



NATIONAL
QUALITY FORUM

eMeasure Learning Collaborative: Advancing the Adoption, Implementation, and Use of eMeasures

FINAL REPORT

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Executive Summary

Introduction

The National Quality Strategy's (NQS) aims and goals set forth a unified vision of the healthcare system that was understandable and applicable to all stakeholders at every level—local, state, and national. To make quantifiable progress towards achieving the NQS vision, the use of health information technology (IT) is essential for performance measurement against the three NQS aims of better care, affordable care, and healthy people and communities. When data necessary for quality measurement are captured as a byproduct of care delivery, and when those data are easily shared between health IT systems, care can be better coordinated, and is safer, more efficient, and of higher quality. The Department of Health and Human Services (HHS) is working specifically to move the quality enterprise forward by supporting measurement, reporting, and improvement of healthcare through the use of health IT. Building an electronic data infrastructure is a fundamental backbone for successful quality measurement and improvement.

eMeasure Learning Collaborative Purpose and Structure

The National Quality Forum (NQF), with funding from HHS, convened the eMeasure¹ Learning Collaborative as an environment in which measure developers, federal agencies, health IT vendors, providers, payers, and other stakeholders could convene to discuss challenges, identify recommendations, and share best practices related to the efficient and effective use of data for electronic performance measurement. The eMeasure Learning Collaborative was chartered to advance the development, adoption, implementation, and widespread use of eMeasures, through two full-day in-person meetings and three webinars, all open to the public at no cost. A multi-stakeholder Planning Committee led the convening process and advised on objectives, content, speakers, and outreach activities to ensure the events were successful.

Impact of the eMeasure Learning Collaborative

By building bridges between and among stakeholder groups, NQF is helping to promote more efficient and standardized adoption of eMeasures – and more importantly, greater synchronicity between the major healthcare players that need to work together to make eMeasurement a reality. The eMeasure Learning Collaborative is the only expeditious and self-sustaining forum whereby priorities and interests of diverse stakeholders can be vetted at a national level, leveraging a broad base of expertise. The Collaborative discusses eMeasure topics such as measure development, implementation methods, barriers and challenges, innovative approaches to managing clinical workflows, and strategies related to data capture and aggregation.

The eMeasure Learning Collaborative sparked great interest as a public forum to encourage broad-based adoption of eMeasures in a more expeditious and self-sustaining manner. Over 200 participants, either in person or via the web, attended the two full day in-person eMeasure Learning Collaborative

¹ The eMeasure is the electronic format for quality measures using the Quality Data Model (QDM) and the Healthcare Quality Measure Format (HQMF), an HL7 standard. This standard representation of quality measures enables consistent reporting and comparison across clinical electronic system vendors across the nation.

meetings. Through the eMeasure Learning Collaborative, communities of practice were created, promoting shared learning and advancing knowledge and best practices related to the development, adoption, and implementation of eMeasures.

Key Themes

During the two face-to-face meetings, as the groups discussed various topics related to the adoption, implementation, and use of eMeasures, three themes emerged: provider organizational leadership, data representation and clinical workflow, and learning health systems (Figure 1).

Provider Organizational Leadership

includes the intersection of management and clinical and technical leadership in defining strategy, operational plans, and education necessary for the integration of electronic quality measurement and improvement into all facets of care delivery.

Data Representation and Clinical Workflow

includes aspects related to standardized representation of data within quality measures, subsequent alignment within electronic health record (EHR) applications and use within clinical workflows, leading to generation of electronic quality reports, measurement, and improvement.

Learning Health Systems includes factors associated with using eMeasures to drive learning and advance evidence-based care as a natural outgrowth of patient care, thereby enhancing innovation, quality, safety, and value in healthcare through clinical decision support (CDS).²

These themes serve as an organizing structure for the Collaborative's 2012 findings.

Best Practices

The following best practices are a sample extracted from the full report; please refer to the [Best Practices and Recommendations](#) section for a complete and thorough description of eMeasurement gaps and recommendations.

Based on experience to-date, the participants noted the tremendous variation in current practices across the entire eMeasurement landscape, and for this reason, best practices are in an early state of maturation and will evolve through continued stakeholder work.

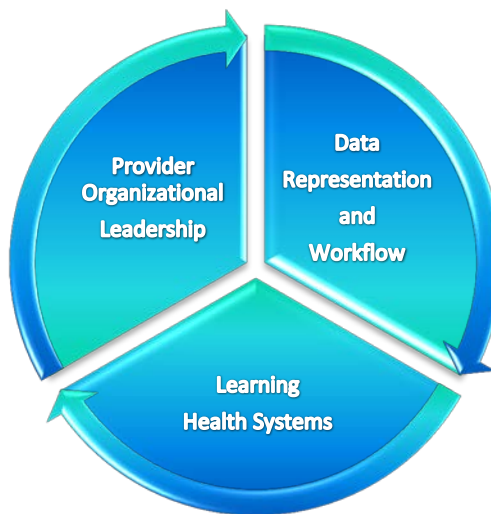


Figure 1: Key themes related to the adoption, implementation, and use of eMeasures

² IOM (Institute of Medicine). *Digital Infrastructure for the Learning Health System: The Foundation for Continuous Improvement in Health and Health Care*. 2011.

Provider Organizational Leadership Best Practices

1. Create inter-professional teams focused on an integrated approach to eMeasure adoption, including data capture, reporting, workflow, clinical decision support (CDS), and evidence-based practice. The team should be led by an individual with the most appropriate skillset depending on the nature of the quality measurement effort.
2. Develop a strategy and plan for data standardization under the guidance of executive leadership and operational teams.
 - a. The data standardization plan spans point-of-care needs, eMeasures, data analytics, and quality improvement across the entire continuum of care.
 - b. The data strategy and plan is informed and guided by the clinical intent of the quality measures, which spans point of care delivery through quality measurement and improvement.
3. Integrate intent of the quality measure into processes of care and point-of-care documentation to enhance decision-making through the entire eMeasure cycle (such as added prompts and decision support alerts for discharge and medication compliance decision support within health information technology solutions).
4. Educate all stakeholders on the importance, meaning, and methods of eMeasurement before moving ahead with any project.
5. Develop an organization-wide plan for execution of small-scale pilots using a technique such as the Plan, Do, Study, Act (PDSA) cycle to move towards capturing discrete data elements from the EHR.
 - a. Use an Agile process³ for providing clinician feedback on data use, workflow, and decision support.

Data Representation and Clinical Workflow Best Practices

1. Use eMeasurement standards (Quality Data Model (QDM), HQMF, QRDA, NLM's value sets⁴ and structured coded terminologies) as a best practice that can be leveraged not just for Meaningful Use (MU), but for quality measurement, reporting, and improvement across all healthcare organizations.
 - a. All stakeholders in the quality measurement enterprise need to understand and consistently use relevant terms. Stakeholders may have different professional/institutional needs, leading to the capture and use of data that may look similar but reflect goals unrelated to the intent of the quality measure. It is important for measure developers, vendors, and measure users to understand who is entering data into the EHR, how it is entered, and for what purpose. General education of all stakeholders

³ Iterative, quick cycle, incremental processes using structured methods and teams.

⁴ Healthcare Quality Measure Format (HQMF) and Quality Data Reporting Architecture (QRDA) are HL7 standards. The National Library of Medicine (NLM) maintains the Value Set Authority Center (VSAC).

through a variety of mechanisms such as the eMeasure Learning Collaborative in-person meetings and/or webinars or in a setting such as the eMeasure Learning Collaborative can be instrumental in ensuring that all stakeholders understand and consistently use terms relevant to eMeasurement.

2. Engage in joint interactive communication between measure developers and other stakeholders early in the eMeasurement process, particularly when measure developers are selecting and representing data within eMeasure logic⁵. All participants identified this as best practice, but also identified the need for a national structure and process to enable this level of dialogue.
 - a. A cross-walk between the QDM, measure logic, and value sets for eMeasures and the corresponding codes and logic typically found within EHRs, is needed. This crosswalk should occur early in the life cycle of an eMeasure (when the measure is represented within the Measure Authoring Tool (MAT))⁶.
3. Adopt an integrated approach to eMeasurement whereby data necessary for quality measurement is not a stand-alone effort, but integrated within *all* EHR and quality measurement related projects, including computerized provider order entry (CPOE), clinical documentation and CDS. It is essential that data definitions are aligned, between point of care systems, quality reporting, CDS, and workflow processes.
4. All participants agreed that clinical knowledge represented within clinical quality measures must be evident at the point of care and implemented within the EHR in a manner that proactively guides clinicians to act in accordance with the quality measure. Please refer to the [Detailed Webinars and In-Person Meeting Discussions](#) section, to obtain additional detail on implementation methods and lessons learned.
5. Use Meaningful Use (MU) clinical quality measures for creation of performance dashboards which can be used to provide direct feedback to clinicians. In addition, the dashboards can be used for broader-based quality improvement within organizations.
 - a. Develop electronic quality reports that meet MU specifications but also show “what is clinically meaningful for providers.”
6. Engage in the use of pilots starting with fairly simple clinical quality measures that leverage data already contained within the EHR, as well as other quality measurement or improvement projects underway.
 - a. Field testing for eMeasures is needed on a national level. The field testing should include organizational factors related to implementation of eMeasures as described in this report.
7. Develop extensible technology and processes that support:

⁵ Measure logic refers to the detailed criteria specifying of a patient is to be included or excluded from the measure population

⁶ The Measure Authoring Tool (MAT) is a publicly available, web-based tool for measure developers to create eMeasures.

- a. Flexible data capture (map front-end to back-end data necessary for quality reporting)
 - b. Standardized data sets and processes for matching patient condition to actual diagnosis.
 - c. Capturing data once and then make it available to all applications that utilize it, including CDS and eMeasures.
8. Develop user interfaces that capture “patient reason” as input into whether recommended interventions occurred or failed to occur.
 9. Develop mapping of local terms to MU Stage 2 requirements for codes.

Learning Health Systems Best Practices

1. Use eMeasurement to generate new knowledge.
2. Create a community of successes and share internally and across all stakeholder groups.
3. Rely on outcome measures to improve clinical practice; don’t simply measure, learn, and revise.

Future Implications

In 2012, the eMeasure Learning Collaborative provided key stakeholders – measure developers, federal agencies, health IT vendors, providers, clinicians, professional societies, payers, patients, etc. – the opportunity to share knowledge about the development and implementation of eMeasures. With adoption of the best practices defined in this report, progress can be made towards the use of health IT for performance measurement against the three NQS aims of better care, affordable care, and healthy people and communities. However, best practices are in an early state of maturation and will evolve through continued stakeholder collaboration. As measure developers, health IT vendors, policy makers and providers continue with implementation of eMeasures, best practices will be enhanced. In addition, through forums such as the eMeasure Learning Collaborative, innovative methods for developing and implementing eMeasures can be discovered and vetted.

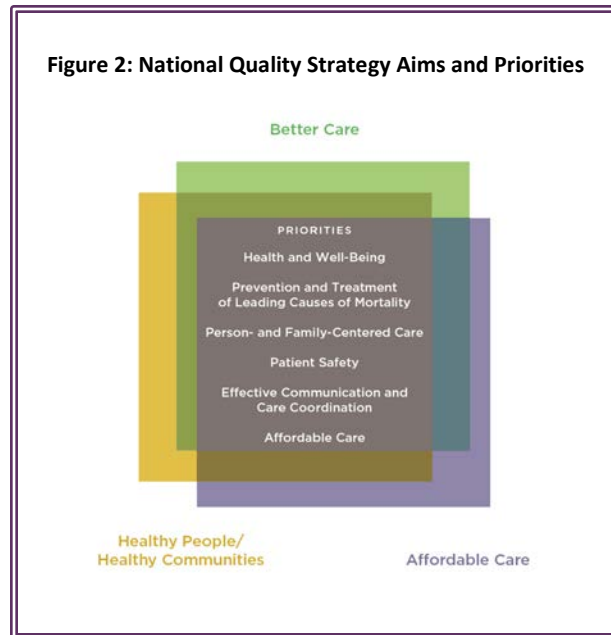
Participants identified the following recommendations to improve use of EHR data for electronic quality measurement:

1. Continue support for the eMeasure Learning Collaborative whereby all stakeholders have the opportunity to communicate requirements, share best practices, identify gaps, and develop recommendations.
2. Develop tools that support automated mapping from SNOMED to ICD on problem / diagnosis lists along with versioning support.
3. Provide implementation guidance, starting with ensuring that the design of documentation templates is aligned with data elements required by eMeasures to support the entire continuum of eMeasurement. This is particularly important for small practice sites that frequently do not have robust health IT support.
4. Support efforts to harmonize measure specifications, value sets, and outputs. Quality measures should be shareable and understandable to all. Usability testing should be done in simulation centers or labs to ensure appropriate workflow incorporation of quality measurement.

- a. To test data capture and workflow processes and to assess unintended consequences of eMeasurement.
 - b. Assess utility of data use from other health IT systems such as case management systems.
5. Extend existing standards to accommodate gap areas and future eMeasurement needs. The participants discussed extension of the QDM to resolve ambiguity in relation to quality measure logic, intended meaning, and data found in EHRs. In addition, participants discussed extension of the HQMF to support attributes, as well as creating more simplified representation of the QDM and HQMF.
6. Offer vendor support in the following areas:
 - a. Development of solutions that allow for flexibility in data capture while still supporting standardized data entry and reporting. Structured English language sentences should be provided to clinicians that are then translated to coded measurements on the backend to reduce complexity.
 - b. Creation of new technologies such as natural language processing which could address some of the challenges associate with unstructured data in EHRs. Additional research in this area should focus on reliability and ability to validate the accuracy of the conversion process.
7. Conduct formal usability testing of vendor products to reduce data capture burden and eliminate redundant data elements.
8. Identify mechanisms to capture, validate, use, and incorporate external data such as outside care, patient reported data, and mortality data.
9. Increase the reliability of new technologies such as natural language processing (NLP) through additional research.
10. Create implementation roadmaps that include suggestions for best practice workflow processes, recommendations on user interface data elements, and suggestions on how to leverage the entire team (and patient) in entering data necessary for quality measurement.
11. Harmonize or streamline registry reporting requirements across regulatory agencies to reduce redundancy.
12. Align incentives for providers and facilities to support clinical data analysis for CDS using data warehouse mining.

Introduction

The Department of Health and Human Services' (HHS) release of the first National Quality Strategy (NQS) in 2011 marked a significant step forward in the effort to align a healthcare system characterized by intense fragmentation. The NQS' aims and goals set forth a unified vision of the healthcare system that was understandable and applicable to all stakeholders at every level—local, state, and national (see Figure 2). To make quantifiable progress towards achieving the NQS vision, the use of health information technology (IT) is essential for performance measurement against the three NQS aims of better care, affordable care, and healthy people and communities. The use of health IT is contingent on building the data infrastructure so information needed for performance measurement can be captured as a byproduct of care delivery. When data necessary for quality measurement are captured as a byproduct of care delivery, and when those data

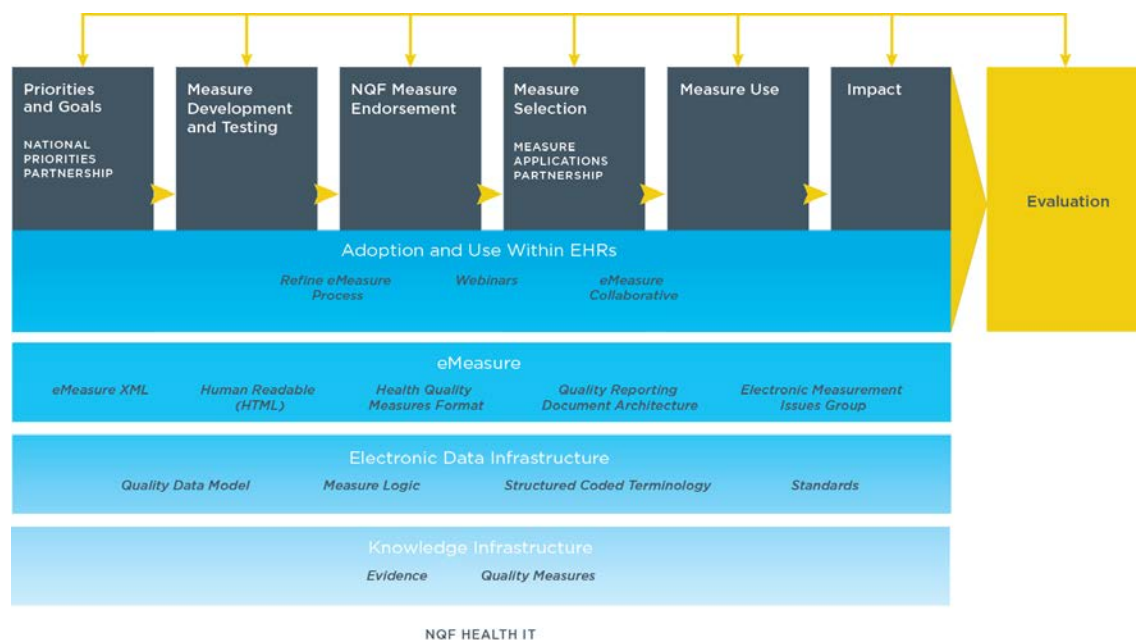


are easily shared between health IT systems, care can be better coordinated, and is safer, more efficient, and of higher quality. HHS is working specifically to move the quality enterprise forward by supporting measurement, reporting, and improvement of healthcare through the use of health IT. Building an electronic data infrastructure is a fundamental backbone for successful quality measurement and improvement. These activities will help ensure health IT contributes to meaningful, continuous, and positive changes in individual and population health as reflected in the goals of the NQS. The electronic infrastructure serves as the foundation for implementation and widespread adoption of the NQS (Figure 3).

To move toward this vision, the National Quality Forum (NQF) convened the eMeasure⁷ Learning Collaborative as an environment in which measure developers, federal agencies, health IT vendors, providers, payers and other stakeholders could cooperate with each other to identify best practices, discuss challenges and collaborate to fill gaps and achieve parsimony for efficient and effective use of data for electronic measurement. HHS funded the first year of the Collaborative's activities.

⁷ The eMeasure is the electronic format for quality measures using the QDM and the Healthcare Quality Measure Format (HQMF), an HL7standard.

Figure 3: Electronic Infrastructure for the Quality Enterprise



Project Overview

The federal government is increasingly embracing electronically-enabled performance measurement as a less-burdensome approach to gathering and publicly reporting performance information. Accordingly, federal contractors and other measure developers are retooling existing quality measures into eMeasures and also creating de novo eMeasures, both intended to support Meaningful Use (MU) quality reporting, value-based purchasing (VBP), and other innovative programs.^{8,9} The implementation of eMeasures within electronic health records (EHRs) for quality reporting is relatively unfamiliar space, requiring knowledge sharing between all stakeholders (measure developers, federal agencies, standards development organizations, health IT vendors, providers, and clinicians). The eMeasure Learning Collaborative seeks to create a learning environment to advance knowledge and promote the development and implementation of eMeasures. By convening stakeholders from across the quality enterprise, the Collaborative will help promote more efficient and standardized adoption of eMeasures. Multi-stakeholder forums where shared best practices and recommendations are disseminated will only serve to advance electronic measurement more expeditiously than single-threaded efforts. As such a forum, the eMeasure Learning Collaborative seeks to identify best practices, gaps, and

⁸ In 2009, HHS, motivated by The Health Information Technology for Economic and Clinical Health (HITECH) Act,³ requested that NQF "retool," or convert, 113 NQF-endorsed[®] measures from traditional paper-based measures to electronic measures, or "eMeasures," to be compatible with or readable by EHR systems.

⁹ Meaningful Use is identified by the Office of the National Coordinator for Health Information Technology as standards and certification criteria for the certification of EHR technology, so eligible professionals and hospitals may be assured that the systems they adopt are capable of performing the required functions. More information can be found at

http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__meaningful_use_announcement/2996

recommendations to advance the development, adoption, implementation, and widespread use of eMeasures.

Specifically, the Collaborative facilitates a public forum to:

- Advance implementation of eMeasures across all healthcare settings;¹⁰
- Drive greater uptake of eMeasures through use of electronic platforms for quality reporting;
- Promote awareness, provide education, and enable understanding of repeatable eMeasure implementation practices across various healthcare settings; and,
- Educate all stakeholders involved in eMeasures, so all stakeholders contribute to the advancement of eMeasures.

The eMeasure Learning Collaborative has been conducted through a series of interactive in-person meetings and webinars. Key stakeholders involved with eMeasures were invited to participate in the process. Participants included measure developers, EHR vendors, health IT vendors, standards developers, clinical professionals, health systems, state and federal government, insurers, professional societies, researchers, and consumers. A Planning Committee led the convening process and content development process, engaged speakers and participated in other outreach activities to ensure the Collaborative events were successful. (See [Appendix A](#) for the Planning Committee roster.) During the in-person meetings and webinars, stakeholders discussed relevant topics, tools, and resources related to eMeasure creation, adoption, use and advancement.

Impact of the eMeasure Learning Collaborative

Measure developers cannot build the most effective quality measures - and healthcare systems cannot accurately measure and assess performance - without comparable high quality data that are captured through effective clinical workflow. In accordance with the NQS, the ultimate goal of the eMeasure Learning Collaborative is to improve care through the use of better measures and better data. In order to achieve this goal, measure developers, federal agencies, health IT vendors, providers and other stakeholders from across the healthcare quality continuum need to collaborate to foster widespread implementation of eMeasures. By building bridges between these groups, NQF is helping to promote more efficient and standardized adoption of eMeasures – and importantly, greater synchronicity between the major healthcare players that need to work together in order to make eMeasurement a reality. Through knowledge sharing between all the stakeholders, eMeasure implementation best practices emerge, breaking down silos and fostering wider-scale adoption and use.

¹⁰ Electronic measures (eMeasures) are standardized performance measures in an electronic format. eMeasures can promote greater consistency in measure development and in measuring and comparing performance results. They also can provide more exact requirements about where information should be collected, and drive greater standardization across the measures and greater confidence in comparing outcomes and provider performance.

The eMeasure Learning Collaborative is the only expeditious and self-sustaining forum whereby priorities and interests of diverse stakeholders can be vetted at a national level, leveraging a broad base of expertise. The Collaborative discussed eMeasure topics such as implementation methods, barriers and challenges, innovative approaches to managing clinical workflows, and strategies related to data capture and aggregation.

Through sharing of best practices, identification of gaps, and creation of solutions, widespread implementation of eMeasures across healthcare settings will ultimately improve data capture and reporting. It will also increase momentum toward the use of an electronic platform for quality measurement which is essential to improving the overall quality of healthcare. The Collaborative's goal is to create a learning environment for advancing knowledge and promoting best practices related to the development and implementation of electronic quality performance measures.

Related NQF Efforts

Since 2009, NQF has worked with HHS to promote and support the transition from the traditional paper-based format and claims-based measures to the eMeasure format that can be processed by EHRs to generate quality measure reports. NQF, in collaboration with HHS, is working specifically to move the quality enterprise forward by supporting measurement, reporting, and improvement of healthcare through the use of health IT. Building an electronic data infrastructure is a fundamental backbone for successful quality measurement. These activities will help ensure health IT contributes to meaningful, continuous, and positive changes at both the individual and population health level as reflected in the goals of the NQS. The electronic infrastructure serves as the foundation for implementation and widespread adoption of the NQS.

NQF's current Health IT initiatives – made up of several distinct yet related areas of focus – have been designed to support and advance standards-based, electronic quality measurement. NQF works with a diverse set of stakeholders to influence the U.S. healthcare system by building consensus on national priorities and goals for performance improvement and working in partnership to achieve them; endorsing national consensus standards for measuring and publicly reporting on performance; and promoting the attainment of national goals through education and outreach programs. NQF has several projects designed to support multi-stakeholder collaboration in the area of health IT.

Quality Data Model (QDM) Development, Adoption, and Use

The QDM is an “information model” curated by NQF that is intended to clearly define concepts used in quality measures and clinical care. The QDM provides a way to describe clinical concepts in a standardized format so individuals (e.g., providers, researchers, measure developers) monitoring clinical performance and outcomes can clearly and concisely communicate necessary information. The QDM

organizes and describes information so that EHR and other clinical electronic system vendors can consistently interpret and easily locate the data required.¹¹

The QDM enables automation of quality measurement through use of EHR data.¹² As the backbone for representation of electronic healthcare quality measures, the QDM is used by the full range of stakeholders involved in electronic quality measurement and reporting, such as measure developers, federal agencies, health IT vendors, standards organizations, informatics experts, providers, and researchers. The QDM evolves through inclusion of input obtained through public comment, webinars, expert panels, and NQF convening processes (e.g., Health IT Advisory Committee (HITAC), QDM Subcommittee, QDM User Group, eMeasure Learning Collaborative). Through these well-developed and proven methods, recommendations are received, vetted, and subsequently used to enhance the QDM. Collectively these efforts are instrumental in using the QDM to increase eMeasure adoption and use throughout all facets of care delivery.

The QDM provides the potential for more precisely defined, universally adopted electronic quality measures to automate measurement and compare and improve quality using electronic health information. Use of the QDM will enable more standardized, less burdensome quality measurement and reporting and more consistent use of EHRs for direct patient care. In addition to enabling comparisons across performance measures, the QDM can promote delivery of more appropriate, consistent, and evidence-based care through clinical decision support (CDS) applications. More information on the QDM can be found in [Appendix B](#).

Measure Authoring Tool (MAT)

The Measure Authoring Tool (MAT) is a publicly available, web-based tool for measure developers to create eMeasures. The MAT has been publicly available through NQF since September 27, 2011. In addition, the March 2012 enhanced version included recommendations from MAT testing results to address system effectiveness, efficiency, and user satisfaction. As of December 2012, there are over 190 users from 80 organizations actively using the MAT to retool or create new eMeasures for HHS programs or for their own use, including HHS contractors, professional groups, and academic medical centers.

In early January 2013, NQF will transition the day-to-day operation of the MAT to HHS. This move will enable HHS to work more directly with the software development contractor to potentially move the MAT to an open-source platform. Throughout this transition, NQF will work with HHS, HHS contractors, and measure owners to ensure data are transferred securely and in accordance with government regulations and industry best practices. Following the transition of the MAT, NQF will support and advise HHS and its contractor in the integration of the most recent version of the QDM within the MAT, so the MAT stays current with QDM enhancements and industry standards.

¹¹ Ibid.

¹² <http://www.qualityforum.org/QualityDataModel.aspx>

Critical Paths

The goal of the Critical Path projects was to assess the readiness of electronic data to support innovative measurement concepts and to recommend actionable steps to address gaps and barriers. From November 2011 to November 2012, NQF executed two Critical Path projects. The Care Coordination project focused on transitions of care and communication of the patient plan of care, and the Patient Safety project focused on acute care infusion devices. Technical expert panels (TEPs) were convened to define electronic data elements and data exchange requirements that will help advance measurement and quality improvement efforts for these two topics.

Knowledge Base

NQF developed and launched a publicly accessible electronic knowledge base early 2012 which provides a means for information to be collected, organized, shared, searched, and utilized to provide answers to some of the most common technical questions around eMeasurement.

Highlighting NQF's key presence in the quality measurement community, the knowledge base allows the general public and health IT stakeholders from diverse professional disciplines to access and gain information on topics such as the structure and function of the QDM; features and functions of the MAT; and standardization and implementation of eMeasures. Users are now able to link to health IT publications from the knowledge base rather than searching multiple locations.

An average of over 200 visitors a month has consulted the Knowledge Base since its launch in March 2012. During the release of Meaningful Use Stage 2, usage peaked to over 350 visitors per month. In addition, the number of visitors has doubled as a result of new frequently asked questions (FAQs), recent updates and improvements made to the site starting in July 2012. Metrics on users' page views and ongoing feedback will determine which content is posted on the knowledge base in the future.

NQF Measure Applications Partnership (MAP)

The Measure Applications Partnership (MAP) is a public-private partnership convened by NQF. MAP was created to provide input to HHS on the selection of performance measures for public reporting and performance-based payment programs.¹³ MAP promotes alignment of performance measurement across public- and private-sector initiatives that use measures to drive value. As a primary tactic to achieve alignment of performance measurement, MAP has also identified families of measures—sets of related available measures and measure gaps that span programs, care settings, levels of analysis, and populations for specific topic areas related to the NQS priorities and high-impact conditions.¹⁴ Stakeholders involved in the MAP were included in the eMeasure Learning Collaborative to share knowledge so there would be alignment between performance measure selection and data infrastructure creation.

¹³ http://www.qualityforum.org/Setting_Priorities/Partnership/Measure_Applications_Partnership.aspx

¹⁴ MAP Families of Measures: Public Comment Draft August 27, 2012.

Related Federal and Industry Efforts

In addition to NQF efforts, there are parallel national efforts related to the development, adoption, and use of eMeasures. The national efforts were used by the eMeasure Collaborative Planning Committee to inform eMeasure best practices and recommendations. Likewise, the eMeasure Learning Collaborative recommendations informed the national efforts described below.

HL7: Healthcare Quality Measure Format (HQMF) and Quality Data Reporting Architecture (QRDA)

An HL7 standard closely tied to quality measurement is the Quality Reporting Data Architecture (QRDA), a QDM- based standard to define explicitly how an HQMF eMeasure can be represented for communication of quality measurement data. For consistent, interoperable electronic quality measurement, there are multiple standards that will be used to support the NQS. The goal is to ensure these standards contain important data and information derived from quality measures in order to use the data captured as byproduct of care delivery for quality measurement.

Meaningful Use Clinical Quality Measures

CMS' Medicare and Medicaid EHR Incentive Programs provide incentive payments specific to eligible professionals (EPs), eligible hospitals (EHs) and critical access hospitals (CAHs) who demonstrate the meaningful use of certified EHR technology to improve patient care.¹⁵ EPs can receive up to \$44,000 through the Medicare EHR Incentive Program and up to \$63,750 through the Medicaid EHR Incentive Program. As part of meeting the criteria for successful meaningful use, EPs, EHs and CAHs must also report on electronic clinical quality measures. The 2014 Electronic Clinical Quality Measures (eCQMs) released late October 2012 were authored using the MAT and expressed using the QDM.

To support the 2014 eCQMs, the National Library of Medicine (NLM) in collaboration with the Office of the National Coordinator for Health Information Technology and the Centers for Medicare & Medicaid Services (CMS) recently launched the Value Set Authority Center (VSAC). The VSAC serves as a central repository which contains "downloadable access to all official versions of vocabulary value sets in the 2014 eCQMs."¹⁶

Environmental Scan/Literature Review

In order to assess the national landscape for similar eCollaborative efforts, an external environmental scan was conducted as part of the planning process and launch of the 2012 NQF eMeasure Learning Collaborative. The goal of the external environmental scan was two-fold: 1) to assess and identify whether there were similar organizations and/or stakeholder groups that convened learning

¹⁵ The Official Web Site for the Medicare and Medicaid Electronic Health Records (EHR) Incentive Programs. Available at http://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/index.html?redirect=/EHRIncentivePrograms/01_Overview.asp

¹⁶ Value Set Authority Center. U.S. National Library of Medicine. NLM Value Set Authority Center (VSAC) Homepage. Available at <https://vsac.nlm.nih.gov/>.

collaboratives focusing on health IT and performance measures; and 2) to gain a better understanding of their outcomes and lessons learned.

NQF identified through a literature review nineteen collaboratives focusing on health IT and/or EHRs . The collaboratives spanned across multidisciplinary national, state and local communities. Funding for the collaboratives was provided through federal, state and private entities/sources. Collaboratives were managed by the Healthcare Information and Management Systems Society (HIMSS), the American Medical Association (AMA), the National Committee for Quality Assurance (NCQA), the Agency for Healthcare Research and Quality (AHRQ), the Office of the National Coordinator for Health Information Technology (ONC), and the Institute for e-Health Policy.

Several collaboratives were run by two or more groups. For example, in 2003, the EHR Collaborative was formed and functioned under the management of HIMSS, American Health Information Management Association (AHIMA), American Medical Informatics Association (AMIA), eHealth Initiative (eHI), and the National Health Alliance for Health Information Technology (NAHIT). The goal of the collaborative was to gather feedback from stakeholders on the EHR model and standards developed by HL7. Stakeholders included practicing clinicians, payers, purchasers, providers, and public health organizations. The feedback was compiled into a report and submitted to the U.S. Department of Health and Human Services. The collaborative disbanded once their work was complete, but their report and work remain important in the EHR community.

Other collaboratives are focused on improving health in a particular state or community through the use of health information technology. Examples of these types of collaboratives include *The Massachusetts eHealth Collaborative*, *the New York eHealth Collaborative (NYeC)*, and *the South Dakota eHealth Collaborative*.

The *Collaborative for Performance Measure Integration with Electronic Health Records (EHR) Systems (Collaborative)* was initiated in 2006 and co-sponsored by the American Medical Association (AMA), the HIMSS Electronic Health Record Association (EHRA) and the National Committee for Quality Assurance (NCQA). The Collaborative's overarching goal was "to bring together experts in the field of performance measure development and implementation in order to remove the obstacles to measuring performance in the ambulatory care setting and facilitate wide-spread use of performance measure functionality in EHRs by the physician community."¹⁷ This group of stakeholders was made up of performance measure developers, EHR vendors, expert EHR users, national quality improvement organizations and technical experts in physician performance measurement and quality improvement—who have a shared goal of facilitating the integration of performance measures with EHR systems.

The AMA-convened Physician Consortium for Performance Improvement[®] (PCPI[®]) and the NCQA, both measure development organizations, have developed performance measures designed to assist

¹⁷ American Medical Association (AMA), National Committee for Quality Assurance (NCQA) and the Centers for Medicare and Medicaid Services (CMS). Collaborative for Performance Measure Integration with EHR Systems. <http://www.ama-assn.org/ama1/pub/upload/mm/472/mtg-summary111706.pdf>

physicians in improving the quality of patient care delivered in the ambulatory environment and EHR vendors are working to incorporate performance measure functionality into EHR products.¹⁸

NQF eMeasures Learning Collaborative Planning Committee

Through a public call for nominations, NQF reached out to all stakeholders to become members of the eMeasure Learning Collaborative Planning Committee. Planning Committee members are health IT vendor experts, measure developers, health insurers, providers from acute and specialty practices, educators, health information network experts, and federal liaisons. The roster of nominations for Planning Committee members was posted on the NQF website for review by NQF members and the public. Following the comment period, members of the eMeasure Learning Collaborative Planning Committee were informed of their selection. A list of the Planning Committee members can be found in Appendix A.

Members of the eMeasure Learning Collaborative Planning Committee are stakeholders critical to advancing the project's mission. The committee was responsible for:

1. Ensuring input from all stakeholder groups for the face-to-face meeting and webinar content;
2. Identifying the most relevant topics for eMeasure Collaborative activities;
3. Providing input into implementation best practices, gaps, and recommendations, which were subsequently discussed and analyzed during face-to-face meetings and webinars;
4. Providing national outreach to other potential participants; and
5. Promoting overall visibility of the project.

eMeasure Learning Collaboration Methods

The eMeasure Learning Collaborative required that NQF convene two full day in-person meetings and three webinars, free and open to the public. The two in-person meetings were held in Washington, DC, and were available online simultaneously via the Web. Allowing all stakeholders to join the conversation was an overarching objective of the Collaborative, so all face-to-face and virtual meetings were open to the public. Invited stakeholders included measure developers, standards developers, vendors, federal and state government representatives, providers encompassing the entire spectrum of care delivery, all members of the healthcare delivery team, researchers, and consumers.

The eMeasure Collaborative Planning Committee was tasked with planning and providing support for the in-person meetings. The Planning Committee identified goals and objectives for each meeting that were aligned with the overall goals and objectives of the eMeasure Collaborative. NQF staff developed meeting agendas with the intent of identifying best practices/repeatable models, gaps and recommendations. The meetings were structured to allow dialogue among multiple stakeholder groups.

¹⁸ American Medical Association (AMA). Collaborative for Performance Measure Integration with EHR Systems. Available at: <http://www.ama-assn.org/ama/pub/physician-resources/physician-consortium-performance-improvement/about-pcpi/collaborative-performance-measure-integration.page>.

The first meeting, *Best Practices in eMeasure Implementation*, occurred on April 26, 2012. Two keynote speakers spoke: Farzad Mostashari, MD, National Coordinator for Health Information Technology, Office of the National Coordinator for Health Information Technology, and Kate Goodrich, MD, Acting Director, Quality Measurement and Health Assessment Group, Centers for Medicare & Medicaid Services. Following the keynotes, there were five concurrent breakout sessions on the following eMeasure domain areas:

1. Implementation Acute
2. Implementation in Office-Based Practices
3. Clinical Data Analytics
4. Innovation
5. Technical

The breakout groups were led by members of the Planning Committee. Objectives were identified for each breakout group in order to identify the content of the vignettes/case studies and to direct discussion within each breakout group. The Planning Committee assisted NQF staff with identifying and securing speakers to present the vignettes/case studies.¹⁹ The first in-person meeting concluded with report-outs from each breakout session.

The second face-to-face meeting, *Advancing Solutions for eMeasure Implementation*, occurred on September 21, 2012 and focused on three key topics and their critical role in eMeasurement, both today and in the future:

1. Conditions/Problem Management,
2. Medication Management, and
3. Data Visibility: Essential Elusive Elements

Feedback from the first meeting indicated that many attendees wanted the option to attend more than one breakout session. For this reason, the second meeting consisted of panel presentations and discussion with all attendees in one room. With this format, all the attendees could listen to and respond to every case study, thereby leading to more enriching conversations among attendees. The day concluded with a presentation by two measure developers describing the process and workflow for measure development and maintenance.

The second in-person meeting provided attendees with a summary overview of the first meeting in April 2012. Dr. Mostashari again provided attendees with his perspective on the current state of Health IT and eMeasures.

Panels for the second meeting offered inpatient and ambulatory case studies. Objectives were identified for each panel. Diversity of the panelists provided a broad range of experiences with eMeasure

¹⁹ For further information about the agenda and the breakout sessions please refer to the sections below and the NQF website: www.qualityforum.org/Topics/HIT/eMeasure_Learning_Collaborative/April26_meeting.aspx.

implementation. Panel moderators managed each group allowing time for questions and discussion. Discussions for each panel focused on:

1. Best practices (repeatable models) for data capture, workflow, and eMeasures,
2. Recommendations, and
3. Gap areas requiring focused attention in the future.²⁰

Best Practices and Recommendations

In accordance with the goal of the eMeasure Learning Collaborative, the participants identified best practices and developed recommendations to advance eMeasure adoption, implementation, and use. Stakeholders from the entire quality measurement continuum (measure developers, informatics experts, providers, clinicians, health IT vendors, consultants, federal partners) shared knowledge through panel presentations and guided discussion to identify best practices and make recommendations. Based on experience to date, the participants noted the tremendous variation in current practices across the entire eMeasurement landscape and for this reason best practices are in an early state of maturation and will evolve through continued stakeholder work. During the two face-to-face meetings, as the groups discussed various topics related to the adoption, implementation and use of eMeasures, three themes emerged: provider organizational leadership, data representation and clinical workflow, and learning health systems.

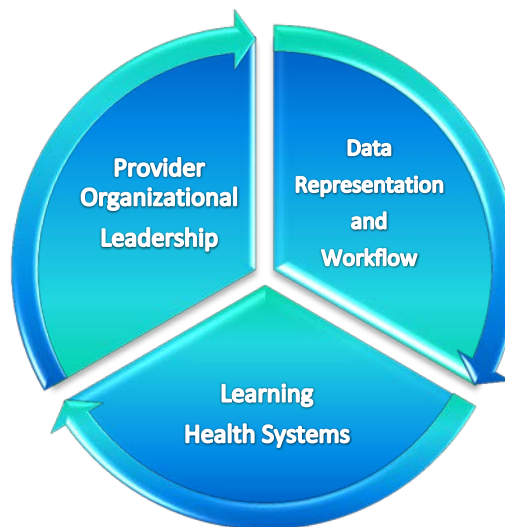


Figure 4: The key themes related to the adoption, implementation and use of eMeasures

Provider Organizational Leadership includes the intersection of management and clinical and technical leadership in defining strategy, operational plans, and education necessary for the integration of electronic quality measurement and improvement into all facets of care delivery.

Data Representation and Clinical Workflow includes aspects related to standardized representation of data within quality measures, subsequent alignment within electronic health records (EHR) applications, use within clinical workflows, to generation of electronic quality reports, subsequently leading to measurement and improvement.

²⁰ For further information about the panels during the second in-person meeting please refer to the sections below and the NQF website: www.qualityforum.org/Topics/HIT/eMeasure_Learning_Collaborative/Events.aspx

Learning Health System includes factors associated with using eMeasures to drive learning and advancement of evidence-based care as a natural outgrowth of patient care, thereby enhancing innovation, quality, safety, and value in healthcare through CDS.²¹

Provider Organizational Leadership

Although participants of the eMeasure Learning Collaborative focused on the technical aspects of eMeasure adoption, there was considerable agreement that organizational leadership plays a pivotal role in eMeasure implementation success. Providers, who shared their experiences at the face-to-face meetings, identified the need for leadership teams who infuse eMeasurement into the entire spectrum of professional practice, not just health IT. Clinician-led organizational leadership was identified as one of the infrastructure components critical to successful adoption of eMeasures. Successful sites have clinician-led leadership teams who identify inter-professional stakeholders and engage them early and often so all decisions are informed by those providing care. They also start with a small, committed group who understand eMeasurement challenges. Sites who presented use cases all have a corporate-wide strategy and plan for data standardization, so every decision during implementation of eMeasures is guided by both national recommendations as well as the organization's enterprise-wide data standardization plan. Some sites are fortunate enough to have simulation centers with databases containing de-identified patient data. These data are used to test eMeasure creation, starting with data capture at the point of care through generation of electronic quality reports.

A best practice data infrastructure plan includes the following areas:

- Methods for the design and development of logical and physical mappings of data in databases, use of metadata in driving logic and decisions, and the adoption, use, and integration of standardized terminologies and data models.
- Use of data to support care delivery, quality measurement, performance improvement, and generation of knowledge (EHRs, PHRs, Medical Devices, Data Warehouse, etc.)
- Reliable and effective use of data across all domains of the organization's business
- Technical architecture infrastructure
- Data exchange between internal and external systems
- Privacy and security
- Research to allow scientists to expedite the translation of research results into knowledge, products, and procedures to improve human health.

Once the leadership team is formed, successful implementation sites form an inter-professional team focused on implementation of eMeasures, including data capture, workflow processes, CDS, reporting, and evidence-based practice. The use of two parallel teams (leadership and professional practice) was identified as an important best practice.

²¹ IOM (Institute of Medicine). 2011. *Digital Infrastructure for the Learning Health System: The Foundation for Continuous Improvement in Health and Health Care*. Washington, DC: The National Academies Press.

When deciding on which measures to implement, the sites engage input from clinicians providing care. Meaningful involvement requires allowing sufficient time for the inter-professional team to think about and understand concepts contained within the measures. Most of the organizations start with measures that resonate with the clinicians. The participants spent much time discussing the importance of providing feedback directly to clinicians on individual performance through the use of dashboards.

One of the most critical functions of the inter-professional team is to focus on integration of eMeasures into practice. It is through integration into practice that the true intent of the clinical quality measure can be achieved and clinical decision-making can be enhanced. If the goal is to have consistent and comparable representation of data beyond billing codes, then it is imperative that approaches to eMeasurement hinge on clinician engagement so feedback on data use, inferences made with data, and workflow interplay with data capture during care delivery, can be obtained.

The first step of clinician engagement in the measurement process starts with understanding the clinical intent of the measure and identifying methods to build EHR function and processes of care around capturing data necessary for the measure. Once the measure intent is made meaningful to people providing care and feedback is given to clinicians on their individual performance, then driving forces extend beyond financial incentives into professional practice improvement and better clinical outcomes.

Provider Organizational Leadership Best Practices

1. Create inter-professional teams focused on an integrated approach to eMeasure adoption, including data capture, reporting, workflow, CDS and evidence-based practice.
2. Develop a strategy and plan for data standardization under the guidance of executive leadership and operational teams.
 - a. The data standardization plan should span point of care needs, eMeasures, data analytics, and quality improvement across the entire continuum of care.
 - b. The data strategy and plan is informed and guided by the clinical intent of the quality measures, which spans point of care delivery through quality measurement and improvement.
3. Integrate clinical intent of the quality measure into processes of care and point of care documentation to enhance decision-making through the entire eMeasure cycle (such as added prompts and decision support alerts for discharge and medication compliance decision support within health information technology solutions).
4. Educate all stakeholders on the importance, meaning, and methods of eMeasurement before moving ahead with any project.
5. Develop an organization-wide plan for execution of small-scaled pilots using a technique such as the Plan, Do, Study, Act (PDSA) cycle to move towards capturing discrete data elements from the EHR.
 - a. Use an Agile process for providing clinician feedback on data use, workflow, and decision support.

Two additional success factors related to organizational leadership include a plan for education, and execution of small-scaled pilots. Education needs to focus on the rationale behind the clinical quality measure and methods for integration into practice, with a focus on documentation implications. Successful sites identified three components to this education:

1. Quality measurement and eMeasures,
2. Role of the EHR in enabling eMeasurement, and
3. Methods for infusing quality measurement into practice and workflow.

In addition to education, some of the sites conducted small-scale pilots before engaging in enterprise-wide implementations. Through pre-and post-measurement of the pilots, best practices were identified. Both education and the use of pilot testing before mass rollout were identified as key contributors to success, and many participants stated these factors are frequently ignored.

The participants spent time discussing the need for further analysis in the following complex areas:

- Identification of best practices and the role for health IT to help identify the clinician(s) responsible for individual quality measures. This mapping is challenging when in most situations, multiple clinicians are involved in delivering care. There was a lack of agreement on best practice approaches, either in terms of professional practice or how health IT could be used.
- Standardization on use of electronic dashboards and identification of other data feedback loops is an important area worthy of further analysis.
- Implementation guidance is needed for the executive leaders (chief executive officers, vice-presidents, etc.) within organizations. There are multiple forces driving the need to demonstrate quality and safety. With fewer resources and increasing pressure from payment reform initiatives, the participants stated that executive leaders are struggling with how to use health IT for quality measurement and improvement.

Data Representation and Clinical Workflow

Data Representation and Clinical Workflow includes aspects related to: 1) Standardized representation of data within quality measures using standards (QDM, HQMF, value sets, and QRDA); 2) Subsequent alignment within EHR applications; 3) Data collection and data use within clinical workflows; and 4) Generation of electronic quality reports, measurement and improvement.

The Data Representation and Clinical Workflow theme generated much discussion. During the face-to-face meetings, participants discussed the need for common understanding between:

- The meaning of data (codes, value sets, user interface terms) in quality measures;
- The meaning of the quality measure data within EHRs; and
- Associated meanings of the quality measure data used in care delivery processes (workflow).

Harmonization of the meaning of data across all stakeholders (measure developers, standards experts, clinicians, providers, vendors, and quality measurement experts), is very important. It is important that everyone uses consistent definitions as the foundation for common understanding. This common understanding pertains to data (codes) and logic (whereby codes are used within measure logic to express meaning) across the entire spectrum of measurement (eMeasures, QDM, measure logic, human readable, XML representation, EHR documentation screens, value sets, and electronic quality measure reports). The participants spent much time discussing how one stakeholder (measure developer, for instance), may:

- Assign a different meaning to data than what a provider or vendor may assign;
- Select a data element needed for measurement that requires modification in EHR data capture or workflow at the point of care delivery; and
- Require a different level of granularity for the data element than what is currently captured in EHRs.

Data Representation and Clinical Workflow Best Practices Highlights

1. Adopt an integrated approach: Include eMeasurement data requirements into all EHR functions including CPOE, clinical documentation and CDS.
2. Conduct pilots starting with fairly simple clinical quality measures, leveraging data already contained within the EHR, as well as other quality measurement or improvement projects underway.
3. Use extensible technology and processes that support the following:
 - a. Use structured data fields for data capture
4. Flexible data capture (map front-end to back-end data necessary for quality reporting).
 - a. Standardize data sets and processes for matching patient condition to actual diagnosis
5. Capture data once and then make it available to all applications that utilize it including CDS and eMeasures.
6. Develop electronic quality reports that not only meet regulatory mandates but also show “how it is clinically meaningful for providers while caring for patients.”

What appears to be simple on the surface, such as the definition of diabetes, is sometimes not so simple: the measure developer’s definition may be different than the clinician’s definition. This needs to be addressed if EHRs are going to be used for quality reporting. Joint communication between measure developers and other stakeholders is needed, and all participants recommend engaging measure developers and other stakeholders earlier in the process, when measure developers are selecting data and representing data in eMeasure logic. Communication early in the measure development process will help avoid misunderstandings about the meaning of terms and provide the opportunity to discuss measure logic; this will then help to lessen the burden on clinical workflow during eMeasure

implementation. Participants identified this as a best practice. In addition, participants thought a consensus building platform such as the eMeasure Learning Collaborative could support this process.

The meaning of the data is obviously tied closely to the measure intent, but the same data element may potentially have different meaning within EHRs. This highlights the need for close stakeholder collaboration during the eMeasure development phase when measure developers are using the QDM and structured terminologies to represent the quality measures.

The data used in representing and describing the quality measure, as well as the measure logic, has implications for EHR applications, clinical workflow, and reliability of electronic quality measurement. Decisions on how to represent data impact every stakeholder in the continuum, from the measure developer to the patient receiving care. Participants spent much time analyzing data needed for quality measures, and even more time discussing practical concerns related to:

- Agreement on where to find the data in the EHR (problem lists, free text notes, history and physical, and other sections of the EHR);
- Identification of consistent definitions for terms used in measures and terms used in EHRs; and
- Feasibility of capturing the data during the care delivery process.

Furthermore, there may be no standardized value sets to represent concepts contained within quality measures. In other situations, there is a mismatch between the data needed for the quality measure and the corresponding data available in the EHR. For instance, the quality measure may contain one data element but it maps to multiple data elements within the EHR, which forces vendors and providers to map data. This increases implementation costs. It was also pointed out that there are different SNOMED codes for the same concept (some are pre-coordinated and others are post-coordinated). This creates variability in vendor and provider interpretation and usage of these codes within the EHR. This situation is further complicated by the fact that many times data are stored in disparate electronic systems that do not interoperate.

The participants agreed that for the foreseeable future some mapping of local terms to MU Stage 2 requirements for standardized codes is inevitable and should be taken into account in eMeasure specifications and implementation guidance. Such local terms mapping should be, to the extent possible, unambiguous and transparent. Local implementers of eMeasures must, however, have a clear understanding of the requirements of eMeasures in order to effectively map local terms to the measure. In the future with widespread adoption of MU standards, the need for such mapping should hopefully be reduced to a minimum. However, in the meantime some facilities have multiple quality reporting requirements, and the mapping can quickly become complex and quite challenging. The group spent time discussing the validity and reliability of such mappings which impacts comparability of data across care settings. Data mapping is not a best-practice on its own without processes to guide and validate data mapping methods.

The increase in quality measures and associated data could result in increased costs related to clinician data collection at the point of care. Participants recommended conducting research to assess whether the increase in data (and data granularity with an increase in data attributes) causes an increase in

eMeasure implementation costs. This cost-benefit research and analysis could facilitate recommendations at a national level. In addition, participants recommended support for research or pilots to answer many of these questions generated during sessions prior to the rollout of MU Stage 2 CQM²². Examples of a few specific questions follow:

1. What are the most appropriate codes to use?
2. What impact do codes have on clinician workflow and productivity?
3. What impact do codes have on professional practice?
4. What impact do codes have on the questions clinicians ask the patient during care delivery?
5. What impact do these decisions have on overall provider costs?

There was tremendous variation reported by participants in how sites collect data necessary for quality measurement, the types of data collected, and location of the data within EHRs. The group discussed the impact this level of variability has on quality measure reporting reliability and validity. All participants were looking forward to MU Stage 2 CQM specifications, to provide answers and serve as guidance.

Providers and vendors spent much time talking about the need for implementation roadmaps to help guide integration of data needed for measurement into existing EHRs and clinician workflows. The consensus supported standardized data at all levels, but they struggled with integration of the standards into practice, something everyone thought should occur in an evolutionary manner. For this reason, the participants of the eMeasure Learning Collaborative discussed the need for education, documentation, starter-sets of data, and best practice workflows that span the entire eMeasure cycle. The groups also discussed the need for pilot testing prior to quality measure endorsement. These pilots involve joint participation between measure developers, vendors, and providers. This assessment could eliminate high costs associated with vendor and provider manipulation of workflow, mapping tools, and data capture screens.

Undoubtedly, healthcare quality, safety, and effectiveness can be improved by using data captured during care delivery for quality measurement and reporting. Sites presented best practices and demonstrated significant progress using the EHR to generate electronic quality reports. These sites are using the data not only for MU but for dashboards that provide direct feedback to clinicians. Sites identified the use of MU Stage 2 clinical quality measures for broader-based quality improvement within organizations as a best practice. To this extent, the use of eMeasurement standards (QDM, HQMF, QRDA, NLM's value sets, and structured terminologies) is a best practice that can be leveraged for quality measurement, reporting, and quality improvement across all healthcare organizations.

²²2014 *Clinical Quality Measures*, Centers for Medicare and Medicaid Services. Available at: http://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/2014_ClinicalQualityMeasures.html

To achieve these goals, all participants felt that clinical knowledge represented within clinical quality measures must be evident at the point of care and implemented in a manner that proactively guides clinicians to act in accordance with the quality measure. There are sites doing this today. EHRs can enable this goal by matching patient information with relevant clinical knowledge contained within quality measures, thereby helping users to incorporate the knowledge into decision-making. CDS tools and EHRs play a significant role and use of a CDS taxonomy such as the one developed by NQF could be beneficial. The goal is to present the “right data” to the “right person” at the “right time in the workflow,” so it has the most significant impact on care outcomes.

For instance, the following use cases were discussed showing how quality measures, EHR function, and CDS interact:

- The EHR user records patient information (trigger) such as a problem or diagnosis that is used to define the population criteria for one or more NQF-endorsed[®] quality measures. CDS accesses essential data defined in the rule (input data); however, a required element is missing. The CDS facilitates documentation of the information by notifying the EHR user (intervention). The EHR user documents the information via one or more facilitated mechanisms (offered choices).
- A test result returns (trigger) confirming a condition used to define the population criteria for one or more NQF-endorsed quality measures. Utilizing data captured and recorded elsewhere in the system (input data), the CDS exposes that the patient meets criteria for an intervention (such as the prescription of a medication) and facilitates adherence to the quality measure by notifying the EHR user (intervention) with a pre-staged order and qualifying contraindications, which the EHR user evaluates and acts upon (offered choices).

However, measure developers reminded the participants that quality measures “measure what happened,” and CDS represents “what should happen.” It may not be possible to use the exact same data for both purposes, specifically when quality measures impact public reporting and reimbursement. Additional analysis is needed in this area.

Furthermore, in order to infuse knowledge from clinical quality measures into workflow, additional eMeasure collaboration is needed to address the following areas:

- Local or particular CDS implementation and adoption issues;
- Considerations related to effective decision support timing in the clinical workflow;
- Measurement of CDS effectiveness;
- Details of coded value sets and terminology in CDS or EHRs overall;
- Local site requests to external third-party systems for electronic information necessary for CDS logic and performance analysis;
- Methods for managing intellectual property of CDS content; and
- Structure of CDS (formalisms) for sharing requirements and storage.

The following best practices for data representation and clinical workflow were identified by the participants:

1. Use eMeasurement standards (QDM, HQMF, QRDA, NLM's value sets, and structured coded terminologies) as a best practice that can be leveraged not just for MU, but for quality measurement, reporting, and improvement across all healthcare organizations.
 - a. All stakeholders in the quality measurement enterprise should understand and consistently use relevant terms. Stakeholders may have different professional/institutional needs, leading to the capture and use of data that may look similar but reflect goals unrelated to the intent of the quality measure. It is important for measure developers, vendors, and measure users to understand who is entering data into the EHR, how it is entered, and for what purpose. General education of all stakeholders through a variety of mechanisms, such as the eMeasure Learning Collaborative in person meetings and/or webinars, can be instrumental in ensuring that all stakeholders understand and consistently use terms relevant to eMeasurement.
2. Engage in joint interactive communication between measure developers and other stakeholders early in the eMeasurement process, particularly when measure developers are selecting data and representing data within eMeasure logic. All participants identified this as best practice but also identified the need for a national structure and process to enable this level of dialogue.
 - a. A cross-walk between the QDM, measure logic, and value sets for eMeasures and the corresponding codes and logic typically found within EHRs, is needed. This crosswalk should occur early in the life cycle of an eMeasure (when the measure is represented within the MAT).
3. Adopt an integrated approach to eMeasurement whereby data necessary for quality measurement is not a stand-alone effort but integrated within *all* EHR and quality measurement related projects, including computerized provider order entry (CPOE), clinical documentation and CDS. It is essential that data definitions are aligned, from point of care systems to "after the fact" quality reporting and everything in-between, such as CDS systems.
4. Integrate quality measure clinical knowledge within EHRs for use at the point of care in a manner that proactively guides clinicians to act in accordance with the quality measure. Please review to the [Detailed Webinars and In-Person Meeting Discussions](#) section.
5. Use MU clinical quality measures for creation of performance dashboards which can be used to provide direct feedback to clinicians. In addition, the dashboards can be used for broader-based quality improvement within organizations.
 - a. Develop electronic quality reports that meet MU specifications but also show "what is clinically meaningful for providers."
6. Engage in the use of pilots starting with fairly simple clinical quality measures, leveraging data already contained within the EHR, as well as other quality measurement or improvement projects underway.

- a. Field testing for eMeasures is needed on a wide-scale. The field testing should include organizational factors related to implementation as described in this report.
- 7. Develop extensible technology and processes that support:
 - a. Flexible data capture (map front-end to back-end data necessary for quality reporting)
 - b. Standardized data sets and processes for matching patient condition to actual diagnosis.
 - c. Capturing data once and then making it available to all applications that utilize it, including CDS and eMeasures.
- 8. Develop user interfaces that capture “patient reason” as input into whether recommended interventions occurred or failed to occur.
- 9. Develop mapping of local terms to MU Stage 2 requirements for codes.

Learning Health System

Creation of a learning health system at a national level was another theme identified by the eMeasure Learning Collaborative participants. This initiative is closely aligned with provider organizational leadership. The key success factors for the learning health system environment were many. The organization must remember that the

rationale for outcome measurement is to improve clinical practice through continual learning and incorporation of that learning back into clinical practice. It is important to develop logic that links patient conditions in the EHR to evidence-based practice (EBP) guidelines through CDS. The measure specifications must be

Learning Health System Best Practices

1. Use eMeasurement to generate new knowledge.
2. Create a community of successes and share internally and across all stakeholder groups.
3. Rely on outcome measures to improve clinical practice. Don't simply measure; learn and revise.

developed in a timely manner to support EBP guidelines. Education is an important component in any learning system environment. This includes education on the rationale and methodology for measure development. Adequate time and resources must be devoted for the education to be successful. Individuals need to understand the intent of the measure, the data elements that specify the measure, the detail for collecting measure data, and workflow changes that need to occur to achieve the outcome of improved clinical practice.

For the learning health system environment concept, a multidisciplinary approach to eMeasure development and implementation was recommended. Professionals from quality measurement, health IT vendors, providers, payers and regulatory agencies must work together to educate each other on the requirements for eMeasure development and implementation.

Transparency is essential at the clinician, practice, and community level to insure they understand the goals, rationales, and processes to improve clinical practice. It was also recommended that when process improvement programs are implemented organizations should focus on one measure or area

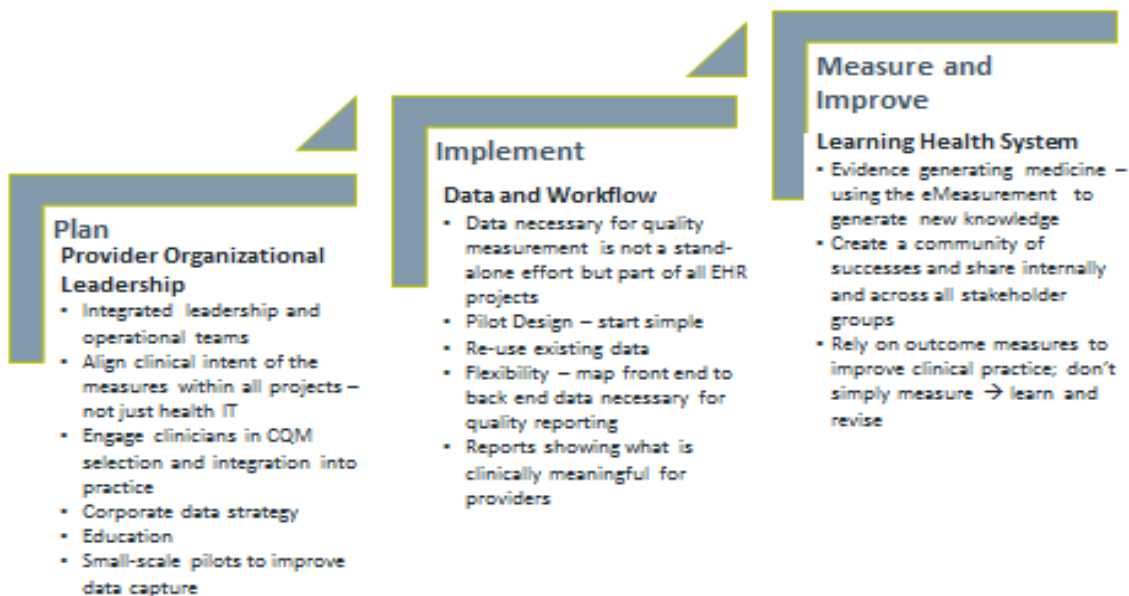
that needs improvement. After the initial implementation, a roll-out of the improvement across all settings affected can occur.

Finally, the ultimate goal is to leverage the data from the eMeasures framework (see Figure 5) to generate new evidence for creating new data driven EBP guidelines. The participants also discussed development of scoring criteria to distinguish leading practices from best practices. One of the key gap areas focused on the need for education at the university level so faculty is prepared for education and research. Methods are needed to identify better ways to extract data in a manner that will generate knowledge and create learning systems. This will motivate people beyond quality measurement into other areas of improvement. The data can also be used for credentialing, certification, and maintaining licensure.

Framework for Best Practices and Recommendations

As the eMeasure Learning Collaborative progressed, a framework for best practice implementation for eMeasures started to emerge. Figure 5 identifies key factors that evolved during the public forums. This framework will continue to unfold as the eMeasure conversation continues.

Figure 5: The figure shows the key factors related to adoption and implementation of eMeasures.



Detailed Webinars and In-Person Meeting Minutes and Discussions

March Webinar eMeasure Implementation: *Implications in Small Practice Settings*

On March 15, 2012, the eMeasure Learning Collaborative hosted a webinar titled *eMeasure Implementation: Implications in Small Practice Settings* with over 380 participants. The overarching goal of the publicly held webinar was to provide attendees with best practices, gaps and recommendations for eMeasure implementation within small practices (e.g., clinicians, private practices and clinics). The webinar had four learning objectives:

1. The importance of advancing eMeasures in small practice settings
2. Best practices in implementing eMeasures within ambulatory electronic health records (EHRs)
3. eMeasure implementation results, challenges, and future work
4. The mission of NQF's eMeasure Learning Collaborative and its value to small practice providers

The webinar provided an overview of the eMeasure Learning Collaborative objectives and the April in-person meeting agenda. A short presentation on eMeasures included a discussion of measure concepts and a sample of the human readable output including the logic needed when the measure criteria is applied to an EHR.

Shawn Griffin, MD, Chief Quality and Informatics Officer, Memorial Hermann Physician Network (MHMD), Houston, Texas, was the webinar's featured speaker. Dr. Griffin, through his experience working with over 800 practices, discussed five principles when working with practices and eMeasure implementation:

1. Survival Breeds Variation
2. Motivation, Education, Communication, and, Innovation to Overcome Insulation
3. "Technically Defined" may still be "Practically Impossible"
4. "Chew the Elephant"
5. Know your limits

During the webinar, Dr. Griffin shared steps Memorial Hermann took to increase engagement of small practices. He emphasized assessing the practice and understanding the workflow as the key to success during his presentation. Dr. Griffin described the importance of understanding the practice beginning with the workflow from both provider and staff perspective, the decision making process in the practice, and the need to engage all providers and staff when implementing workflow changes.

Other salient points included keeping the process simple and executable to make it work, the need to integrate eMeasures processes into the providers' workflow, assisting the practice in assessing their workflow and EHR to understand where and how data for measures are collected, and establishing a single point of contact for the practice to improve communications. Dr. Griffin stated that providers need to be educated on eMeasures processes and requirements and understand that quality measurement is about providing better care. To this end, Memorial Hermann sends providers individual reports on their current status, distributes quarterly newsletters to practices with a focus on eMeasures.

Practices are offered technical assistance to tweak their EHR and workflow to collect the required data. Understanding the limits of the project is essential to its success. Dr. Griffin stressed that it must be recognized that challenges due to—personnel, technology, financial, etc. — may be too much for some to undertake.²³

April Meeting: Best Practices in eMeasure Implementation

As noted above, the first meeting had five breakout sessions. Below is a summary of the vignettes and discussion during the breakouts.

Implementation Acute

The Implementation Acute Breakout session focused on best practices for eMeasure implementation in hospital settings from diverse multidisciplinary perspectives. The discussion concentrated on the clinician/EHR interface with respect to workflow impact and how off-the-shelf vendor products are used or modified to achieve results, as well as essential implementation elements regarding governance, process, vendor interaction, and hybrid data management methods.

The first vignette was presented by Pam Feeler, BS-ChE, RN-BC Nursing Informatics, Director of Nursing Informatics, and Linde Merrow, RN, MS, Administrative Director Clinical Quality and Measurement of the Phelps County Regional Medical Center, a small community hospital. The initial steps for eMeasure implementation included conducting a gap analysis with a quality reporting vendor, establishing a core team and ad hoc physician advisory committee, and understanding the measures thoroughly. For each indicator, they developed workflows and identified documentation requirements. It was important to ensure the appropriate team members were involved in the development of workflows, and to insert documentation into existing successful workflows when possible. It was also vital to ensure data is validated and every piece of the data is captured; in fact, validation during the software build helped to drill down to the point where compliance could be improved. Training was crucial not only for the clinicians, who were becoming more familiar with the core measures, but also for everyone on the team. Another important practice was to specify each measure to the group implementing the measure; for example, ED measures were specified for the ED.

The second vignette was presented by Tanna Jackson, Software Analyst III and Amy Crow, Project Consultant, from Texas Health Resources, in Arlington, TX on eMeasure implementation in a large integrated health system. Ms. Jackson stated they conducted a gap analysis by evaluating the CMS guidelines for each data element and the EHR model configuration. They were then able to map discrete data elements and strategically place the elements into nurse and physician workflow. They also conducted technical and clinical validation. The technical validation for electronic abstraction ensured that data from discrete documentation in the medical record matched the report. Clinical validation looked at differences between discrete data on the report and what can be found in manual abstraction

²³ The webinar titled *eMeasure Implementation: Implications in Small Practice Settings* can be accessed at: http://www.qualityforum.org/Topics/HIT/eMeasure_Learning_Collaborative/Events.aspx

of both discrete and non-discrete data. They then conducted a second analysis to find out all the possible ways the element can be documented discretely and incorporate it into workflow.

Implementation Office-Based Practice

The Implementation Office-Based Practice breakout group focused on eMeasure implementation best practices in ambulatory settings, particularly small practices. Discussion concentrated on the clinician/EHR interface with respect to workflow impact and how off-the-shelf vendor products are used or modified to achieve results, as well as essential implementation elements regarding governance, process, vendor interaction, and hybrid data management methods.

The first vignette was presented by MaryAnne Peifer, MD, MSIS, from Lehigh Valley Family Practice. The practice built a variety of quality and operational metrics which are routinely distributed to their providers and office managers; the team-based approach is important. They follow a set of rules, including the exact use of evidence-based measures in addition to pushing out standardized measures to all providers instead of waiting for specific requests. They have worked toward growing the comfort level with data transparency. At the provider and practice level, they make the data available to all; there is privacy at the patient level data. They also select measures that are important to the providers; for example, the warfarin registry is one of the most popular operational registries. Dr. Peifer also recommended starting with measures that have a high degree of ease of use and are not complicated. Several lessons learned were shared. For example, data that are collected naturally in the clinician workflow are the easiest to obtain. Another lesson was to encourage and respond to clinician feedback to encourage their participation. Payment can also be an important incentive, as are patient-centric outcomes measures that relate directly to better care. A looming challenge is ensuring the consistent use of vocabulary sets recommended by the federal government's Health IT Standards Committee, since the underlying data structure of EHRs are not standardized, even when they are ONC certified. Often the EHR has the ability to follow the specifications of the measures, but they are typically customized to follow the clinical workflow.

For the second vignette, Michael Mirro, MD, Parkview Physician Group, presented a use case example of registry data for performance reporting. The PINNACLE registry has quality data for outpatient management of cardiovascular conditions that can be used for quality measurement and CDS. The project started with a small pilot group before rolling out to all physicians in the group. The registry initially allowed paper-based data entry, but now only allows data directly submitted from the EHR vendor or through a data aggregator. Many of the data fields are pre-populated and the physicians review for accuracy at the point-of-care. This active data entry was a contributor to the practices' above average performance. Physicians receive financial incentives for their participation and performance adherence. Point-of-care CDS tools help physicians identify and record exceptions, for which they receive credit. They also have an infrastructure, including protocols and nurses, to support the anticoagulation care that is being tracked in these measures to respond to the performance reports.

Clinical Data Analytics

The Clinical Data Analytics breakout group was tasked with identifying best practices for collecting, scrubbing, analyzing and using clinical data to allow aggregation for quality measurement and reporting. The breakout group was asked to focus on data workflow from collection through analysis and reporting, as well as data workflow components and suggestions for clarifying process steps.

Presentations by two providers kicked off the session. Ted Palen, PhD, MD, MSPH, FACP, Physician Manager - Clinical Reporting, Institute for Health Research at the Colorado Permanente Medical Group discussed using eMeasures to support registry development, clinical practices, transitions of care, and patient outcomes. Dr. Palen emphasized the overall need to translate research into practice in order to care for patients. He discussed the use of quality and safety alerts in the Kaiser EHR and provided examples. Kaiser uses a system to provide feedback to providers on their measures for the population they are caring for.

The second vignette was presented by Christopher Snyder, D.O, Chief Medical Information Officer at Peninsula Regional Medical Center in Salisbury, MD. Peninsula Regional Medical Center is the sixth largest medical center in Maryland and provides a full scope of services to the residents of Maryland's Delmarva Peninsula. It is a Level 6 HIMSS facility²⁴ and it has been identified as a "Most Wired" hospital in 2010, 2011, and 2012. Dr. Snyder focused on the Cardiology Data Analysis Team (CDAT) at Peninsula Regional. Dr. Snyder started by asking the question: "how do you take data and apply it to care?". He described how after CPOE was in production at Peninsula Regional, the decision was made to look at high risk medications such as dilaudid, morphine and anticoagulants. By educating providers about dosing and risks, provider behaviors would change. Dr. Snyder noted with CDS, Narcan use was reduced by 70% in the first year.

Using the data from their most active department, Cardiology, Peninsula Regional has undertaken a project to assess and modify the process for collecting, analyzing and submitting data to external reporting organizations. Under the current method, clinical staff collects the data and enter it into the system. With no analysis, the quality data is sent to the external reporting organizations (standards programs Society of Thoracic Surgeons (STS) and the American College of Cardiology (ACC), Code Blue: Get With the Guideline, etc.). Six months later a report and analysis is received. This process has a number of gaps: staff is entering the data without analyzing the data and understanding what the data will be used for or what to do with it; the 6 month lag in receiving a quality report back; the reports do not provide relevant information, and; department directors who read but do not understand what to do with the results to improve the quality of care.

Upon reviewing the data in the reports analysts found omissions and inconsistencies with the collection and accuracy of the hospital's data. To correct this issue, Peninsula Regional set a goal to "transform poorly managed data in their major service line to usable clinical analytics supporting both clinical

²⁴ Only 6% of all US hospitals have reached this level of information technology sophistication - this according to a recent Peninsula Regional press release. Available at <http://www.peninsula.org/body.cfm?id=35&action=detail&ref=847>

practice and optimizing regulatory compliance.” Applying Lean principles, the staff assessed the current state of data collection and reporting. Dr. Snyder and his team then identified objectives to meet their goal. These included: streamlining the abstraction process, infusing validation in the process, automating for concurrent data analysis, providing a means to display variances to the provider, and sharing with providers scores that show improvement and in turn quality. Two ways to meet these goals are through automating data abstraction and providing a data omission scorecard to providers so they can see what is being left out of the scoring process. Dr. Snyder also stated that incentives are needed in order to continue to prove that systems work, that taking data and translating it for why it is important to physicians does lead to greater success. And that physicians’ challenging the reliability and safety of the system only helps the system improve. He also emphasized the need for reports and outputs to show what is deemed clinically meaningful to providers. Dr. Snyder pointed out an emerging common problem across the industry - that we are “becoming data rich and knowledge poor.”

Innovation

The Innovation breakout group focused on new, innovative methods to enhance the value of structured data and to interpret unstructured data for use in quality measurement and reporting from EHRs and other data sources. The discussion concentrated on common threads among these various methods, as well as consideration of method evaluation criteria and suggestions for including methods in quality measurement data workflow.

The first vignette was presented by Dorinda Leutink, RN, BSN and Dwight Brown, NREMT-P, MIM, CPHIMS on implementing heart failure eMeasures at Mayo Clinic in Rochester, Minnesota. The first layer in their “peel back the onion” approach is retrospective review which involves administrative data supplemented with manually abstracted data. The next layer is concurrent analysis to transition into using eMeasures. In this phase, they are testing CDS rules with a review team to provide feedback to the providers. The final step is to bring decision support and real-time analytics to the point of care and to take the review team out of the middle. They are following the Plan, Do, Study, Act (PDSA) cycle to move towards discrete data elements that can be pulled from the EHR. To facilitate workflow in the EHR, they have added prompts to the dictation system and decision support alerts for discharge and medication compliance decision support. They are also researching natural language processing (NLP) to capture documentation that is in free-text. As lessons learned, Mr. Brown recommended elemental analysis to understand what data are available and to develop a practice-driven strategy for data collection. He also recommended using concurrent review feedback to inform decision support development and clinical documentation changes. By leveraging data elements that are already available, the transition to EHR-based reporting can be more successful.

The second vignette was presented by Heather Budd at Blackstone Valley Community Health Center in Pawtucket, Rhode Island on using eMeasurement for cost and quality accountability. The Blackstone Valley Community Health Center network uses an ambulatory EHR service and Health Information Exchange (HIE) at the local level for radiology and lab interfaces; the data are then stored in a quality reporting data warehouse. In terms of performance improvement, they have found that focusing on one metric per month enables targeted interventions for improvements. These metrics can also be tracked

over time so they do not lose sight of progress already made. They have also looked at redesigning the care team to have sufficient administrative support for the providers to get ensure the data is properly entered into the EHR. They also connect with the state level HIE and Beacon Community for population reporting and benchmarking, as well as integrating hospital and claims data with the ambulatory data warehouse. This enables standardized interoperability for patient data exchange across multiple providers. In addition to quality, the hospital and claims integration allows cost data analysis. By overlaying quality metrics with cost data, they can easily display that reducing costs has not impacted quality improvement activities.

Technical

The Technical breakout group was tasked with identifying current efforts to format and express quality measures and other queries for secondary data use; review benefits and challenges of the HL7 Reference Information Model (RIM), Java Script and other formats to describe data, context of use and logic; identify essential requirements for queries to EHRs to fit data workflow; and develop recommendations to drive eMeasure expression. Additional notable challenges the group faces were to explore ways to expand and improve the Health Quality Measures Format (HQMF); addressing the issue of 'scraping' EHRs for data; and how to express attribution in HQMF.

Two vignettes were presented during this session to provide a common understanding of existing efforts to format and express quality measures. The first vignette was presented by Eric Pupo of Deloitte Consulting on the ONC S&I Framework's Query Health Initiative. The Query Health initiative uses existing standards to create reference implementation for querying electronic data. The standards used included HL7's Quality Reporting Document Architecture, other ONC S&I framework standards such as the Clinical Element Data Dictionary. The initiative has led to lessons learned regarding the complexity of existing standards and approaches to simplify existing standards including the input into the next version of the HQMF standard.

The second vignette was presented by Floyd Eisenberg of the National Quality Forum on HL7's Health Quality Measure Format (HQMF) and Quality Report Data Architecture (QRDA) standards and the Quality Data Model (QDM). Many of the current standards and models start simple but gradually become more complex as the needs evolve, for example the QDM started as a simple model for data elements similar to the CEDD but became more complex in order to support the nuances of measure criteria. The second vignette highlighted complex measurement areas that existing eMeasure standards will have to address in the future.

The discussion following both vignettes highlighted two ends of a continuum with simple standards that can be interpreted consistently and implemented easily on one end, and complex standards modeled after inherently complex data on the other. The group agreed that it is to the benefit of the industry to build upon existing work and to improve standards so that they are more implementable and still meet measurement needs. This not only prevents duplication of work that has already been completed, but also focuses any new efforts on addressing true gaps that prevent wide scale electronic quality measurement.

September Meeting: *Advancing Solutions for eMeasure Implementation*

The second meeting focused on identifying best practices in use of EHR data for quality measurement. The day began with a summary of the April meeting and keynote remarks. Dr. Butt presented the three overarching themes from the April meeting:

- Provider Organizational Factors / Leadership
- Data Representation and Clinical Workflow
- Learning Health System

Dr. Mostashari shared keynote remarks on the future of quality measurement and his vision moving from a retrospective accounting to providing real-time improvement. To get to this future vision, he noted some of the progress already made and lessons learned. First, there was a need to prioritize measurement concepts. Then based on the priorities, measure development acceleration began, including development of *de novo* measures. With this accelerated development came the need to maintain and standardize the quality measure data elements and their associated value sets. With feedback on data quality assurance, Dr. Mostashari stated he is hopeful for continued progress toward the future vision.

The agenda then proceeded to three panel discussions on condition management, medication management, and data visibility of essential elusive elements. The sections below contain summaries of the vignettes and discussion during the panels.

Following these panels, two measure developers provided insight into the measure development process. Their remarks helped participants and end-users of the measures understand more about how measures are developed.

Condition/ Problem Management

The Condition/Problem Management panel was tasked with defining condition/problem management and its importance to eMeasures/CQM. During the April Collaborative meeting the use of the problem list in defining the denominator for quality measures in Meaningful Use Stage 1 emerged as an important issue which led to the panel's focus during the September meeting. The panel was moderated by Ginny Meadows, RN, Executive Director, Program Office, McKesson. Two organizations shared their perspectives: Zahid Butt, MD, FACG, Digestive Disease Associates Practice, Maryland; and Peggy Pollard, RN, Director, Clinical Informatics, CentraHealth, Lynchburg, VA.

Dr. Butt discussed his experiences implementing an EHR system in an ambulatory practice. The practice upgraded to a full certified EHR system in March 2012, and eight providers are qualified to attest for Meaningful Use Stage I in October. They use structured data entry from patient-completed forms, and their system has CPOE, ePrescribing, and interfaces with commercial labs and radiology. The practice employs medical assistants to capture structured data in the problem list, medication list, allergy list, and the past medical history. The practice decided to include an expansive definition of the problem list, including previous problems, which led to the need for guidance on coding for current, previous, suspected, and resolved problems. Another challenge is the question of attribution of results to the

physician managing a problem; that is, within a specialty gastroenterologist practice, they can report on blood pressure management but they are not the responsible party for treating blood pressure. Dr. Butt concluded by stating that selecting the quality measures for reporting before implementation was an important “lesson learned” to ensure the necessary data elements are incorporated and workflow changes are addressed upfront.

Peggy Pollard, RN, then presented on Quality Measures in an acute care setting. They aligned achieving the status of Stroke Center of Excellence while implementing Meaningful Use, which added value for the clinicians and increased adoption rates. They attested for Meaningful Use in September 2011. A challenge for implementing their EHR system was designing and managing the problem list. In switching from a “frequently used” list to searchable SNOMED codes, they found they were losing specificity in the diagnosis coding, and they had to balance accuracy with ease of use and fit in the workflow. A “lesson learned” was being able to demonstrate the benefits of the new technologies to gain physician champions; for example, a voluntary decision support for early diagnosis of community-acquired pneumonia was championed by the pulmonologists when they found it helped with a more definitive diagnosis. A challenge was “who owns” the problem list; nurses felt comfortable creating the initial problem list, but did not feel comfortable updating or marking conditions as resolved. Another challenge was explaining the measure logic for inclusion and exclusion of patients. Ms. Pollard stated that one factor in their success was incrementally adding IT functionality; barcode scanning and CPOE were implemented and widely accepted prior to rolling out the quality measures. Another success factor was engaging staff, including administrative staff, early in education. Ms. Pollard concluded by stressing the importance of partnership with providers in implementing eMeasurement; when we do the right thing for patients, providers will champion it.

Medication Management

The Medication Management panel was tasked with identifying data requirements and workflow best practices to reliably determine medication usage and adherence over time and location. The panel was moderated by John Derr, RPh. Four organizations/entities shared their perspectives: Jude Pierre, MD, Access Healthcare Physicians, LLC; Colorado Permanente Group (Ted Palen, MD, Samer K. Khodor, MD and Brandy D. McGinnis, PharmD); Skekhar Mehta, PharmD, American Society of Health-Systems Pharmacists; and Heather Sobko, PhD, RN, University of Alabama at Birmingham.

Jude Pierre, MD, is a practicing physician at Access Healthcare Physicians, LLC, a multi-specialty practice in the Tampa Bay, Florida area. Dr. Pierre is also the CEO of Phyaura, LLC, a health information technology company which has developed an open source EHR for provider offices. Dr. Pierre spoke about medication list management, how data is inputted in the EHR by patients (through a portal), providers and staff, data sources for medication management, and, medication sampling. Dr. Pierre discussed using a standardized RxNorm database to assure communication of information between systems including the patient portal and the EHR. Dr. Pierre’s practice encourages patients with computer access to review their medication lists via the patient portal and add/delete medications they are taking. Information entered through the portal is transferred back to the EHR allowing for drug-to-drug interactions and allergy checking on medications the patient has entered. Because the EHR has the

capability to split screens, a provider can view both the medication list and the patient portal making medication reconciliation easier. Dr. Pierre went on to discuss how their EHR has the ability to categorize and inventory sample medications. Like many practices, they accept medications from pharmaceutical companies. They provide the medication to patients who cannot afford the meds. It allows the practice to assess compliance of those patients who have received the medications from the office and track on the medication list.

The second case study was presented by a team from Colorado Permanente Group in the Denver area. Ted Palen, MD, noted in his opening remarks that Medication Management is a very broad topic. Samer Khodor, MD, was introduced and focused his presentation on managing active medication lists and the challenge of eliminating duplicate meds on the list. The goal at Colorado Permanente is to maintain an accurate list of medication in the EHR. The challenge is getting providers to record the medication in the medication tab of the EHR. This is important because Kaiser has shown that medication reconciliation at discharge can reduce hospital readmissions by 16%. Dr. Khodor emphasized that an accurate medication list directly impacts quality and patient safety when a patient is discharged to another facility or to home. Kaiser focused on the ambulatory physicians. They looked at three functions within the HealthConnect system to determine if a provider was reconciling medications: 1) did the physician access the system and, if so, how often; 2) did they reorder or discontinue medications; and, 3) did they acknowledge they had reviewed the medications? Dr. Khodor stated these three actions support good medication management. They will also look for duplicate medications as they are the most common error on a medication list and easiest to capture. Dr. Khodor emphasized that reconciling meds to eliminate or reduce duplicates can reduce other errors in the med list. It was noted that some meds will be duplicated, for example, albuterol inhaler and albuterol nebulizer. Dr. Khodor mentioned that medication reconciliation has been added to the dashboard for operational leaders. Colorado Permanente has implemented a standardized, web-based tool focused on medication reconciliation for review by physicians. And they are considering how to include others on the healthcare team in reconciling medications in the ambulatory setting.

Following Dr. Khodor, Brandi McGinnis, PharmD, addressed the issue of medication adherence. Dr. McGinnis identified as a gap the lack of adherence documentation in EHRs. A second big gap is the external filling of prescriptions. Improving medication adherence starts with accurate medication lists. At Kaiser they are integrating adherence data into the EHR along with educating providers and patients to the importance of medication adherence.

The third presentation was by Skekhar Mehta, PharmD, Director, Clinical Guidelines and Quality Improvement, American Society of Health-System Pharmacists. Dr. Mehta spoke from the perspective of a professional association and discussed best practices used at member sites. One site he discussed uses barcoding and CPOE, and pharmacists round with the healthcare teams in the ICUs and medical units. These actions allow pharmacists to conduct preventive strategies. The pharmacists at the site developed an independent custom library, fed by the EHR and barcode data, allowing pharmacists to communicate among themselves about patient administration times. Because medications and administration time data was not available to all providers, a communications gap was created. Sometimes a process

implemented to improve work actually contributes to a break in communications. Dr. Mehta continued this theme with a brief discussion about the importance of timing in administration of medications in the area of medication management and the important role pharmacists can play in managing this area.

The fourth panelist was Heather Sobko, PhD, RN, a nurse informatician from the University of Alabama at Birmingham (UAB), and president/ CEO of IVR Care Transition Systems, a robotics company. Dr. Sobko presentation focused on the challenge of care transitions and the gap with medication adherence post discharge to home for patients. Patients may receive instructions about their medications before discharge but a variety of issues may interfere with retention of the information leading to confusion about medication administration instructions. This vulnerable time can lead to patients taking incorrect medications, an incorrect dose at the incorrect time(s), and possibly, for the incorrect period of time. Through the use of interactive voice technology, a low tech technology, a study is underway to track patients discharged to home to monitor compliance with medication administration. The program, in conjunction with the UAB Health System, uses a telephone as many patients do not have access to the internet. Using the telephone also overcomes some of the challenges associated with health literacy. Using a phone requires the patient to push buttons in response to questions. And, it is inexpensive. Patients respond to questions about their prescription drugs, over-the-counter drugs, side effects, questions to determine if they are following their medication regime, etc. The survey is less than 4 minutes, the patient is called at a time they choose and continues through the first 30-days post discharge. Patient responses are displayed on a dashboard allowing nurses monitoring the patient responses to determine if a patient needs a call or home visit. A challenge with the program is that many of the patients live hundreds of miles away and may visit another hospital or provider rather than return to UAB. The information is linked to the patient's last encounter in the EHR allowing for providers to review the results and reconcile the patient's medication if needed. Dr. Sobko reported that the program has reduced re-hospitalizations by 25% and emergency department visits by 22%. Dr. Sobko also pointed out the importance of understanding the context of the patient and how they are taking their medications.

Data Visibility: Essential Elusive Elements

The Data Visibility: Essential Elusive Elements was tasked with identifying best practices and potential new solutions to manage data that have a high impact on clinical care yet have proven problematic to capture and manage in structured form. The panel was moderated by Kevin Larsen, MD, Medical Director, Meaningful Use, Department of Health and Human Services (DHHS), Office the National Coordinator (ONC) for Health IT, and Karen Nielsen, Analytics and Business Intelligence, R&D, Siemens Healthcare. Two organizations/entities shared their perspectives: Kenneth Goldblum, MD, FACP, Chief Medical Officer, Renaissance Health Network, and David Stumpf, MD, PhD, Woodstock Health Information and Technology.

Dr. Larsen started the panel with a few remarks and observations. He suggested as a best practice the idea of one person/one device strategy that results in providers effectively completing tasks. He also commented on data disparity across systems. Data is in silos for various reasons – for example, there are incentives to keep it siloed, or the perceived risk of data loss if it is not siloed, or for professional reasons

because the data is collected for reasons other than quality. So, how do we all work together and use the same data? Dr. Larsen then offered recommendations to close the gaps. Systems must be sophisticated enough to allow different users to see the data differently was one suggestion. He also stated the need to present data when it is needed to help provide the best care and suggested the concept of data in continuous feedback loops.

Karen Nielsen also offered some opening remarks. She looked at the challenges, or gaps, from the perspective of discrete data being available but it is not all in the same system and/or the systems do not exchange data. She used as examples structured data in an ambulatory system not talking to an acute care system, or data captured on paper but not in the EHR, or data captured electronically but not in a structured format. Ms. Nielsen said an important question to ask for meaningful use is where will the data come from and who will determine the definition of the data element – the coder or the clinician?

Dr. Goldblum discussed data in the trenches. He discussed how the Gateway Medical Associates, a 30 provider practice he is part of, is a member of Renaissance Health Network, a Pioneer ACO (Accountable Care Organization). He stated that they are fortunate to have three full time IT staff to support the EHR and who have been instrumental in developing the tools that allow them to extract and upload data to Renaissance. Data from the EHRs is uploaded to a Population Management Tool, a web-based application they developed. The tool is really a registry but allows for reporting that is used for quality improvement. It allows the provider to see what quality measures are at goal and which are not. He said a challenge of the system is tracking the denominator because patients who make up the population may no longer be patients, were seen once, etc. Dr. Goldblum also pointed out that some data (e.g. vaccines) can be documented in multiple places in the record challenging them to standardize where the data is collected in the EHR. Conversely, there was no place to record depression screening, falls assessment, mammography data and colonoscopy data so they developed a health maintenance section in the EHR to record data and document actions if required. This data is easy for users to search and find the information. Other challenges are with recording data out of range such as a patient's abnormal body-mass index or cigarette smoking – easy to record but need to standardize in the EHR a place to document the action taken. Dr. Goldblum also spoke to the challenge of what he referred to as the “data/document divide” or interoperability – getting data into the patient record for tests or procedures that are not ordered by the practice but for which they receive results.

Dr. Stumpf discussed the need to look at frameworks that exist today and can be deployed. He pointed out that many of the conversations in the course of the day could tie to his presentation and that it is about process as well as outcome. He cited a recent Institute of Medicine (IOM) report²⁵ that suggests we need better capture of real-time data to move toward continuous improvement. Recommendations from the report cited the need to change digital infrastructure including better ways to extract data to allow for learning systems. Dr. Stumpf emphasized it is not all technology – it is also people and

²⁵ IOM (Institute of Medicine). 2012. *Best care at lower cost: The Path to Continuously Learning Health Care in America*. Washington, DC: The National Academies Press.

processes. Defects in implementation exist, interoperability is too narrow and the definition of it needs to expand. Dr. Stumpf suggested use of platforms that sit on top of EHRs, ADT, pharmacy, lab, systems that will aggregate and harmonize data. He suggested the use of modular capabilities. The goal is to get real-time analytics. He suggested using analytics to create a list of tasks with outcomes. Dr. Stumpf recommended a medical ontology model with links to tasks of related capabilities, and encouraged the development of modular components to interact with EHRs.

Future Implications

In 2012, the eMeasure Learning Collaborative provided key stakeholders – measure developers, federal agencies, health IT vendors, providers, clinicians, professional societies, payers, patients, etc. – the opportunity to share knowledge about the development and implementation of eMeasures. With adoption of the best practices defined in this report, progress can be made towards the use of health IT for performance measurement against the three NQS aims of better care, affordable care, and healthy people and communities. However, best practices are in an early state of maturation and will evolve through continued stakeholder collaboration. As measure developers, health IT vendors, policy makers and providers continue with implementation of eMeasures, best practices will be enhanced. In addition, through forums such as the eMeasure Learning Collaborative, innovative methods for developing and implementing eMeasures can be discovered and vetted.

Participants identified the following recommendations to improve use of EHR data for electronic quality measurement:

1. Continue support for the eMeasure Learning Collaborative whereby all stakeholders have the opportunity to communicate requirements, share best practices, identify gaps, and develop recommendations.
2. Develop tools that support automated mapping from SNOMED to ICD on problem / diagnosis lists along with versioning support.
3. Provide implementation guidance, starting with ensuring that the design of documentation templates is aligned with data elements required by eMeasures to support the entire continuum of eMeasurement. This is particularly important for small practice sites that frequently do not have robust health IT support.
4. Support efforts to harmonize measure specifications, value sets, and outputs. Quality measures should be shareable and understandable to all. Usability testing should be done in simulation centers or labs to ensure appropriate workflow incorporation of quality measurement.
 - a. To test data capture and workflow processes and to assess unintended consequences of eMeasurement.
 - b. Assess utility of data use from other health IT systems such as case management systems.
5. Extend existing standards to accommodate gap areas and future eMeasurement needs. The participants discussed extension of the QDM to resolve ambiguity in relation to quality measure logic, intended meaning, and data found in EHRs. In addition, participants discussed extension

of the HQMF to support attributes, as well as creating more simplified representation of the QDM and HQMF.

6. Offer vendor support in the following areas:
 - a. Development of solutions that allow for flexibility in data capture while still supporting standardized data entry and reporting. Structured English language sentences should be provided to clinicians that are then translated to coded measurements on the backend to reduce complexity.
 - b. Creation of new technologies such as natural language processing which could address some of the challenges associate with unstructured data in EHRs. Additional research in this area should focus on reliability and ability to validate the accuracy of the conversion process.
7. Conduct formal usability testing of vendor products to reduce data capture burden and eliminate redundant data elements.
8. Identify mechanisms to capture, validate, use, and incorporate external data such as outside care, patient reported data, and mortality data.
9. Increase the reliability of new technologies such as natural language processing (NLP) through additional research.

Appendix A: Planning Committee Roster

Dana Alexander, RN, MSN, MBA

Vice President, Integrated Care Delivery & Chief Nursing Officer, Caradigm

Dwight Brown

Manager, Quality Measurement, Mayo

Zahid W. Butt, MD, FACP

CEO, Medisolv, Inc.

Jason Colquitt

Director of Clinical Development, Greenway Medical Technologies

Kendra Hanley, MS

Project Manager, Health Outcomes and Quality Initiatives, American Medical Association – convened Physician Consortium for Performance Improvement

Delane Heldt

Project Manager, American Medical Association – convened Physician Consortium for Performance Improvement

Sharon Hibay, RN, DNP

Director, Performance Measures, American Board of Internal Medicine (formerly MIDS Director, Quality Insights of Pennsylvania)

Louis Hochheiser, MD

Chief Medical Leader, Professor Emeritus, Humana Inc., University of Vermont (resigned 6/30/2012)

Jesse James, MD, MBA

Senior Medical Officer, Meaningful Use, Office of the National Coordinator for Health Information Technology, U.S. Department of Health and Human Services

Liz Johnson, MS, FHIMSS, CPHIMS, RN-BC

Vice President, Applied Clinical Informatics, Tenet Healthcare

John Maese, MD

Practicing Physician, Geriatric Private Practice

Ginny Meadows, RN

Executive Director, Program Office, McKesson Corp.

Michael Mirro, MD, FACC, FACP

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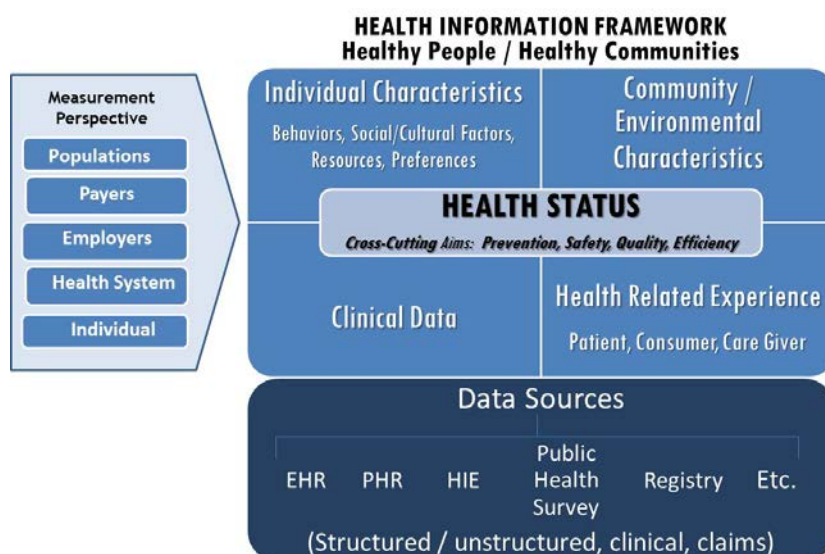
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Appendix B: QDM Health Information Framework

NQF’s Health Information Technology Advisory Committee (HITAC) developed a Quality Data Model (QDM) Health Information Framework (see Figure 8) to describe the breadth of information needed to measure health.²⁶ The framework was envisioned to assist in the development of the national data platform that would provide the information necessary to support health improvement and measurement efforts. The framework provides the basis for a common model that can be used to describe data that are reusable for different purposes (a model of meaning).²⁷ The framework helps to identify the requirements and methods necessary to describe, capture and access reusable data for purposes of quality measurement.

Figure 8: HITAC QDM Health Information Framework



The HITAC QDM Health Information Framework (Framework) incorporates four domains of information that enable a broader reach for data and encourage attention to the entire spectrum of potential data sources: Individual Characteristics (encompassing the Behaviors, Social / Cultural Factors, Preferences, and Personal Resources), Health Related Experience (with the perspectives of patient, consumer, and care giver), Clinical Care Process (including proteomic and genomic data), and Community /

²⁶ Quality Data Model June 2012 Update, Pre-publication Release.

²⁷ A model of meaning represents the underlying meaning in a way that is common to, and reusable between, different use cases. In contrast, a model of use represents the underlying meaning in a way that is determined by a limited set use cases. Excerpted from International Health Terminology Standards Development Organization (IHTSDO) Glossary, January 2012 International Release. Available at:

http://www.ihtsdo.org/fileadmin/user_upload/doc/tig/glsc/glsct_ss_ModelOfUse.html#_c0cc3aca-4e72-40ba-af25-116e04a36fad, accessed 25 April 2012.

Environmental Characteristics. Each of these dimensions has an individual consumer, a population (previously, community), and health system dimension – factors that can be attributed to the individual and factors that are influenced by local community and population demographics. It is likely that any comprehensive measure of health should address each of the dimensions. The information requirements for each dimension are grounded in sources such as EHRs, personal health records (PHRs), HIEs, public health surveys, and other sources.

The Framework is the conceptual platform on which the QDM structure is built. It encompasses data from EHRs and other sources to manage measures of health for populations, health plan members, health system participants (or an individual provider’s panel of patients), employers, or for measures of individual health for consumers. Examples of the many data sources are listed in Figure 8 (EHRs, PHRs, HIEs, public health surveys, and registries), but these are not intended to be exclusive. Information obtained from social media, hand-held and other devices will be increasingly significant for measuring health. The QDM is a model, or a grammar, to describe the information requirements (the model of meaning), based on the Framework, that can encourage innovation in data capture (multiple models of use) to enable easier access to data and an analysis of health. It is based on a patient-centered approach to health with careful attention to outcomes and patient engagement. The Framework is intended to encourage a more data-driven approach to health information applications to allow greater data sharing and transparency of health outcomes through measurement.