard. HQMF represents quality measures in electronic document structure using QDM data elements and logic, which are explained in more detail in Section 3.4.2.

3.2.8 Statistical/Analytical Measure Types

Measures use precise mathematical relationships for calculation (scoring). Measure types can be further defined according to their scoring methodology, as described in Table 1 below.

Table 1 – Statistical/Analytical Measure Types

Measure Type	Definition
Proportion	In proportion measure scoring, the denominator represents the number of persons treated by a provider during a defined period who were at risk of, or eligible for, the numerator event. The numerator represents the number of persons in the denominator who received the appropriate diagnostic test or treatment (e.g., aspirin for heart attack), or the number who experienced an adverse outcome (e.g., respiratory failure after surgery).[11] Most CQMs, including EHDI-1a, use proportion measure scoring.

[11] Direct excerpt from AHRQ (2014, October). Selecting Quality and Resource Use Measures: A Decision Guide for Community Quality Collaboratives, Part II. Introduction to Measures of Quality. https://www.ahrq.gov/professionals/quality-patient-safety/quality-resources/tools/perfmeasguide/perfmeaspt2.html. Accessed on April 11, 2017.

Measure Type	Definition
Continuous Variable	A measure score in which each individual value for the measure can fall anywhere along a continuous scale and can be aggregated using a variety of methods, such as the calculation of a mean or median. Can be either patient- or episode-based. They include • Initial population, which is roughly equivalent to the Denominator in proportion measures. • Measure Population, a subset of the initial population and roughly equivalent to the Numerator in a proportion measure. • Measure Observations, which describe the computation to perform over the members of the Measure Population.
Ratio	A measure score calculated by dividing the count of one type of data by the count of another type of data, often for related populations (e.g., the number of patients with central lines who develop infection divided by the number of central line days).

Different statistical measure types imply different mathematical operations for how to compare the measure. The following illustrates the computation of a proportion measure, using EHDI-1a criteria:

1. Determine initial population (IP): The Encounter must be during the measurement period, with a length of stay <= 120 days, and a diagnosis of live birth or liveborn newborn born in a hospital.
2. Determine denominator (DEN): All patients in the Initial Population are included in the Denominator.
3. Determine denominator exclusions (DENEX): Patients who expired prior to discharge and did not have a hearing screen performed in either ear.
4. Determine numerator: Patients with hearing screens performed in both ears with a result of "pass" or "refer" or "medical reasons the hearing screen was not performed."
5. Determine denominator exceptions (DENEXCEP): There are no denominator exceptions for the EHDI-1a measure

Figure 1 shows how the proportion measure computes the performance rate.

$$Rate = \frac{\text{Numerator}}{(\text{DEN} - \text{DENEX} - \text{DENEXCEP})}$$

Figure 1 – Performance Rate Formula

3.2.9 Composite Measure

Composite measures combine two or more individual measures into one single measure with a single score that summarizes the quality of care provided. For example, the Agency for Healthcare Research and Quality (AHRQ) Patient Safety and Adverse Events Composite measure, known as PSI 90, includes 10 different component indicators (measures).

3.2.10 Inverse Measure

Measures for which a lower performance rate is better.

3.3 The Entities/Organizations and Their Roles

This section covers the various entities working with the clinical quality measures and the roles they play. This includes the measure steward, measure developer, standards development organizations, endorsing agencies, adopting agencies, implementers, and consumers.

3.3.1 Measure Steward

The measure steward is an individual or organization that owns a measure and is responsible for its maintenance[12]. Measure stewards can be measure developers.

In the case of the EHDI-1a measure, CDC is the measure steward but not the measure developer. Users submit measure data to other adopting agencies, not CDC.

3.3.2 Measure Developer

The measure developer is an individual or organization that plans, creates, and maintains a measure. The measure developer is an individual or organization that plans, creates, and maintains a measure, including government agencies, such as CMS and AHRQ, private not-for-profit organizations, such as TJC and NCQA, and for-profit companies, such as Healthgrades and U.S. News and World Report.

CMS adopted the EHDI-1a measure under its Inpatient Hospital Quality Reporting program. CMS acts as the measure developer and collaborates with CDC as the measure steward to implement changes.

3.3.3 Standards Development Organizations (SDOs)

An SDO is an organization that develops technical standards, guidelines, and rules to help healthcare entities collect, store, use, and exchange secure protected health information.

Health Level 7 (HL7) International is the global authority on interoperability standards. A non-profit, ANSI-accredited SDO with the mission “to provide standards that empower global health data interoperability.” HL7 supports and promotes standards for “exchange, integration, sharing,

[12] National Quality Forum. (2013). *Phrasebook: A Plain Language Guide to NQF Jargon*. Washington, DC. Available at: http://public.qualityforum.org/NQFDocuments/Phrasebook.pdf. Accessed on: March 30, 2017.

and retrieval of electronic health information that supports clinical practice and the management, delivery and evaluation of health services."[13]

IHE is an "initiative by healthcare professionals and industry to improve the way computer systems in healthcare share information. IHE promotes the coordinated use of established standards such as Digital Imaging and Communications in Medicine (DICOM)[14] and HL7 to address specific clinical needs in support of optimal patient care."[15]

3.3.4 Endorsement Agencies

Professional societies and consumer groups often endorse developed quality measures. The endorsement process is consensus-based and allows stakeholders to evaluate a proposed measure. Usually, a nonprofit or government agency convenes stakeholders to rigorously review potential quality measures and endorse those that meet pre-established standards.

NQF is a nonprofit, nonpartisan, organization working toward high quality, high value health care that is safe and equitable. NQF reviews, endorses, and recommends use of standardized healthcare performance measures that support quality goals. NQF uses a formal consensus development process to evaluate and endorse performance measures, clinical best practices, and reporting guidelines. NQF-endorsed measures are recognized as meeting high-quality standards and provide validity to a provider or organizations adoption of a measure.

NQF initially endorsed the EHDI-1a measure in 2011 and re-endorsed it in 2016. The NQF-endorsed measure is identified as NQF 1354.

3.3.5 Adopting Agencies

CMS is a federal agency that administers Medicare, Medicaid, and the Children's Health Insurance Program. CMS is the largest U.S. health plan insurer and provides coverage to over 100 million people.[16] CMS uses quality measures in its quality improvement, public reporting, and value-based reporting programs. CMS selects measures for quality improvement based on the National Quality Strategy and regulatory mandates, such as the Affordable Care Act.

AHRQ is a federal agency whose mission is to improve U.S. healthcare safety and quality.[17] AHRQ develops and uses quality measures to monitor and improve the nation's healthcare delivery system.

[13] http://www.hl7.org/

[14] DICOM is the registered trademark of the National Electrical Manufacturers Association for its standards publications relating to digital communications of medical information. DICOM is a standard for handling, storing, printing, and transmitting information in medical imaging.

[15] https://www.ihe.net/

[16] https://www.cms.gov/

[17] https://www.ahrq.gov/

The Joint Commission (TJC) is a private, non-profit organization that accredits and certifies U.S. providers.[18] Its mission is to continuously improve quality and value by evaluating provider's provision of care. TJC develops and uses quality measures in support of its mission.

CMS chose the EHDI-1a measure as one of the Meaningful Use Stage 2 quality measures[19] for eligible hospitals in the Clinical Process/ Effectiveness National Quality Strategy Domain. The TJC also chose it as one of 13 eCQMs for accreditation.

3.3.6 Care Providers

In this paper, care providers refer to organizations that deliver care and generate the data used to assess the quality measure.

3.3.7 Measure Implementer

Organizations that extract care delivery data and compute quality measure results. Care providers often fill the role of measure implementer.

3.3.8 Accreditation Agencies

Accreditation ensures a provider or organization meets established standards. This is different from endorsement, which focuses on a measure. Accreditation applies to standards that assess hospital performance with well-defined and/or endorsed measures.

Accreditation recognizes a commitment to quality and ability to meet regulatory requirements that some insurers mandate for reimbursement. Numerous healthcare accreditation organizations exist, like AHRQ, TJC, NCQA, and URAC.

[18] https://www.jointcommission.org/

[19] https://www.cms.gov/regulations-and-guidance/legislation/ehrincentiveprograms/downloads/2014_cqm_eh_finalrule.pdf

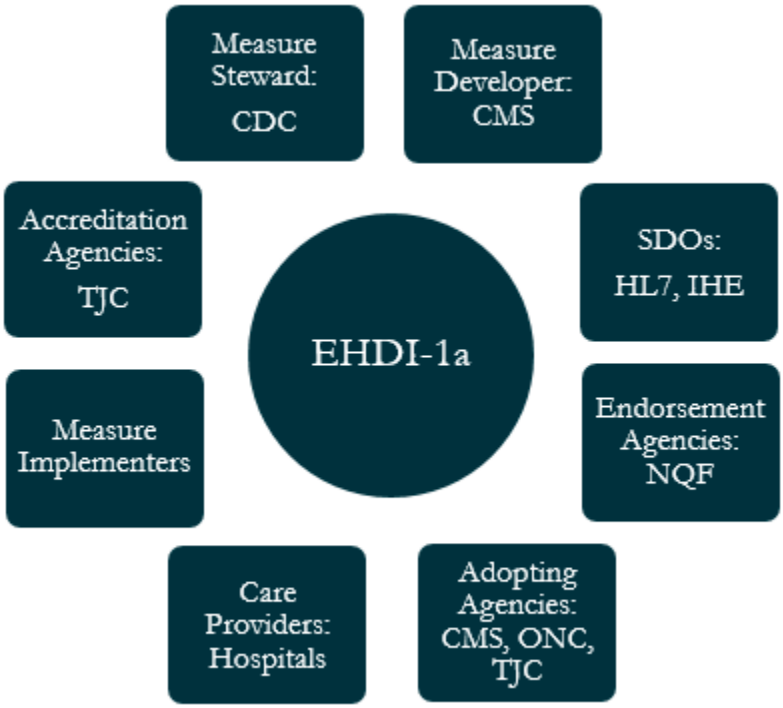

Figure 2 – Organizations Involved in the EHDI-1a Measure

3.4 Measure Lifecycle

The measure lifecycle is composed of five phases: conceptualization, specification, testing, implementation, and use/continuous evaluation/maintenance. This is an iterative process throughout the measure lifecycle.

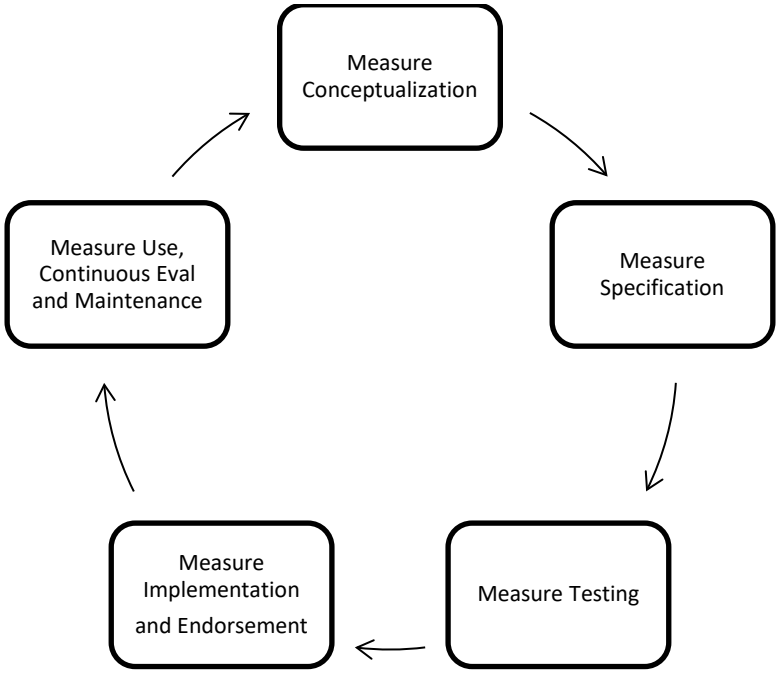

Figure 3 – Measure Lifecycle

3.4.1 Conceptualization

Quality measures begin with evidence. Often, clinical practice guidelines and standards of care[20] are a starting point in determining where quality measurement is necessary. They provide the evidence to develop the measure. Information gathering includes an environmental scan, business case, existing or related measures review, and stakeholder input.

Sources for stakeholder feedback can include technical expert panels (TEPs), public comment, CMS/ONC Issue Tracking System (JIRA), advocacy groups, and associations.

The measure steward and/or measure developer completes the conceptualization stage.

3.4.2 Scientific review

Measure evaluation criteria can include assessments of reliability, validity, feasibility, and usability. Reliability represents how well a measure functions across users over time. Validity represents how well a measure provides the intended information. Feasibility represents the availability of the information to calculate a measure. Understanding usability represents the extent that a measure is used for quality improvement and decision-making.

The measure steward and/or measure developer completes the scientific review.

[20] A standard of care based on high-quality evidence that outlines the recommended course of care, including relevant options and their outcomes and designed to help providers make the best possible care decisions.

3.4.3 Specification

Measure specifications provide comprehensive technical details for how users should collect the measure. This iterative process includes defining the data source, specifying code sets (i.e., terminologies), defining the data elements, and testing for feasibility. Through each iteration, the measure specifications become more precise.

Harmonization of the measure is an important step in the specification process. It standardizes similar measures that cannot be combined. Harmonization of measures eases the burden on implementers and vendors (please see Section 3.3.5 below on the implementation stage) by sharing data elements for re-use and use in multiple programs and care settings.

The measure steward and/or measure developer completes the specification phase.

3.4.4 Testing

Measure testing assesses the quality of the technical specifications and analyzes the measure evaluation criteria. This begins with a testing work plan, testing of measure validity and reliability, test result analysis, and measure refinement. Validity testing determines if quality measures truly measure what they are designed to measure, and reliability testing determines if measures yield stable, consistent results.

The testing phase involves the measure steward and/or measure developer and organizations participating in test phases. Although the measure steward tests the measure, implementer participation and feedback are critical at this stage.

3.4.5 Implementation

This is the execution phase of a measure. Many entities are involved in the implementation phase of a measure. The measure steward and/or measure developer may submit the measure for endorsement during this phase. Adopting agencies that have selected the measure for their program(s) make the measure available for use. Health IT vendors incorporate the measure specifications into their product. Clinicians who choose to report on the measure then use the product to capture data for measure reporting.

3.4.5.1 Measure Endorsement/Maintenance/Disposition

Professional societies and consumer groups often endorse quality measures. The endorsement process is a consensus-based method that allows stakeholders to evaluate a proposed measure. Usually, a nonprofit organization, such as the National Quality Forum (NQF) or government agency like AHRQ, convenes stakeholders to rigorously review potential quality measures and endorse those that meet pre-established standards. Endorsed measures pass a thorough scientific and evidence-based review.

Effective measures are feasible, evidence-based, and scientifically acceptable (i.e., valid and reliable) throughout their use and through regular review cycles. Measure production and monitoring occurs through three basic review types: (1) measure updates, (2) comprehensive reevaluations, and (3) ad hoc reviews.

Updates to the measure justification and technical specifications occur through a continuous evaluation process, known as the Annual Update in federal reporting programs. This ensures the procedure, diagnostic, and other codes within the measure are updated as the code sets change. Stewards and developers update the logic and data elements based on public comment, implementer feedback, or QDM changes. The CMS Annual Update is another opportunity for measure harmonization.

A comprehensive reevaluation of each measure is conducted every three years. During a comprehensive reevaluation, the developer/steward performs a literature review for recent studies, changes in clinical guidelines, and analysis of performance rates. This process ensures the measure remains valid.

An ad hoc review is a limited examination of the measure based on new information. This is necessary for changes in scientific evidence supporting the measure. Ad hoc reviews can occur at any time, regardless of the update or reevaluation schedule.

The measure steward and/or measure developer complete the maintenance phase but it affects health IT vendors who must make maintenance changes to their EHR products, and clinicians who report on the measure must also adjust to any changes in the workflows and/or the way how system functions. The disposition of a measure is described as endorsed, provisionally endorsed, withdrawn, topped out, or retired. Measures are endorsed if they meet all criteria specified by the endorsement agency, or may be granted a provisional endorsement. A measure is denoted as "topped-out" if its overall performance is so high (near 100 percent) that it is no longer meaningful to collect and report on it. The measure steward/developer evaluates the cost of maintaining measures nearing maximum effectiveness against the value of performance.

For federal programs, measure maintenance reviews may result in the need to change the disposition of a measure. Measures may need updates to the specifications to reflect new information. If a measure is retired, the adopting agency will no longer collect or report data on it. The removal of a measure is based on if it is no longer in a program. Removal from one program does not mean other programs must stop using the measure.

Endorsement agencies, the measure steward and/or measure developer complete the measure disposition.

3.5 eCQM Standards, Implementation Guides, and Profiles

Standards, also called specifications or protocols, promote functionality. Base standards cover a broad set of use cases, while implementation guides and profiles cover a narrower set. Often, implementers rely on additional guidance to understand how to use a base standard for a specific use case.

Clinical Document Architecture (CDA®)[21] and Fast Healthcare Interoperability Resources (FHIR®)[22] are examples of base standards. These base standards create structured documents for

[21] CDA is the registered trademark of Health Level Seven International.

[22] FHIR is the registered trademark of Health Level Seven International.

exchange. Although beyond the scope of this white paper, base standards are important to the standards landscape and interoperability.

Quality Reporting Document Architecture (QRDA) and Consolidated CDA (C-CDA) are implementation guides (IGs) that narrow the use of the CDA base standard. The IHE Quality Measure Execution –Early Hearing (QME-EH) is a profile that further narrows guidance from the QRDA IG for the use case of computing the EHDI-1a measure.

Organizations update base standards, implementation guides, and profiles as new information becomes available or is replaced/removed and as practices, guidelines, and requirements change.

3.5.1 Quality Data Model (QDM)

QDM is an information model and expression language for electronic measures that defines clinical concepts in a standardized format for electronic quality performance measurement. It maintains context for a concept through logic expressions. It automates structured data captured in EHRs and other electronic clinical sources. Computers follow QDM to consistently locate and interpret information for quality measurement.

QDM uses data elements to describe measurement parameters. This includes the data element categories, data types, attributes, and value sets. Value sets are the codes, like SNOMED CT, ICD, RxNorm, and LOINC, for a concept in a patient's record. Please refer to Section 3.6 for more information about these coding systems.

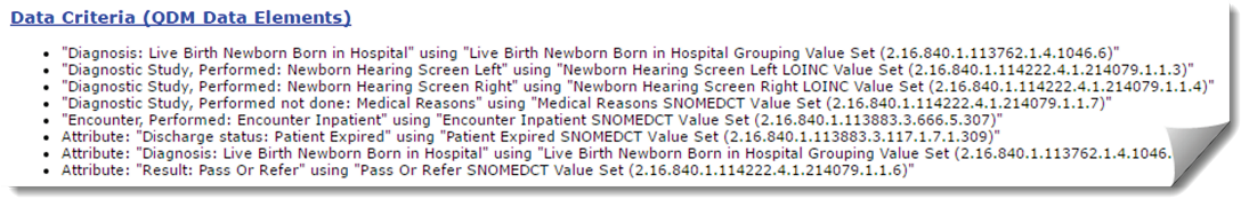

Figure 4 – QDM Data Elements in the EHDI-1a Measure

3.5.2 Health Quality Measure Format (HQMF)

HQMF is an XML-based standard that shows the measure content in both human and machine-readable forms. It provides a standard structure for constructing an electronic quality measure. HQMF provides consistency and unambiguous interpretation.

The code structure includes a header and body. The header is for classification and management of the quality measures and metadata that describes the measure. The body carries the content of the quality measure (i.e., logic and data elements). This allows a machine to analyze the content into sections and perform calculations.

QDM and HQMF specify an electronic measure. The QDM-based HQMF Implementation Guide provides QDM templates for creating eCQMs. The EHDI-1a Newborn Hearing Screening measure started as an eCQM rather than a chart-abstracted or paper measure.

eMeasure Title	**Hearing Screening Prior To Hospital Discharge**		
eMeasure Identifier (Measure Authoring Tool)	31	**eMeasure Version number**	4.0.000
NQF Number	1354	**GUID**	0924fbae-3fdb-4d0a-aab7-9f354e699fde
Measurement Period	January 1, 20XX through December 31, 20XX		
Measure Steward	CDC National Center on Birth Defects and Developmental Disabilities		
Measure Developer	CDC Early Hearing Detection and Intervention Program		
Endorsed By	National Quality Forum		
Description	This measure assesses the proportion of births that have been screened for hearing loss before hospital discharge.		
Copyright	None		
Disclaimer	These performance measures are not clinical guidelines and do not establish a standard of medical care, and have not been tested for all potential applications. The measures and specifications are provided without warranty. CMS has contracted with Mathematica Policy Research and its subcontractors, Lantana and Telligen, for the continued maintenance of this electronic measure.		
Measure Scoring	Proportion		
Measure Type	Process		
Measure Item Count	Encounter, Performed: Encounter Inpatient		
Stratification	None		
Risk Adjustment	None		
Rate Aggregation	None		
Rationale	Birthing facility staff should review the effectiveness and timeliness of screening relative to nursery discharge. Benchmarks set within the EHCP may trigger hospital or jurisdictional compliance activities, such as re-writing of procedural guidelines or re-training of screening staff.		
Clinical Recommendation Statement	None		
Improvement Notation	Improvement noted as an increase in rate.		
Reference	HRSA Title V Block Grant MCHB Performance Measure: Percentage of newborns who have been screened for hearing before hospital discharge.		
Reference	U.S. Preventive Services Task Force (http://www.ahrq.gov/clinic/uspstf/uspsnbhr.htm) Year 2007 Position Statement: Principles and Guidelines for Early Hearing Detection and Intervention Programs. Joint Committee on Infant Hearing. Pediatrics 2007;120:898-921 (http://pediatrics.aappublications.org/cgi/content/full/120/4/898?		

Figure 5 – EHDI-1a Measure Expressed in HQMF (Header)

Table of Contents

Population Criteria

- **Initial Population =**
  - AND: Occurrence A of $EncounterInpatient ends during "Measurement Period"
  - AND: Union of:
    - "Diagnosis, Active: Liveborn Newborn Born in Hospital"
    - "Diagnosis, Active: Livebirth"
    - starts during Occurrence A of $EncounterInpatient
- **Denominator =**
  - AND: Initial Population
- **Denominator Exclusions =**
  - OR:
    - AND: Intersection of:
      - Occurrence A of $EncounterInpatient
      - "Encounter, Performed: Encounter Inpatient (discharge status: Patient Expired)"
    - AND NOT: Union of:
      - "Diagnostic Study, Performed: Newborn Hearing Screen Left (result: Pass Or Refer)"
      - "Diagnostic Study, Performed: Newborn Hearing Screen Right (result: Pass Or Refer)"
      - during Occurrence A of $EncounterInpatient
- **Numerator =**
  - AND: Union of:
    - "Diagnostic Study, Performed: Newborn Hearing Screen Left (result: Pass Or Refer)"
    - "Diagnostic Study, Performed not done: Medical Reasons" for "Newborn Hearing Screen Left"
    - during Occurrence A of $EncounterInpatient
  - AND: Union of:
    - "Diagnostic Study, Performed: Newborn Hearing Screen Right (result: Pass Or Refer)"
    - "Diagnostic Study, Performed not done: Medical Reasons" for "Newborn Hearing Screen Right"
    - during Occurrence A of $EncounterInpatient
- **Numerator Exclusions =**
  - None
- **Denominator Exceptions =**
  - None
- **Stratification =**
  - None

Data Criteria (QDM Variables)

- **$EncounterInpatient =**
  - "Encounter, Performed: Encounter Inpatient" satisfies all
    - (length of stay <= 120 day(s))
    - ends during "Measurement Period"

Data Criteria (QDM Data Elements)

- "Diagnosis, Active: Livebirth" using "Livebirth SNOMEDCT Value Set (2.16.840.1.114222.4.1.214079.1.1.1)"
- "Diagnosis, Active: Liveborn Newborn Born in Hospital" using "Liveborn Newborn Born in Hospital Grouping Value Set (2.16.840.1.113762.1.4.1046.6)"
- "Diagnostic Study, Performed: Newborn Hearing Screen Left" using "Newborn Hearing Screen Left LOINC Value Set (2.16.840.1.114222.4.1.214079.1.1.3)"
- "Diagnostic Study, Performed: Newborn Hearing Screen Right" using "Newborn Hearing Screen Right LOINC Value Set (2.16.840.1.114222.4.1.214079.1.1.4)"
- "Diagnostic Study, Performed not done: Medical Reasons" using "Medical Reasons SNOMEDCT Value Set (2.16.840.1.114222.4.1.214079.1.1.7)"
- "Encounter, Performed: Encounter Inpatient" using "Encounter Inpatient SNOMEDCT Value Set (2.16.840.1.113883.3.666.5.307)"
- Attribute: "Result: Pass Or Refer" using "Pass Or Refer SNOMEDCT Value Set (2.16.840.1.114222.4.1.214079.1.1.6)"
- Attribute: "Discharge status: Patient Expired" using "Patient Expired SNOMEDCT Value Set (2.16.840.1.113883.3.117.1.7.1.309)"

Supplemental Data Elements

- "Patient Characteristic Ethnicity: Ethnicity" using "Ethnicity CDCREC Value Set (2.16.840.1.114222.4.11.837)"
- "Patient Characteristic Payer: Payer" using "Payer SOP Value Set (2.16.840.1.114222.4.11.3591)"
- "Patient Characteristic Race: Race" using "Race CDCREC Value Set (2.16.840.1.114222.4.11.836)"
- "Patient Characteristic Sex: ONC Administrative Sex" using "ONC Administrative Sex AdministrativeGender Value Set (2.16.840.1.113762.1.4.1)"

Risk Adjustment Variables

- None

Measure Set	Early Hearing Detection and Intervention (EHDI)

Figure 6 – EHDI-1a Measure Expressed in HQMF (Body)

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3.5.3 Quality Reporting Document Architecture (QRDA)

QRDA is a Health Level 7 (HL7) standard document format for the exchange of electronic clinical data. It specifies how to assemble and submit reports to quality or other organizations. While there is no prerequisite that a QRDA document must be based on an eMeasure, the QDM-based QRDA standard aligns tightly with HQMF.

The two categories of QRDA in healthcare are

- QRDA Category I (QRDA-I): Single-Patient Report
  - Contains information relevant to the quality measure for one patient
  - Includes information for one or more quality measures
  - Raw data
  - Users can calculate the result for an individual or organization's measure process or outcome using individual patient reports
- QRDA Category III (QRDA-III): Multiple Patient Aggregate Report
  - Report using data aggregated multiple QRDA I patient reports
  - Contains calculated quality data for one or more measures for a specified population of patients within a health system over a specific period
  - Aggregates quality results (e.g., total number of patients in the Numerator, total number of patients in the Denominator) for the quality data recipient
  - Does not contain protected health information, thereby protecting patients and healthcare providers from the risks of inadvertent leakage of private information

Appendix A includes examples of EHDI-1a QRDA-I and QRDA-III.

3.5.4 Clinical Quality Language (CQL)

CQL is an emerging HL7 standard for trial use. It is available for implementation following the HL7 ballot process. However, it has not received the American National Standards Institute accreditation.[23] CQL defines a representation for the expression of clinical knowledge used within both the Clinical Decision Support (CDS) and Clinical Quality Measurement (CQM) domains. The goal of CQL is to harmonize expressions between eCQMs and CDS.[24]

CQL expresses human readable logic in a structured manner that allows for electronic query processing. In the future, CQL may cover all clinical quality measure Health Quality Measure Format (HQMF) electronic specifications and replace the logic expressions defined in the Quality Data Model (QDM). CQL may not replace the data elements in the QDM.

[23] https://www.ansi.org

[24] https://ecqi.healthit.gov/cql

A CQL-based HQMF Implementation Guide, which describes how to represent eCQMs using HQMF and CQL logic, is also available[25]. The CQL-based HQMF is in the testing phase of a transition plan to replace the QDM logic expression in use.

Testing of the CQL standard and CQL-based HQMF in the MAT and Bonnie tools for writing logic expressions are in progress[26]. An expression of the EHDI-1a measure using CQL is under development.

3.6 Healthcare Terminologies

In healthcare quality measurement, terminology is the vocabulary or language used to capture, store, retrieve, calculate, and share data. Healthcare terminology ensures data elements have the same meaning across settings and providers and supports interoperability (i.e., electronic data exchange) between systems because it is based on standardized codes.

3.6.1 SNOMED CT

The Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT) is a clinical terminology standard for the electronic exchange of clinical health information. The International Health Terminology Standards Development Organization owns and maintains the terminology. The U.S. National Library of Medicine (NLM) is the U.S. National Release Center. This means that NLM is the official point of contact for the U.S. and they maintain the U.S. Edition of the terminology. NLM also provides the SNOMED CT content to anyone who has a free Unified Medical Language System (UMLS) Metathesaurus License and UMLS Terminology Services account.

SNOMED CT supports EHR capture of data through 19 broad concepts, such as body structure, clinical findings, events, procedures, and substances.

3.6.2 International Classifications of Diseases (ICD)

Maintained by the World Health Organization, ICD classifies diseases and other health issues for identification and reporting purposes. ICD codes encompass diseases, disorders, injuries, and procedures. ICD enables storage and retrieval of diagnostic information for clinical, epidemiological, and quality purposes.[27]

eCQMs utilize ICD-9 (9^{th} revision) and ICD-10 (10^{th} revision) diagnoses and procedure codes to help identify pertinent patient populations.

[25] http://www.hl7.org/implement/standards/product_brief.cfm?product_id=405

[26] https://bonnie.healthit.gov/

[27] http://www.who.int/classifications/icd/en/

3.6.3 LOINC

Logical Observation Identifiers Names and Codes (LOINC)[28] is a standard that identifies laboratory measurements and observations. The Regenstrief Institute created the standard. The Regenstrief Institute maintains it, and it is free to users.

eCQMs use LOINC codes to record laboratory procedures and values.

3.6.4 RxNorm

RxNorm provides normalized names for clinical drugs. It links many of the drug vocabularies commonly used in pharmacy management and drug interaction software and includes clinical drug property codes, category codes, and other pertinent drug information.[29] By providing normalized drug names and unique identifiers, RxNorm supports interoperability between disparate data systems that use different drug names.

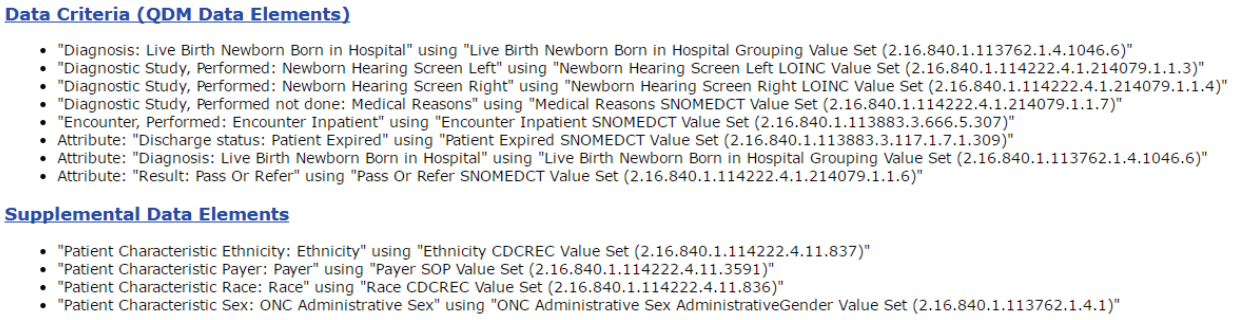
eCQMs use RxNorm codes to identify and define measure populations and whether a standard of care was provided.

Each quality measure, whether electronic or chart-based, includes a list of the data elements with relevant value sets that compute the measure and report on the determined result. Data elements represent the clinical concepts of a measure. Value sets represent concepts that consist of either single or a grouping of multiple code systems such as LOINC and SNOMED. The Data Criteria and Supplemental Data Elements lists summarized at the end of the eCQM measure definition identify the necessary information in a clinical summary document from which a patient-level quality report (PLQR) can be directly extracted. This list reduces the burden on the provider by eliminating the need to generate a PLQR separately from the clinical summary document. The key to higher quality clinical summaries, which include necessary information to support quality measures, is to align data collection in the clinical summaries with the data elements required for quality reporting.

The following figure shows the data elements and associated value sets for the EHDI-1a measure (CMS31v6).

[28] https://loinc.org/

[29] https://www.nlm.nih.gov/research/umls/rxnorm/



Data Criteria (QDM Data Elements)

- "Diagnosis: Live Birth Newborn Born in Hospital" using "Live Birth Newborn Born in Hospital Grouping Value Set (2.16.840.1.113762.1.4.1046.6)"
- "Diagnostic Study, Performed: Newborn Hearing Screen Left" using "Newborn Hearing Screen Left LOINC Value Set (2.16.840.1.114222.4.1.214079.1.1.3)"
- "Diagnostic Study, Performed: Newborn Hearing Screen Right" using "Newborn Hearing Screen Right LOINC Value Set (2.16.840.1.114222.4.1.214079.1.1.4)"
- "Diagnostic Study, Performed not done: Medical Reasons" using "Medical Reasons SNOMEDCT Value Set (2.16.840.1.114222.4.1.214079.1.1.7)"
- "Encounter, Performed: Encounter Inpatient" using "Encounter Inpatient SNOMEDCT Value Set (2.16.840.1.113883.3.666.5.307)"
- Attribute: "Discharge status: Patient Expired" using "Patient Expired SNOMEDCT Value Set (2.16.840.1.113883.3.117.1.7.1.309)"
- Attribute: "Diagnosis: Live Birth Newborn Born in Hospital" using "Live Birth Newborn Born in Hospital Grouping Value Set (2.16.840.1.113762.1.4.1046.6)"
- Attribute: "Result: Pass Or Refer" using "Pass Or Refer SNOMEDCT Value Set (2.16.840.1.114222.4.1.214079.1.1.6)"

Supplemental Data Elements

- "Patient Characteristic Ethnicity: Ethnicity" using "Ethnicity CDCREC Value Set (2.16.840.1.114222.4.11.837)"
- "Patient Characteristic Payer: Payer" using "Payer SOP Value Set (2.16.840.1.114222.4.11.3591)"
- "Patient Characteristic Race: Race" using "Race CDCREC Value Set (2.16.840.1.114222.4.11.836)"
- "Patient Characteristic Sex: ONC Administrative Sex" using "ONC Administrative Sex AdministrativeGender Value Set (2.16.840.1.113762.1.4.1)"

Figure 7 – EHDI-1a Data Elements and the Terminologies (Value Sets) That Define Them

3.7 eCQM Tools

3.7.1 Measure Authoring Tool (MAT)

Measure developers use the MAT, a web-based tool, to write eCQMs using current standards. The MAT supports QDM authoring and is testing CQL authoring in anticipation of eventually writing all eCQMs in the CQL specifications. The tool exports measures in multiple formats, including a human-readable document in a web browser (HTML) and an HQMF XML document for integration with EHRs.

Measure developers rely on both the MAT and Bonnie to promote tested measure development.

CMS sponsors the MAT, which is freely available to registered users. The MAT can be accessed here: https://www.emeasuretool.cms.gov/

3.7.2 Value Set Authority Center (VSAC)

The VSAC is the central repository for the official versions of value sets in eCQMs. Each value set contains the numerical values (i.e., codes) and human-readable names (i.e., terms) from standard vocabularies, such as SNOMED CT®, RxNorm, LOINC, and ICD-10-CM, which define the clinical and administrative concepts in the quality measures.

NLM provides VSAC, in collaboration with the Office of National Coordinator for Health Information Technology (ONC) and CMS. Users can download value sets and the data element catalog through the VSAC. Access to view or download content requires a free Unified Medical Language System® Metathesaurus License (UMLS), which users can obtain here: https://uts.nlm.nih.gov/license.html. Users can access the VSAC here: https://vsac.nlm.nih.gov/

Value Sets

VSAC can produce a single list of all value sets used with the EHDI-1a Newborn Hearing Screening Measure. This is an easy way to view all relevant codes from the various code systems and their versions over time.

3.7.3 Bonnie

Bonnie is a software tool measure developers use to test eCQM logic before releasing a measure version. Using synthetic test cases, the tool converts measure definitions into a format that allows execution of the measure logic and evaluates if the defined logic behaves as expected, or deviates from the intent of the measure. This is expected to improve eCQMs by ensuring the logic performs appropriately.

CMS and ONC sponsor Bonnie. Bonnie software is open-source and registration is free. Users can access Bonnie here: https://bonnie.healthit.gov

3.7.4 Cypress

Cypress is the official testing and certification tool for the EHR Certification program. EHR vendors and Authorized Testing Labs use it to verify the accuracy of Stage 2 Meaningful Use (MU) eCQM calculations by EHRs through an analytics engine and calculation software.

Cypress is an open source, web-based application supported by the ONC and CMS. It is available for download here: https://www.healthit.gov/cypress/release.html

4 Putting it all together

Peter Drucker said, “You can’t manage what you don’t measure?” Sound measurement is critical to effectively managing, monitoring and improving healthcare quality. This requires solid measurement tools, such as scientifically reliable eCQMs.

To construct an eCQM, you first determine what you intend to measure and identify the most appropriate type of measure to support this measurement. Then, build the scientific evidence base, gather input from stakeholders, and establish the requirements to define or specify the measure. eCQM logic statements follow QDM and HQMF. Developers create value sets in VSAC according to terminology standards. Once the measure is specified, developers can construct it in the MAT using the value sets and QDM data elements. The developer exports the measure from the MAT and tests the logic with tools like Bonnie. If the developer finds logic errors or the measure does not perform as intended, the whole process starts over.

The measure steward releases the measure for implementation after testing and approving it. This is typically when a measure steward seeks endorsement for the measure, or re-endorsement, depending on the review cycle.

Following implementation, healthcare providers capture and report data according to the measure specifications. To report the data, the measure is presented in the proper QRDA format. Cypress is a tool that tests and verifies the reporting structure before the receiving entity receives the data.

The receiving entities, such as insurers, payers, and accreditation agencies, use the data to monitor quality effectiveness and performance. Healthcare providers and organizations also use the results to make improvements. For example, many state EHDI programs use EHDI-1a to monitor the hospital hearing screening programs. Monthly or quarterly quality reports inform the state public health agency about program performance. Analysis of the quality measure information can help states identify populations at risk of not receiving hearing screening prior to hospital discharge. Analysis informs those involved with directing resources and assistance for program improvement.

5 Continuous Evolution within the eCQM Ecosystem

5.1 Needs, Requirements, and Technical Dependencies (when and why)

Maintenance ensures measures reflect changes in evidence-based medicine, code sets, and logic. This is an iterative cycle of review, re-specification, and testing.

QRDA uses the QDM and HQMF for data modeling. Developers build value sets from code systems, which rely on terminology standards. eCQM logic testing in Bonnie depends on the correct value set version applied to the measure logic. Building an accurate measure in the MAT depends on current QDM and terminology standards. These examples demonstrate the importance of measure creation, maintenance, and the underlying standards.

5.2 Why Things Change Over Time

Measures can change over time with changes to the underlying data model, standards, and terminologies. It is helpful when developers and stewards understand the various schedules for updates throughout the calendar year.

5.2.1 Input from Users

Transparency with quality measures, particularly eCQMs, is important to maintaining a measure's validity. The federal government encourages stakeholder feedback on eCQMs in its programs. The vehicle for this is the ONC JIRA[30] system. Stakeholders can submit questions and comments for the measure developer, measure steward, and technical reporting team. The JIRA system assigns comments to the correct recipient, who will post a response or solution to JIRA. Many eCQM changes occur this way as implementers identify issues.

5.2.2 Changes in the Standards

Changes to standards can cause changes to measures. For example, ICD codes are updated annually. This may necessitate changes to data elements within a measure. The QDM undergoes routine updates, which in turn affect measures for the Annual Update.

5.2.3 Changes in the Systems/Tools/Actors

Changes in systems may include migration from one platform to another, migration from one EHR vendor product to another, or addition or expansion of EHR modules. Tools like Bonnie and the MAT get updated routinely based on user feedback or enhancement requests or changes in the underlying standards. As entities (i.e., actors) change, measures are adapted. For example, the Physician Quality Reporting System is sunsetting[31] and a new program, the Merit-Based Incentive Payment System is beginning. As a result, when new measures are created for the new

[30] https://ecqi.healthit.gov/ecqm-tools-key-resources/tool-library/jira

[31] Sunsetting means to discontinue use or support of a program once a new program has been implemented.

program, some existing measures may be affected and need to adapt to the requirements of the new program.

5.2.4 Continuous Improvement Initiatives

NQF's Measures Application Partnership (MAP) identified opportunities to reduce the reporting burden in federal healthcare programs.[32] It recommended HHS consider the future removal of 51 of 240 measures in seven federal healthcare value-based purchasing, public reporting, and other programs. MAP also recommended improvements to measure sets in nine additional federal programs.

5.2.5 Federal Initiatives

Federal initiatives, such as the Meaningful Use incentive program[33], can cause measures to change. New legislation is also a factor. For example, the 21st Century Cures Act mandates changes to the way certain federal programs measure performance.

5.3 What this means for the eCQM Landscape

Developers use a highly complex system of many interdependent parts to construct eCQMs, each with a unique level of complexity. The process is continually in motion, which raises numerous challenges and barriers to adopting eCQMs.

The following table demonstrates this system by showing how the individual eCQM standards and tools change versions each year.

[32] National Quality Forum. (2017, Mar.). Maximizing the Value of measurement: MAP 2017 Guidance. Retrieved from http://www.qualityforum.org/Publications/2017/03/Maximizing_the_Value_of_Measurement__MAP_2017_Guidance.aspx

[33] https://www.healthit.gov/providers-professionals/meaningful-use-definition-objectives

Reporting/ Performance Period	eCQM Annual Update	EHDI-1a	Tool and Resources			Standards				
			MAT	Cypress	Bonnie	QDM	QDM-based HQMF	HQMF	HL7 QRDA Version	CMS QRDA IG
2018	May 2017	CMS31 v6	V4.6.0	V3.2 (release July 2017)	V1.6.2	V4.3	R1.4	R2.1	QRDA-I, STU R4 QRDA-III, STU R2	Summer 2017
2017	April 2016	CMS31 v5	V4.3.1	V3.0	V1.4.8 (support for QDM 4.2)	V4.2	R1.3	R2.1	QRDA-I, DSTU R3.1 QRDA-III, STU R2	Eligible Hospitals EP/Eligible Clinicians
2016	June 2015	CMS31 v4	V4.2.0	V2.7.0 (supports QRDA R3)	V1.3.7	V4.1.2	R1.1	R2.1	QRDA I, DSTU R3 QRDA III, DSTU R1	V1.0
2015	April 2014	CMS31 v3	V3.1.2	V2.6.1 (supports HL7 QRDA R2)	V1.0	V4.1.1 V4.1 V4.0	R1.0	R1	QRDA I, DSTU R2 (and July 2014 Errata) QRDA III, DSTU R1 (and June 2014 Errata)	V1.0
2014	April 2013	CMS31 v2	V1.1.1	V2.4.1	N/A	HQMF Templates	N/A	R1	QRDA I, DSTU R2 QRDA III, DSTU R1	EH V2.2 EP QRDA I V4.0 EP QRDA III V2.0

Terminologies	
SNOMED CT	International Edition is released twice a year: January 31 and July 31
ICD-10-CM	Updated annually in July
LOINC	New versions are released twice a year: June and December
RxNorm	Updated monthly

Figure 8 – EHDI-1a Measure and Other eCQM Standards and Tools Versions by Years

6 The Problem

Given the challenges of the complex eCQM ecosystem and the burden of quality reporting on care providers? How can hospitals, public health agencies, and reporting programs that transition to standardized digital eCQMs leverage interoperability? Can health information standards achieve valuable business results?

Creating and maintaining an eCQM measure definition is complex. Reporting and receiving electronic quality data can create resource, financial, and technical burdens on providers and healthcare systems. Reducing complexity for measure developers has benefits; however, only a small number of organizations develop and maintain measures.

Changing the way providers collect, compute, and report measure data offers a greater return. Improvements can shift the burden of quality reporting off the clinical care organizations that need to focus on patient care. Changing the way organizations gather, aggregate, and share quality information can increase transparency and consistency for measure computation. This is expected to make quality measure results more accurate and trusted and ultimately more valuable in decision-making. Changing the way organizations track and report quality measure results may increase the availability of quality information. Automated closed-loop communication will allow care providers to use quality measure information for real-time assessment of the quality of care processes. This is expected to improve learning and decision-making related to changes in the healthcare delivery system, and/or care for certain populations.

Valuable improvements seem possible. Can organizations develop technical solutions to leverage the availability of digital care summary information and electronic clinical quality measures in the complex environment surrounding quality measurement reporting?

6.1 Potential Solutions

IHE is a standards development organization specializing in the creation of implementer guidance on the use of available HIT standards to achieve valuable business results. The IHE profile development process is suited for exploring technical solutions and revealing new possibilities.

IHE develops profiles that address the specific requirements of different use cases that examine and address information exchange questions. In terms of alleviating measure reporting burden from providers, it could useful to explore the following key questions:

- Can an agency that receives quality measure results do more to generate this information so providers can do less?
- Is it possible to shift some or all burden off care providers?
- Can a new type of system be developed that it could process the quality measure data and reduce the burden for providers without demanding more of the report receivers?
- Will a middle-man solution allow care providers to monitor and adjust their performance in real-time, rather than waiting for the entire reporting period to pass before they get measure feedback?

The IHE QME-EH Profile attempts to answer these questions by describing a modular technical solution that offers several options for optimizing information exchange for quality reporting. It addresses a variety of scenarios and shows new ways of processing quality measure information to reduce burden, manage complexity more effectively, increase transparency and consistency, and create closed-loop communication of quality information to aid care providers.

An IHE profile uses "technical actors" to analyze an intricate information exchange environment. Technical actors aid in creating new solutions that leverage the use of HIT standards.

Technical actors are abstract roles played by the organization's systems involved in the quality measure landscape. Technical actors help users understand the information processing and exchange required throughout the healthcare ecosystem to make eCQM reporting possible.

The following technical actors developed in the QME-EH Profile describe the computer system capabilities, which various organizations use to create and assess quality measure results and reporting.

6.1.1 Content Creator

A system that can generate standard documents in eCQM reporting is a Content Creator. A Content Creator can produce

- C-CDA documents that convey the summary of care (SoCD)
- QRDA-I documents that express patient-level quality reports (PLQR)
- QRDA-III documents that express aggregate-level quality reports (ALQR)

6.1.2 Report Assembler

A Report Assembler is a system that transforms data from one format into another format. A Report Assembler may transform summary of care data into patient-level quality reports (QRDA-I), based on the data elements required by a measure's definition. It may transform patient-level quality reports into aggregate-level quality reports (QRDA-III), based on the logic and computation requirements defined by the measure.

6.1.3 Content Consumer

A Content Consumer is a system that processes data for computing eCQMs. A Content Consumer may be able to read and process data from any of the file types generated by Content Creators.

Systems used by the entities and organizations involved in quality reporting may have different levels of technical capability. The QME-EH Profile establishes several different options for how information sharing and data processing can work. Organizations that want to improve the efficiency and effectiveness of their quality measure reporting processes can choose an option that might be attainable in the near-term, while planning for additional improvements in the future. The QME-EH Profile shows a continuum of possible technical solutions to help organizations answer strategic planning questions.

Are there options for shifting or sharing the burden of quality reporting in new ways? Consider the differences between use cases 1 and 2.

6.1.4 Use Case 1

A birthing facility participates in a quality measurement program that assesses the quality of the process used to perform hearing screening for newborns. The facility employs a system capable of producing an aggregate-level quality report for the Newborn Hearing Screening measure (EHDI eCQM) defined by the program. The system assembles the final aggregate-level quality report based on data available in the system. It shares the report so that an organization, such as CMS or a Public Health Agency, can access the information. No patient-level information is supplied to support validation of the computation used to generate the aggregate report or to provide patient-level insight information that might be used for risk adjustment.

This Use Case represents the simplest form of electronic sharing of clinical quality measure results. It offers low transparency for information receivers and puts a high processing burden on senders. The figure below shows the technical solution in the QME-EH Profile for organizations operating in this way.

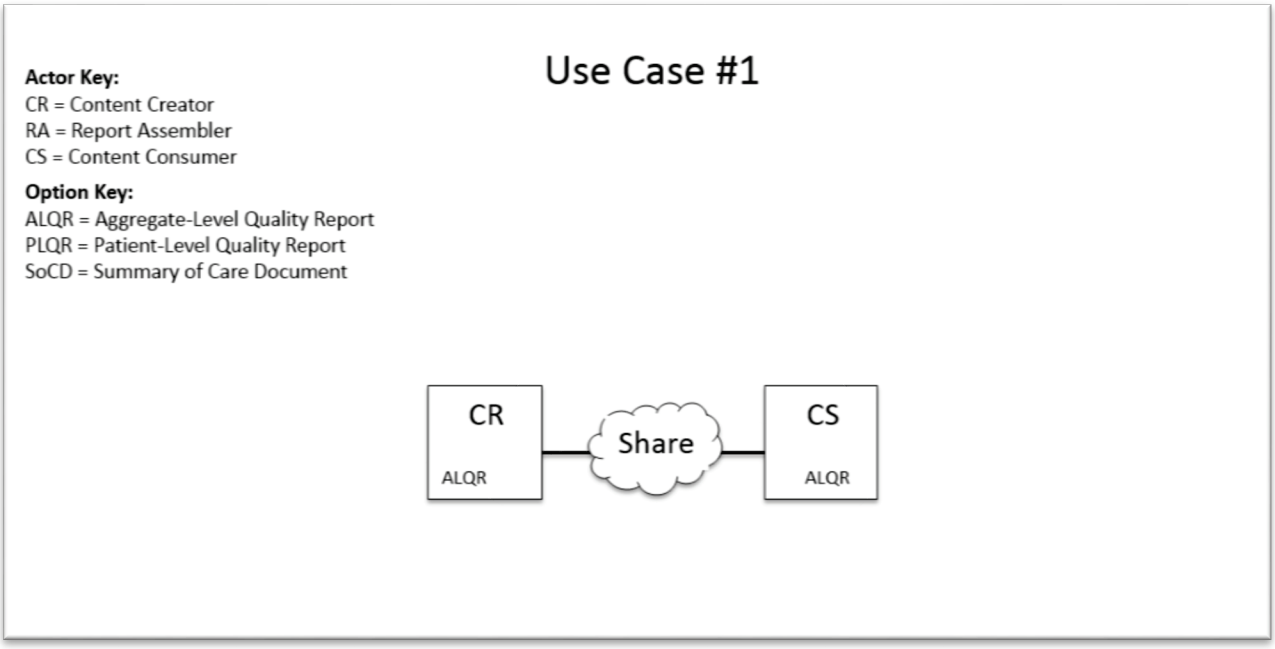


Figure 9 – Use Case #1 in the QME-EH Profile

6.1.5 Use Case 2

A birthing facility participates in a quality measurement program that assesses the quality of the process used to perform hearing screening for newborns. The facility employs a system capable of producing patient-level quality reports for the Newborn Hearing Screening measure as defined

by the eMeasure Definition. The system assembles patient-level quality reports based on data available in the system. It shares the reports with an organization, such as CMS, a Public Health Agency, or a company that offers quality measurement and assessment services.

This Use Case spreads the processing burden across information senders and receivers. Senders only need to submit Patient-Level Quality Reports. Receivers process the Patient-Level Quality Reports to determine the Aggregate-Level results. It offers better transparency for information receivers but an increased burden because they must process Patient-Level Quality Reports to get the needed results.

The figure below shows this technical solution in the QME-EH Profile for this use case. It shows an agency that monitors quality measures to inform changes in care guidelines can reduce the burden of quality reporting for care providers by adding capabilities to its system and act as a Content Consumer of patient-level quality reports from participating care providers.

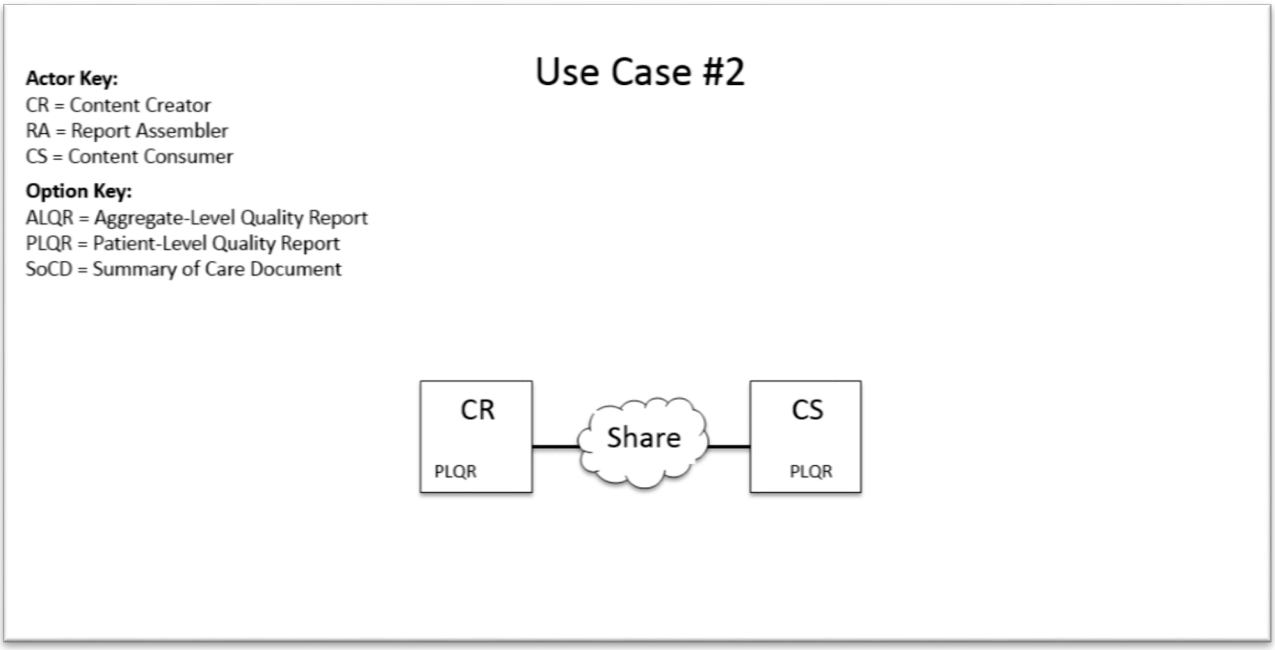


Figure 10 – Use Case #2 in the QME-EH Profile

Due to meaningful use legislation, many EHR systems act as a Content Creator for summary of care documents. They have the burden of generating patient-level or aggregate-level quality reports as well as the summary of care documents. Does the EHR need all this functionality or do other options exist?

What if other systems could process the standardized data in the summary of care documents to extract the necessary data elements for the patient-level quality report? What if a different system specializing in statistical processing took the burden of computing the measure and producing the aggregate-level quality report? Will that reduce the burden of quality reporting for both care

providers and public health agencies? Can it simultaneously increase transparency and consistency in the way users compute quality measure results?

Consider use cases 3 and 4, which use the "middle-man" system in the QME-EH Profile.

6.1.6 Use Case 3

A birthing facility participates in a quality measurement program that assesses the quality of the process used to perform hearing screening for newborns. The facility does not employ a system capable of producing patient-level quality reports for the Newborn Hearing Screening measure as defined by the eMeasure Definition. The system creates summary of care documents based on data available in the system to facilitate continuity of care.

Information available in the summary of care document is shared with a "middle-man" system that processes the summaries of care to produce the patient-level quality reports defined by the eMeasure Definition. The "middle-man" system assembles the patient-level reports and shares them for subsequent processing by recipient systems.

The "middle-man" system may produce an exception report as it produces the patient-level quality reports. The exception report can be used to create a feedback loop to improve the quality of the data in the care summary records being produced by the birthing facility.

A third system at an organization such as CMS or a Public Health Agency accesses the patient-level quality reports.

The figure below shows the technical solution developed in the QME-EH Profile for this use case. This solution shifts data processing burden off the information senders. It offers greater transparency for information receivers because they receive patient-level quality reports, but information receivers carry the burden of processing the patient-level quality reports.

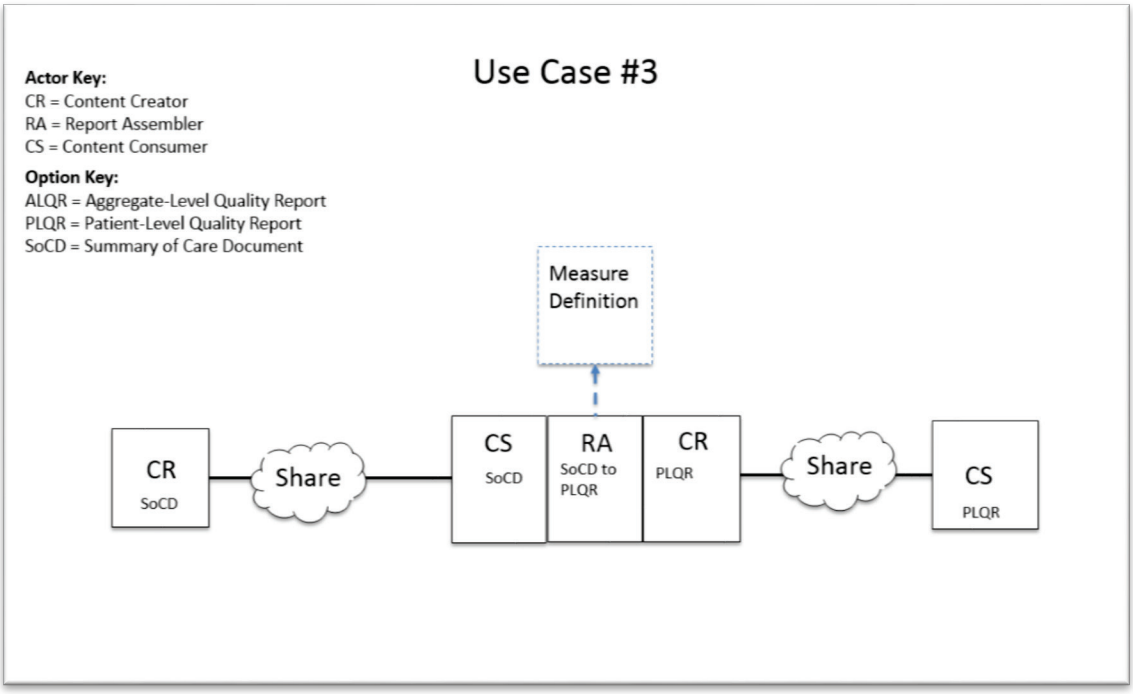


Figure 11 – Use Case #3 in the QME-EH Profile

6.1.7 Use Case 4

As in use case 3, a "middle-man" system is used in use case 4 to process the summaries of care. Unlike in use case 3 where the middle-man system only produces the patient-level quality report, in use case 4, it assembles the patient-level reports and then processes them to produce the aggregate-level quality report as defined by the eMeasure definition. The aggregate-level quality report is shared for subsequent access.

A third system at an organization such as CMS or a Public Health Agency accesses the aggregate-level quality reports to track and monitor process performance against the Newborn Hearing Screening measure.

The figure below shows the technical solution developed in the QME-EH Profile for this use case. This use case shifts data processing burden off the information senders and the information receivers. The new "middle-man" system absorbs the work of processing data already produced by the information sender and does the work of putting the result in a format that can be consumed by the information receiver. Information recipients who do not need transparency into the underlying details may benefit from simply receiving the aggregate-level quality report.

An EHR vendor offering quality measure processing support may have a system that acts as (1) all three actors, (2) consumer of summary of care documents to generate quality reports, or (3) consumer of patient-level quality reports to generate aggregate-level reports. By consolidating the quality measurement processing within a specialized system that off-loads the burden from

other systems, the burden can be reduced for many and concentrate the complexity into a small number of places. It would also make measure computation more consistent and the tracking system more transparent if all the quality reporting data were included in summary of care documents.

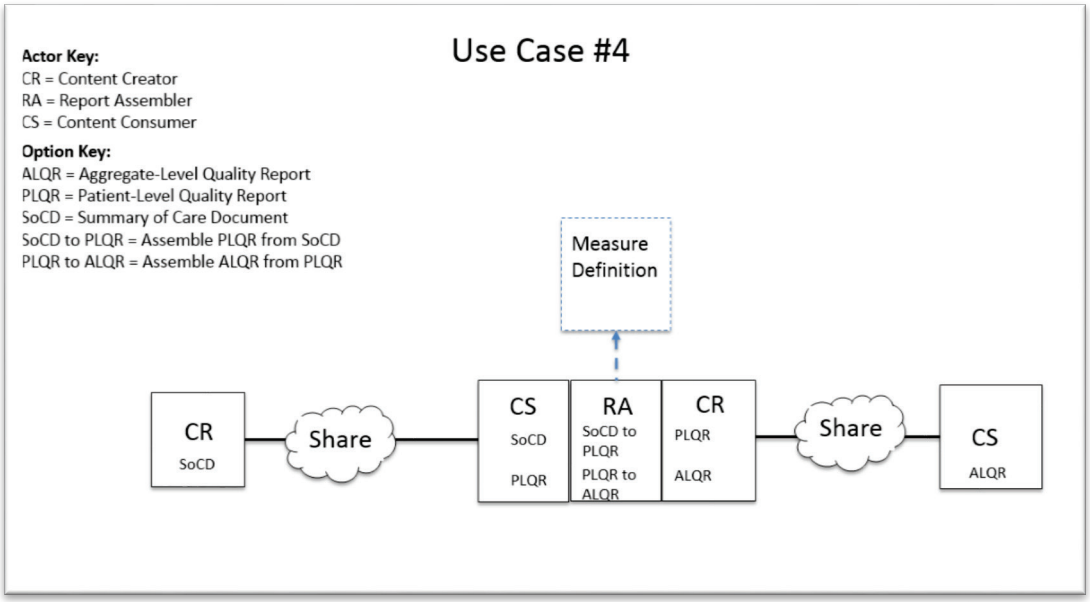


Figure 12 – Use Case #4 in the QME-EH Profile

Use case 4 reveals another option that supports closed-loop communication and moves in the direction of a Learning Health System. Consider the possibilities represented in use case 5.

6.1.8 Use Case 5

This use case is a variation of use case 4. It shows that the system, which does the work of producing the aggregate-level quality report, can share the quality measure results back with the information sender of the original clinical summary data. It shows how closed-loop information sharing can be created for quality reporting.

This use case does not focus on sharing the aggregate-level quality report with a third system at an organization such as CMS or a Public Health Agency. Rather, it focuses on creating a closed-loop communication with the system providing the summary of care documents. The system at the birthing facility accesses the aggregate-level quality reports to track and monitor their process performance against the Newborn Hearing Screening measure.

The figure below shows the technical solution developed in the QME-EH Profile for this use case. Like use case 4, this solution shifts data processing burden off the information senders and the information receivers. The "middle-man" system absorbs the work of processing data already produced by the information sender and does the work of putting the result in a format that can be consumed by the information receiver. Information recipients who do not need transparency

into the underlying details may benefit from simply receiving the aggregate-level quality report, but more importantly, aggregate-level quality reports are made available to the organization participating in the quality program.

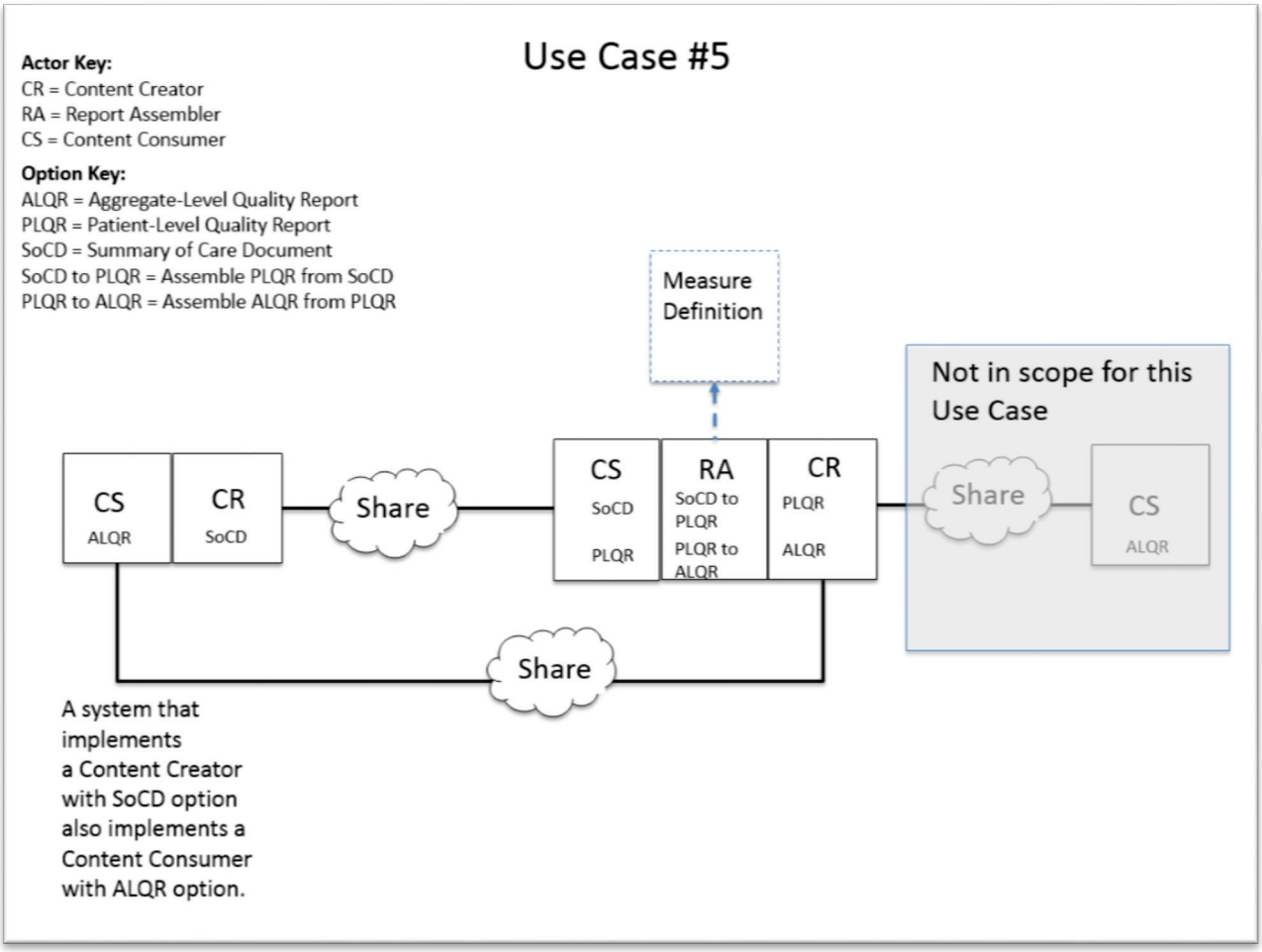


Figure 13 – Use Case #5 in the QME-EH Profile

The QME-EH Profile decomposes the flow of information for quality reporting into technical actors, standardized data, and standardized transactions, and produces a technical solution for the EHDI-1a measure that supports many options for leveraging information standards for more efficient quality measure data collection and reporting. The profile provides implementers with technical specifications that show how to use standards to support the different use cases in a consistent, compatible way. It shows how information processing goals can be achieved without dictating which systems may be employed to make the improvements possible. Organizations can choose to operate in the way that optimizes the value they attain while maximizing the benefits associated with using quality measures to improve care.

Although the technical solution in the QME-EH Profile is specific for the EHDI-1a quality measure, the technical solution it develops is modular. The eCQM measure definition is abstracted and treated as an input to the solution. For this reason, the information processing patterns established in the QME-EH Profile have the potential to be generalized to support other eCQMs. This technical solution represents a solution to reduce the burden of quality measure reporting for care providers in general. It also shows ways to improve management of complexity, increase transparency and consistency, and create more effective uses of quality reporting information by leveraging the availability of digital clinical data and electronic quality measure definitions.

7 Conclusion and Recommendations

This white paper outlines the potential to achieve burden reductions with eCQM standards. The IHE QME-EH Profile explains a technical solution that demonstrates how to reduce the quality reporting burden and more efficiently manage the complexities associated with eCQMs. It identifies the technical roles systems play throughout the eCQM ecosystem and shows how organizations involved in quality measure reporting can leverage interoperability to achieve efficiency, while promoting greater data transparency and consistency.

While the QME-EH Profile focuses specifically on the EHDI-1a measure, the information sharing options represent an opportunity to change the processing method for all eCQM measures.

When EHDI-1a definitions are substituted with other quality measure definitions, the QME-EH Profile shows how to leverage the increasing availability of digital clinical data for processing all electronic quality measures.

The benefits of reduced quality reporting burden, improved management of complexity, increased transparency and consistency, and improved closed-loop communication in the QME-EH Profile can apply to quality reporting more broadly.

The interoperability benefits for quality reporting may also apply to research and public health. For example, these benefits may assist the CDC improve the health of certain populations, such as children with hearing loss. These benefits may also assist research organizations, such as the Patient-Centered Outcomes Research Institute (PCORI), in comparing health care options based on outcomes important to patients.

As the healthcare industry evolves in its ability to create clinical summaries and care plan documentation, it could consider expanding the use cases that drive standards adoption and interoperability beyond clinical care requirements to include quality measurement, research, and public health requirements. The focus of quality measurement could also continue to expand beyond processes to consider outcomes of care. Greater focus on outcomes may accelerate the development of a LHS that uses quality measurement to drive policy-making for public health agencies and improve healthcare decision making for clinicians and patients.

Clinical care data and secondary data, like the information needed by quality, research, and public health, were split historically into separate data silos. One defines requirements for the other and vice versa. If data are relevant to the quality of care, why not share it in the document that summarizes the care? Organizations may benefit from considering data elements for measuring quality when defining clinical summary documents to assure accuracy and transparency. Measure developers could also consider data elements in clinical summary documents when defining eCQM measures to assure feasibility.

Although much of the healthcare industry adopted a “middle-man” solution by using data registries and third-party vendors, developers and implementers have much to do. A hand-and-glove relationship exists between data that supports quality measures and data that supports clinical summaries. All providers, including ambulatory care organizations and skilled nursing

facilities, could move toward the solutions in use cases 4 and 5, where the organizations consider quality measure requirements when developing clinical summaries.

Appendix A – Example QRDA Documents

Below is an example of a QRDA-I document using CMS version 4 of the EHDI-1a measure.

QRDA Incidence Report

Patient	RightScreened LeftReason
Date of birth	January 1, 2012
Sex	Male
Race	American Indian or Alaska Native
Ethnicity	Not Hispanic or Latino
Contact info	Primary Home: 202 Burlington Rd. Bedford, MA 01730, US Tel: +1-781-271-3000
Patient IDs	12345 PlaceholderOrganization
Document Id	11bb4240-b937-0132-ca14-0ed547e6c23d
Document Created:	March 30, 2015, 18:18:20, EST
Performer	
Author	Cypress
Contact info	202 Burlington Rd. Bedford, MA 01730, US Tel: (781)271-3000
Legal authenticator	Henry Seven of Cypress signed at March 30, 2015, 18:18:20
Contact info	202 Burlington Rd. Bedford, MA 01730, US Tel: (781)271-3000
Document maintained by	Cypress Test Deck
Contact info	202 Burlington Rd. Bedford, MA 01730, US Tel: (781)271-3000

Table of Contents

- Measure Section
- Reporting Parameters
- Patient Data

Measure Section

eMeasure Title	Version neutral identifier (set id)	eMeasure Version Number	Version specific identifier (Defined in the HQMF)
Hearing Screening Prior To Hospital Discharge	0924FBAE-3FDB-4D0A-AAB7-9F354E699FDE	4.0.000	40280381-4c18-79df-014c-2864b0a404c5

Reporting Parameters

- Reporting period: 01 January 2014 - 31 Dec 2014

Patient Data

- Encounter, Performed: Encounter Inpatient

Code	8715000
effectiveTime/low	January 1, 2015 8:00am
effectiveTime/high	January 2, 2015 9:00am
discharge disposition	371828006 (Patient Deceased)

- Diagnosis, Active: Liveborn Newborn Born in Hospital

Code	282291009
effectiveTime/low	201501011000000January 1, 2015 10:00am
effectiveTime/high	201501011030000January 1, 2015 10:30am
Coded Value	V30.00
Problem Status	Active

- Diagnostic Study, Result: Newborn Hearing Screen Right

Code	54109-4
effectiveTime/low	201501011215000January 1, 2015 12:15am
effectiveTime/high	201501011230000January 1, 2015 12:30am
Value	164059009 (Pass or Refer)

- Diagnostic Study, Result: Newborn Hearing Screen Left

Code	54108-6
effectiveTime/low	January 1, 2015 12:31am
effectiveTime/high	n/a
Screening Not Performed	Medical contraindication

- Patient Characteristic, Payer

Code	48768-6 (Payment Source)
effectiveTime/low	March 3, 2011
effectiveTime/high	March 3, 2016
Source of Payment	Medicare

Below is an example of a QRDA-III document using CMS version 4 of the EHDI-1a measure.

Newborn Hearing Screening EHDI CMS31v4 Sample QRDA-III Report

Document Id	26a42253-99f5-48e7-9274-b467c6c7f623
Document Created:	March 11, 2015, 06:12:31, EST
Performer	Good Health Clinic
Performer	Good Health Clinic
Performer	Good Health Clinic
Performer	Good Health Clinic
Performer	Good Health Clinic
Author	SOME Data Aggregator Transform Tool AS00016dev
Author	Trevor Philips, Good Health Clinic
{$classCode='RGPR'?}	medical record, device
{$classCode='SDLOC'?}	healthcare related organization
Contact info	123 Healthcare St Norman, OK 73019 Telecom information not available
Information recipient:	CPC 2.16.840.1.113883.3.249.7
Legal authenticator	Good Health Clinic signed at March 12, 2015, 15:32:22, EST
Document maintained by	Good Health Clinic

Table of Contents

- Reporting Parameters
- Measure Section

Reporting Parameters

- Reporting period: 01 January 2015 - 31 Dec 2015

Measure Section

eMeasure Title	Version neutral identifier (set id)	eMeasure Version Number	Version specific identifier (Defined in the HQMF)
Hearing Screening Prior To Hospital Discharge	0924FBAE-3FDB-4D0A-AAB7-9F354E699FDE	4.0.000	40280381-4c18-79df-014c-2864b0a404c5

- **Performance Rate**:84%
- **Initial Patient Population**:1000
  - **Gender- Male**:400
  - **Gender- Female**:600
  - **Gender- Undifferentiated**:0
  - **Ethnicity- Not Hispanic or Latino**:350
  - **Ethnicity- Hispanic or Latino**:650
  - **Race- Black or African American**:300
  - **Race- White**:350
  - **Race- Asian**:350
  - **Race- American Indian or Alaska Native**:0
  - **Race- Native Hawaiian or Other Pacific Islander**:0
  - **Payer - Medicare**:350
  - **Payer - Medicaid**:250
  - **Payer - Private Health Insurance**:350
  - **Payer - Other**:50
- **Denominator Population**:1000
  - **Gender- Male**:400
  - **Gender- Female**:600
  - **Gender- Undifferentiated**:0
  - **Ethnicity- Not Hispanic or Latino**:350
  - **Ethnicity- Hispanic or Latino**:650
  - **Race- Black or African American**:300
  - **Race- White**:350
  - **Race- Asian**:350
  - **Race- American Indian or Alaska Native**:0
  - **Race- Native Hawaiian or Other Pacific Islander**:0
  - **Payer - Medicare**:350
  - **Payer - Medicaid**:250
  - **Payer - Private Health Insurance**:350
  - **Payer - Other**:50
- **Denominator Exclusions**:50
  - **Gender- Male**:30
  - **Gender- Female**:20
  - **Gender- Undifferentiated**:0
  - **Ethnicity- Not Hispanic or Latino**:40
  - **Ethnicity- Hispanic or Latino**:10
  - **Race- Black or African American**:10
  - **Race- White**:20
  - **Race- Asian**:20
  - **Race- American Indian or Alaska Native**:0
  - **Race- Native Hawaiian or Other Pacific Islander**:0
  - **Payer - Medicare**:15
  - **Payer - Medicaid**:10
  - **Payer - Private Health Insurance**:15
  - **Payer - Other**:10
- **Numerator**:800
  - **Gender- Male**:300
  - **Gender- Female**:500
  - **Gender- Undifferentiated**:0
  - **Ethnicity- Not Hispanic or Latino**:250
  - **Ethnicity- Hispanic or Latino**:550
  - **Race- Black or African American**:250
  - **Race- White**:300
  - **Race- Asian**:250
  - **Race- American Indian or Alaska Native**:0
  - **Race- Native Hawaiian or Other Pacific Islander**:0
  - **Payer - Medicare**:300
  - **Payer - Medicaid**:200
  - **Payer - Private Health Insurance**:250
  - **Payer - Other**:50

Appendix B – Acronyms

Acronym	Description
AHRQ	Agency for Healthcare Research and Quality
ALQR	Aggregate-level quality report
CDA	Clinical Document Architecture
CDC	Centers for Disease Control and Prevention
CDS	Clinical Decision Support
CMS	Centers for Medicare & Medicaid
CQL	Clinical quality language
CQM	Clinical quality measure
CR	Content Creator
CS	Content Consumer
CY	Calendar year
DEN	Denominator
DENEX	Denominator exclusion
DENEXCEP	Denominator exception
DICOM	Digital Imaging and Communications in Medicine
eCQM	Electronic clinical quality measure
EHDI	Early Hearing Detection and Intervention
EHR	Electronic health record
HEDIS	Healthcare Effectiveness Data and Information Set
HIT	Health information technology
HL7	Health Level 7
HQMF	Health quality measure format
ICD-10-CM	International Classification of Diseases, Tenth Revision, Clinical Modification
ICD-9-CM	International Classification of Diseases, Ninth Revision, Clinical Modification
IHE	Integrating the Healthcare Enterprise
IOM	Institute of Medicine
IP	Initial population
IQR	Inpatient Quality Reporting
LHS	Learning health system
LOINC	Logical Observation Identifiers Names and Codes
MAP	Measures Application Partnership
MAT	Measure Authoring Tool
MIF	Measure Information Form
MIPS	Merit-based Incentive Payment System
MJF	Measure Justification Form
MU	Meaningful Use
NCQA	National Committee for Quality Assurance
NHSN	National Healthcare Safety Network

Acronym	Description
NLM	National Library of Medicine
NQF	National Quality Forum
ONC	Office of the National Coordinator for Health Information Technology
PCMH	Patient Centered Medical Home
PCORI	Patient-Centered Outcomes Research Institute
PLQR	Patient-level quality report
PQRS	Physician Quality Reporting System
QDM	Quality data model
QME-EH	Quality Measure Execution-Early Hearing
QRDA	Quality Reporting Data Architecture
QRDA-I	Quality Reporting Data Architecture, Category I
QRDA-III	Quality Reporting Data Architecture, Category III
QRPH	Quality, Research and Public Health
RA	Report Assembler
SDO	Standards Development Organization
SNOMED CT	Systematized Nomenclature of Medicine Clinical Terms
SoCD	Summary of care document
TEP	technical expert panel
TJC	The Joint Commission
U.S.	United States
UMLS	Unified Medical Language System® Metathesaurus License
VSAC	Value Set Authority Center
XML	Extensible markup language

Appendix C – References

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CDA: http://www.hl7.org/implement/standards/product_brief.cfm?product_id=7

CMS: https://www.cms.gov/

CQL: http://www.hl7.org/implement/standards/product_brief.cfm?product_id=400

eCQI Resource Center: https://ecqi.healthit.gov/

HealthIT.gov: https://www.healthit.gov/

HQMF: https://ecqi.healthit.gov/hqmf

IHE: https://www.ihe.net/

LOINC: https://loinc.org/

QDM: https://ecqi.healthit.gov/qdm

RxNorm: https://www.nlm.nih.gov/research/umls/rxnorm/

SNOMED CT: http://www.snomed.org/snomed-ct

URLs (for list on pages 9-10)

Centers for Disease Control and Prevention (CDC): https://www.cdc.gov/

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Hospital Inpatient Quality Reporting (IQR) Program: https://www.cms.gov/medicare/quality-initiatives-patient-assessment-instruments/hospitalqualityinits/hospitalrhqdapu.html

Medicare and Medicaid EHR Incentive Programs: https://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/index.html?redirect=/ehrincentiveprograms/

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