An Environmental Snapshot

Quality Measurement Enabled by Health IT: Overview, Possibilities, and Challenges

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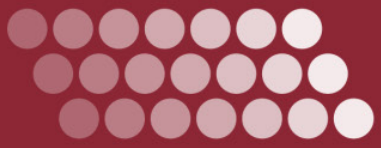

AN ENVIRONMENTAL SNAPSHOT

Quality Measurement Enabled by Health IT: Overview, Possibilities and Challenges

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Foreword

Health information technology (health IT) has seen a tremendous increase in adoption over the last 3 years and plays a critical role in the U.S. health care system. Currently, quality measurement is primarily conducted via manual chart entry, manual chart abstraction, and the analysis of administrative claims data despite continued growth in health IT adoption and progress in the retooling of existing measures into electronic measures. However, health IT has the potential to advance quality measurement and reporting by availing access to information not previously available and automating data collection. Additionally, reduced reliance on paper medical records presents an opportunity for health information to be shared across care settings to follow the patient, thus facilitating the measurement of quality across providers and time.

Quality Measurement Enabled by Health IT: Overview, Possibilities, and Challenges presents an environmental snapshot of the intersection of quality measurement and health IT, offers stakeholders insights into the rapidly changing landscape, and promotes an ongoing dialogue toward framing the next generation of quality measurement enabled by health IT. This snapshot provides a brief overview of the historical and current state of quality measurement through health IT, describes possibilities for the next generation of health IT-enabled quality measurement, and illustrates some of the challenges facing the advancement of quality measurement enabled by health IT. A *Partial Catalog of Current Activities to Improve Quality Measurement Enabled by Health IT* (Appendix A) describes over 80 different programs and initiatives conducted by Federal agencies, State and regional communities, and private organizations that seek to address some of these challenges.

AHRQ, given its ongoing role in the support of health services research to improve health care quality, is committed to engaging in a productive dialogue so that all stakeholders successfully realize advances to the next generation of quality measurement. As a next step, AHRQ is seeking insight from diversified stakeholders via a Request for Information (RFI) to advance learning on these issues as well as enable stakeholders to identify and disseminate successful strategies to improving health IT-enabled quality measurement. Through this RFI, AHRQ will explore pathways toward nonregulatory solutions for challenges to achieving the next generation of health IT-enabled quality measurement.

For more information on the Pathways to Quality through Health IT initiative or the Request for Information, please go to AHRQ's Health IT-Enabled Quality Measurement Web page.

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Introduction

Quality measurement is a critical element of the strategy to improve the quality of care delivered in the U.S. health care system. Until recently, quality measurement relied almost exclusively on the use of electronic claims data, manual chart abstraction, and patient surveys. However, there has been enormous, recent growth in the adoption of health IT, which has the potential to enable superior quality measurement. By 2011, approximately 35 percent of non-Federal, acute care hospitals in the United States had adopted at least a basic electronic health record (EHR) system, up from 16 percent in 2009.[1] During that same time period, adoption of EHRs increased from approximately 22 percent to 34 percent among office-based physicians.[2] This is a pivotal time to examine performance measurement enabled by health IT due to the convergence of increased health IT adoption and the implementation of new, patient-centered reimbursement and care delivery strategies (e.g., bundled payment, accountable care organizations, patient-centered medical homes).

The Agency for Healthcare Research and Quality (AHRQ) has been a leader in building the evidence base on quality measurement enabled by health IT. AHRQ has supported a continuum of research activities, innovative demonstrations, approaches, and methodological work in this area through the Health Information Technology Portfolio. Other AHRQ-funded programs, such as the National Quality Forum's Health IT Expert Panel I and II, have accelerated ongoing efforts to define how health IT can evolve to effectively support quality measurement. Given the multitude of activities occurring at the intersection of quality measurement and health IT, this is an ideal moment for a closer examination of the many stakeholders and their contributions in the field.

As the Centers for Medicare & Medicaid Services (CMS) and the Office of the National Coordinator for Health IT (ONC) act to implement meaningful use over the next 3 years, AHRQ continues to pursue various activities in concert with other Federal agencies to discern and disseminate successful strategies, challenges, prioritized possibilities specifically pertaining to the intersection of quality measurement and health IT. Moreover this environmental snapshot contains a partial catalog of many activities which are intended to improve health IT-enabled quality measurement (Appendix A). AHRQ seeks to identify pathways to the next generation of quality measurement that describes resources required in the near term and issues and topics that must be addressed through research in the longer term to achieve a robust information infrastructure that supports a national quality measurement and reporting strategy. This report and the inter-related RFI are intended to illuminate both AHRQ-led and other stakeholder deliberations and strategies on iterative advancements in health IT-enabled quality measurement and reporting.

Findings

Quality measurement has become an essential component of health care quality improvement efforts. The measurement of the quality of care delivered is a critical lever necessary to improve the quality of care delivered in the health care system. Quality measurement has the capability of identifying areas in need of improvement and quantifying improvements that have been made. This information can be used to drive quality improvement efforts, inform consumers, and reward high-quality performers.

This section provides an overview of the key themes identified from this environmental snapshot of health IT-enabled quality measurement, and then explores possibilities and critical challenges for the next generation of this technology.

During the research process for the environmental snapshot, numerous activities were identified that are working toward improving quality measurement enabled by health IT. Appendix A describes a subset of these efforts at the Federal and State levels as well as efforts by private stakeholders; this catalog of programs and initiatives is not exhaustive, but rather illustrates the breadth and depth of the work being conducted by a variety of the stakeholders discussed in this report.

A Partial Catalog of Current Activities to Improve Quality Measurement Enabled by Health IT (Appendix A) contains over 80 programs and initiatives being conducted by:

- Federal Government
- State/Regional Communities
- Private Organizations

Overview of Health IT-Enabled Quality Measurement

Recent years have seen tremendous developments in the U.S. health care system. Growing concerns over health care quality have been on a collision course with rising health care costs. Landmark Institute of Medicine (IOM) reports, *To Err is Human: Building a Safer Health System* and *Crossing the Quality Chasm: A New Health System for the 21st Century*, changed how health care was perceived and discussed in the United States.[3,4] While *Crossing the Quality Chasm* described a system that delivers high-quality care consistently, little was known about how to achieve that state.[4] Meanwhile, rising costs continue to be a major concern in the U.S. health policy landscape, particularly given the evidence that higher costs are not necessarily correlated with higher quality. Health care quality problems can be categorized as the result of underuse, overuse, and misuse.[5] These sources of poor patient care are major contributors to the growth of health care costs. The IOM and other health care stakeholders recognize that quality measurement and health IT will be important tools for performance improvement.[4]

Quality measurement and health IT have both been growing enterprises in the health care arena over the past several decades. Historically, secondary use of data to measure quality has focused primarily on administrative and billing functions within hospitals, physician offices, and health plans. Frequently, the decision about what to measure and how to measure is determined by what is easiest to measure. Thus, initial quality measures relied heavily on administrative data, particularly claims, because they were readily available, ubiquitous, and largely standardized. With the growing understanding that administrative claims are not as precise as clinical data for appropriately identifying specific patient populations and therapies and often lag behind clinical data by as much as a year, there was a movement in the measurement enterprise toward clinical measures. However, this meant that quality measurement relied primarily on the collection of clinical information via manual data collection, either abstraction of paper charts or manual insertion of specific codes into claims.

In the 1990s, companies began developing products geared more toward the capture of clinical data in hopes of fully replacing a paper record for improved care management. However, what constituted an electronic health record (EHR) varied widely and many systems lacked interoperability that would render them ineffective for the future. Moreover, current EHRs have not yet made significant changes in the way that quality measurement is conducted using clinical data since EHRs were not originally designed to calculate quality measures.

Prompted by the need to improve health care quality and contain cost growth, there has been an increase in Federal legislation and regulation pertaining to health care over the past decade. The more recent laws include the Deficit Reduction Act of 2005 (Public Law 109-171); the Medicare, Medicaid, and SCHIP (State Children's Health Insurance Program) Extension Act of 2007 (MMSEA) (Public Law 110-275); the Medicare Improvements for Patients and Providers Act of 2008 (MIPPA) (Public Law 110-275); Children's Health Insurance Program Reauthorization Act (CHIPRA) (Public Law 111-3); the American Recovery and Reinvestment Act of 2009 (ARRA) (Public Law No 111-5); and the Patient Protection and Affordable Care Act (ACA) (Public Law No 111-1480). These pieces of legislation have called for new approaches to cost and quality and have helped drive the development of the quality measurement enterprise and the adoption of health IT.

For example, ARRA contained the Health Information Technology for Economic and Clinical Health (HITECH) Act, requiring the government to take a leadership role in encouraging the meaningful use of health IT, which has increased the expectations on EHR functionality, including quality measurement. HITECH invested $20 billion for health IT infrastructure and for Medicare and Medicaid incentives to encourage doctors and hospitals to become meaningful users. HITECH also included the State Health Information Exchange Cooperative Agreement program to foster health information exchange (HIE)—i.e., EHRs can share information across institutions and communities—ensuring that the health record is patient-centered as opposed to the current provider-centric data model. Moreover, HITECH gave legislative authority to the Centers for Medicare & Medicaid Services (CMS) to bolster quality measures. Subsequent regulation has provided additional specifics and requirements.

At the Healthcare Information Management Systems Society's (HIMSS) 2012 annual conference, the National Coordinator for Health IT, Farzad Mostashari, stated that as a result of HITECH, more progress has been made toward EHR adoption in the past 2 years than in the previous 20 years. His statement is supported by multiple reports that show a dramatic increase in adoption over the last 3 years.[1,2] For example, the Centers for Disease Control's annual National Ambulatory Medical Care Survey indicates that approximately 34 percent of physicians reported having at least a basic EHR/EMR system (comprehensive EHR, basic EHR with clinician notes, or basic EHR without clinician notes), a 36-percent increase from 2010.[2]

Interoperability

A key goal of ARRA's HITECH Act is ensuring that EHRs can share information to further care coordination, patient-centered care, cost savings, and other goals. One building block of information exchange is interoperability—"the extent to which systems and devices can exchange data, and interpret that shared data."[6] Interoperability relies on standards harmonization, which can allow providers and others to efficiently share information in the current environment of heterogeneous standards.[7]

Even before the HITECH Act, the Health Information Technology Standards Panel (HITSP) undertook significant work in this area. The Health Information Technology Standards Committee, created by

HITECH, followed up on HITSP's work by providing key advice, which helped ONC develop regulations in the area of standards and certification criteria for EHRs as well as metadata standards.[8,9]

In 2007, ONC launched the Nationwide Health Information Network (NHIN) Exchange—a set of standards, services, and policies that enable secure HIE over the Internet—to encourage progress toward information exchange. The NHIN Exchange serves 500 hospitals and more than 4,000 provider organizations.[10] Based on recommendations by the NHIN Work Group, in March 2010 ONC launched the Direct Project which seeks to create a simple, secure, scalable, standards-based way to transmit health information from a sender to a trusted recipient over the Internet.[11] The Direct Project has been widely embraced voluntarily by HIE vendors, and its protocols have already been used to transmit information.[12] The Direct Project transport standards may also satisfy some Stage 1 Meaningful Use requirements when combined with clinical content. For example, a primary care physician can refer a patient to a specialist using the Direct Project to provide a clinical summary and then receive a consultation summary from the specialist in return.[11]

As EHR vendors continue to integrate interoperability standards into their products, the hope is that providers will exchange information across institutions and communities. As of 2011, there were at least 255 communities engaged in exchanging health information.[13] While many of these communities are in the initial stage, a small number are fully operational and offer advanced analytics, quality reporting, and clinical decision support.[13] Given the underlying privacy, ownership, and competitive issues, these communities face daunting challenges in negotiating data-use and reciprocal support agreements, in addition to technology concerns. Hospitals and hospital systems are demonstrating increasing willingness to invest in HIE products and services to integrate different data systems, referring physicians, and other related providers.[14]

Data linkage is also critical for linking administrative and clinical data to registry data. Several integrated delivery systems, physician groups, and HIEs have developed internal patient registries—databases of clinical data used to assess patient outcomes.[15] These internal registries often interface with their EHR systems, laboratory data, and practice management systems.[15] Additionally, there are piloting efforts to link external, national registry data and payer claims data to calculate quality measures.[16]

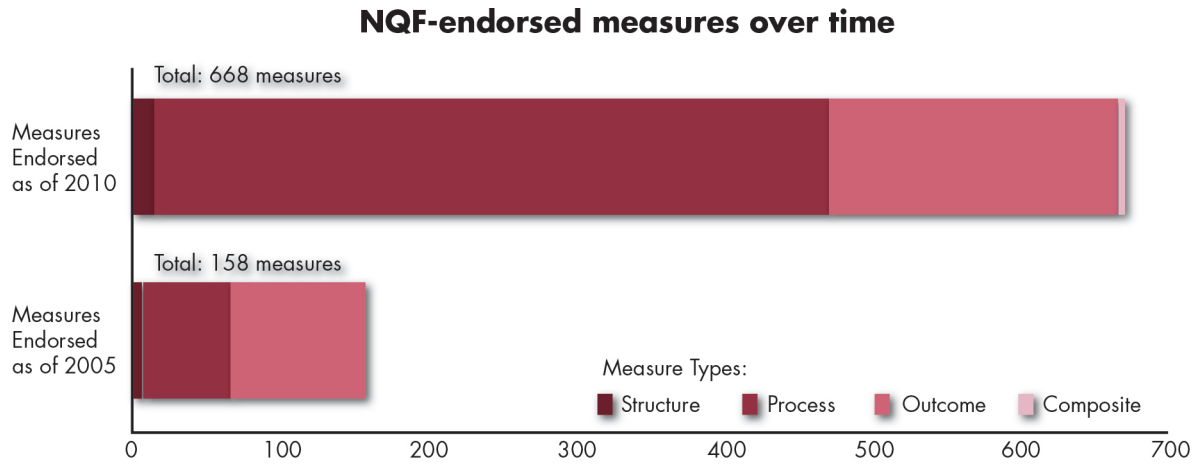
Evolution of Measurement Focus

As concerns about rising costs and poor quality have grown, researchers, measure developers, providers, policymakers, and others have increasingly sought to measure as many aspects of health care as possible. In the late 1960's Avedis Donabedian's three-element model—structure, process, and outcomes—became what is now considered the foundation for modern quality measurement.[17–19] Much of recent quality measurement has focused on examining the extent to which providers adhered to treatment guidelines and best practices. In effect, this meant examining care processes (e.g., whether a patient experiencing a heart attack received a Beta Blocker upon arrival to a hospital within a specified time frame). While process measures are by far the most widely used type of measures in place today, structural measures (e.g., nurse staffing, health IT) comprise the smallest component of current NQF endorsed measures. Composite measures are quite new to the quality measurement scene. They attempt to summarize the quality of care delivered to a patient and may be important in indicating the extent to which a patient received all recommended steps of care.

While process and structural measures will remain important quality indicators, public and private payers are clearly pushing providers to measure and report patient outcomes (e.g., 30-day readmission, 30-day mortality, hospital-acquired infections) (see Exhibit 1). The evolution from process and structural measures to outcome

measures has been taking place gradually and is the result of many influences, including legislative initiatives as well as payer- and provider-driven quality improvement efforts.

Exhibit 1. NQF-endorsed Quality Measure Growth by Type, 2005-2010



Source: Data provided by National Quality Forum, March 2012

Process measures are well accepted by providers because they reflect the care that the providers deliver.[20] However, recent studies have demonstrated that the relationship between processes of care and patient outcomes may vary by condition type.[20,21] Moreover, outcome measures are critical for value-based purchasing (i.e., holding providers accountable for health care value as a function of both cost and quality), which is being rolled out by CMS and many private health plans.

Stakeholder Perspectives

On a national level, AHRQ annually publishes the National Healthcare Quality Report and the National Healthcare Disparities Report, which measure trends in effectiveness of care, patient safety, timeliness of care, patient centeredness, and efficiency of care. Organizations such as CMS, the Joint Commission, and the National Committee for Quality Assurance (NCQA) have been measuring and reporting on the performance of hospitals and health plans for many years.[22] A number of States, regions, and local communities are also reporting on quality measures. Furthermore, health plans are collecting and reporting quality measures, primarily for quality improvement and incentive-based payments. Commercial entities and numerous collaboratives and alliances have also made advances in quality measurement. The following are examples of some of the stakeholder activities that reflect the current state of quality measurement enabled by health IT.

Consumers

Consumers act as both providers and users of quality information in the health care system. Patient satisfaction and experience surveys are commonly used by providers and health plans. For example, the Consumer Assessment of Healthcare Providers and Systems (CAHPS®), an AHRQ program, asks consumers and patients to report on and evaluate their experiences in health care.[23] In 2011, there were 517,478 respondents in the CAHPS® health plan database.[24] To date, there have been few wide-scale efforts to routinely incorporate patient-reported measures into clinical records; however, there is growing interest in capturing patient-reported outcomes in addition to patient experience.[25,26] The hospital version of CAHPS®,

known as HCAHPS®, is currently being used by the Hospital Value Based Purchasing Program to adjust payments to hospitals based on performance.

Consumer use of public quality reporting began in the 1980s when Medicare began to publish mortality rates for U.S. hospitals.[27] Public reporting efforts are now being conducted by Federal, State, and local governments as well as health plans, provider organizations, employers, and other quality coalitions and organizations. Despite increased public quality and cost reporting, use of the information by consumers remains low.[28] Only half of the individuals who visited hospital quality Web sites reported that they used the data to choose a hospital.[28] Moreover, there is evidence that consumers often believe that higher costs are associated with higher quality, thus public cost reports may have unintended consequences.[29]

Providers

Quality measurement has demonstrated its ability to improve the quality of care delivered by providers.[30] As significant benefits to patients began to and continue to be observed, many providers have welcomed the reporting of valuable quality measures as a means to drive clinical process improvements.[31] Indeed, much of quality measurement began with individual clinicians and hospitals measuring mortality or infection rates as early as the mid-19th century. However, as modern quality measurement programs and the science supporting them progressed, a plethora of quality metrics has resulted.[31] Hospitals and physicians have been facing growing demands to participate in quality measurement for a number of purposes (e.g., accreditation and licensure, quality reporting, quality improvement, pay-for-performance). For example, many medical specialty boards are now requiring physicians to submit quality measurement data as a part of maintaining certification. This growing number of quality measurement programs—often each with their own distinct quality measures—has placed additional administrative burden on providers.[32]

Clinicians and hospitals have been implementing and upgrading their EHR technology to meet certification requirements at increasing levels since the CMS EHR Incentive Programs to support meaningful use took effect. By 2011, approximately 34 percent of office-based physicians had adopted at least a basic EHR, increased from 25 percent in 2010.[2] Thirty-five percent of non-Federal hospitals had adopted at least a basic EHR in 2011, up from 16.1 percent in 2009.[1] Despite continued growth in health IT adoption, quality measurement is still primarily conducted via manual chart abstraction and administrative claims data, sometimes with results manually entered into the EHR.[33]

EHR adoption rates in care settings that are not included in the EHR Incentive Program lag behind adoption rates in care settings that are offered incentives.[34] Twenty-six percent of community health centers and twenty-nine percent of home health care agencies report having a basic EHR.[35,36] However, rates in long-term care facilities, rehabilitation hospitals, and psychiatric hospitals are substantially lower than acute care hospitals, at 6 percent, 4 percent, and 2 percent, respectively. Rates of HIE in these care settings are also lower than rates for hospitals and physicians. This gap is expected to widen and could further impede the ability to effectively facilitate care coordination across care settings.[34] Moreover, the gap could also hinder quality measurement efforts for these providers which are growing. For example, CMS currently publicly reports on home health measures (i.e., Home Health Compare) and nursing homes (i.e., Nursing Home Compare), the Health Resources and Services Administration (HRSA) has a series of measures on which community health centers report, and a number of independent organizations measure and report on various dimensions of quality for these providers.

Commercial Payers

Numerous examples of shared risk and bonus programs using quality measurement have emerged from commercial payers who have been seeking more effective ways to control costs by attempting to move away from fee-for-service reimbursement, which incentivizes quantity of services over quality of care outcomes. For example, pay-for-performance (P4P) penetration increased after *Crossing the Quality Chasm* called for new models of reimbursement focused on quality. More recently, Accountable Care Organizations and Patient-Centered Medical Homes have become models of great interest. Although, to date, there are relatively few shared-risk contracts in operation.[37]

Simultaneously, payer health IT has evolved beyond basic eligibility and claims systems to include care management modules. The desire to manage chronic conditions has led to an increased focus on data collection and analysis. New vendors have entered the market offering systems that collect real-time clinical data, process care plans through algorithms, provide clinical decision support, and track ongoing care interventions.[38] Moreover, these tools can all be used for payment decisions.[38]

Quality measurement within health plans has also grown in importance. For example, NCQA accredited health plans cover approximately 70 percent of Americans currently enrolled in health plans.[39] Accreditation requires health plans to meet 60 standards and to routinely report on performance in over 40 areas. NCQA's primary measurement tool is the Healthcare Effectiveness Data and Information Set (HEDIS). HEDIS consists of 76 measures across five domains of care, in areas such as asthma medication use, breast cancer screening, comprehensive diabetes care, and childhood immunization status. Ninety percent of health plans use HEDIS as a quality measurement tool to demonstrate that they are committed to delivering high-quality care.[39]

Health IT Vendors

As a provision of HITECH, all providers participating in the Medicare and Medicaid EHR Incentive Programs must use certified EHRs, which meet a variety of requirements established by ONC to encourage vendors to develop features in their products that support meaningful use of technology to enable coordinated, high-quality care.[40] Certification provides assurance to providers about the extent to which the EHRs they purchase work as intended.[41,42] As a result, as of March 2012, there were 1,835 certified complete EHRs and EHR modules.[43]

Despite certification, an ongoing concern is that EHRs were not initially designed to compile and report on quality measures. At their core, EHRs were built to support transactions and can obtain, store, track, and display clinical fields. EHR functionality has expanded greatly since its inception (e.g., use of clinical decision support at the point of care).[44] EHR vendors have relatively little experience with complicated algorithms to support measurement and with exporting data, which is needed to support downstream data use such as quality reporting and monitoring population epidemiology. To help providers report measures and meet meaningful use requirements in short timeframes, EHR vendors developed workarounds to allow their customers to calculate and report on these measures. Thus, despite increased EHR use, much of the quality reporting that is supported by health IT is still not fully automated.[33] The health IT vendor community has sought to address issues such as certification and automation. For example, the EHR Association has brought over 40 companies from the EHR software industry to collaborate on and weigh in on key challenges in the health IT arena (e.g., standards, interoperability, meaningful use).

Examples of Federal Government

The Federal Government and its many Agencies play numerous roles in the quality measurement and health IT landscape. For example, Agencies such as AHRQ support research in quality measurement, quality improvement, and health IT in addition supporting innovative demonstration and methodological advancements in health care and health services research. Federal Agencies are engaged in testing innovative delivery and payment models and implementing incentives to improve health care quality and health IT adoption. Moreover, Agencies such as ONC are coordinating the development of standards to ensure interoperability and ensuring certification of EHR products. Many Federal Agencies such as CMS produce reports on the quality of health care in the United States and provide publicly reported quality data on providers for health care consumers. Additionally, there are numerous workgroups and committees to support and align many of these activities. Specific examples of these activities can be found in the Partial Catalog of Current Activities to Improve Quality Measurement Enabled by Health IT (Appendix A).

State, Regional, and Local Communities

Even prior to ARRA, States, regions, and local communities were beginning to engage in programs to promote HIE and measure quality; 45 States and the District of Columbia had passed legislation in 2007 and 2008 relating to health IT (e.g., set up HIEs, appropriate funds). Concurrently, many States moved forward in the area of quality measurement and reporting, either as part of their Medicaid programs, as participants in Federal programs and demonstrations, or as local demonstrations to improve care outcomes by standardizing measurement and putting mechanisms in place to receive quality data. For example, by the end of 2010, 18 States were voluntarily reporting on pediatric-specific quality measures, in response to the Children's Health Insurance Program Reauthorization Act of 2009 (CHIPRA) and subsequent development of an initial core set of measures specific to children's health care.[45] Additionally, a number of States and regions are providing reported quality data for their communities. For example, the Pennsylvania Health Care Cost Containment Council allows consumers to compare hospital quality within the State.[46]

ARRA further expanded these efforts; organizations supported by all 50 States and the territories have received grants to establish regional extension centers to expand EHR adoption in their State or region.[47] For example, Fifty-six States, eligible territories, and qualified State Designated Entities received awards through the State Health Information Exchange Cooperative Agreement Program. The HIE Challenge Grant Program has subsequently provided additional funding to 10 States showing the promise of innovation and breakthrough technologies.[48] Moreover, 17 U.S. communities are funded through the Beacon Community Cooperative Agreement Program, which provides funding to communities who have begun the development of secure, private, and accurate systems of EHR adoption and HIE.[49] These communities have specific, measurable goals for health systems improvement in terms of quality, cost-efficiency, and population health.[49]

Measure Developers and Endorsers

The National Quality Forum (NQF) has played a critical role at the intersection of quality measurement and health IT. NQF is a nonprofit organization that seeks to build consensus on national priorities and goals for performance improvement and endorses national consensus standards for measuring and publicly reporting on performance.

For example, a key initiative of NQF was convening the Health IT Expert Panel (HITEP). With funding from AHRQ, the first HITEP sought to prioritize physician and hospital measures, identify common data types to be standardized and thereby improve the automation of quality measurement using EHRs, and

develop a comprehensive view of quality measurement to help create, use, and report measures generated from EHRs.[33] The second HITEP (HITEP II) continued the work of the first panel and recommended a standardized Quality Data Model. It also recommended ways to advance measurement by improving flows of clinical data across care settings.[50]

NQF has also taken key steps to help providers using EHRs generate and report quality measures required by meaningful use regulations. For example, NQF is refining its process to better evaluate electronic measures (eMeasures)—standardized performance measures in an electronic format—which can be calculated via EHR. Measure developers, for their part, are retooling existing, paper-based measures into eMeasures and are moving to create new measures that are specified for EHRs. For example, The American Medical Association (AMA) Physician Consortium for Performance Improvement (PCPI)—one of leading measure developers in the U.S—identifies, develops, tests, and implements measures and is a leading force in enabling the use of measures in EHRs.[51] There are a number of costs associated with measure development, much of which is born by the developing organization.[52] Measure developers are leveraging NQF's Measure Authoring Tool, a Web-based tool that allows measure developers to create standardized eMeasures and to define the information needed to inform EHRs on how to capture and express clinical information.[53]

NQF also convenes the Measure Applications Partnership (MAP), a public-private partnership. The MAP provides advice to HHS on quality measures for public reporting, performance-based payment programs, and other purposes. Additionally, the MAP encourages the alignment of public and private sector efforts in this area, which is needed to create a fully coordinated vision for performance measurement and ensure measure selection is informed by a balance of stakeholders across the quality measurement lifecycle.

Research Community

The research community has many roles in both the quality measurement enterprise and in the health IT arena, which overlap with many of the previously mentioned stakeholder groups. For example, clinical research is critical to the development of the evidence base which informs clinical guidelines and in turn, clinical decision support systems and quality measurement. Moreover, research has informed and shaped many of the programs and initiatives that are listed in the *Partial Catalog of Efforts to Improve Quality Measurement Enabled by Health IT* (Appendix A). The research community is also conducting many of these efforts.

Possibilities for the Next Generation of Health IT-Enabled Quality Measurement

From the IOM's *Crossing the Quality Chasm*, to the AHIC Quality Workgroup's Vision Roadmap, to the work of the NQF National Priorities Partnership, quality stakeholders speak to the need for a national framework around quality measurement.[4,54,55] There is a great deal of consensus among these stakeholders on a number of high level attributes or components of an ideal future state. For example, the need for patient-centricity and involvement, measure harmonization, transparency about health care costs and quality, and the use of technology to support measurement have been well documented and represent some examples of possible characteristics of the future state.[4,13,54,56–58] However, there is not always consensus on the extent to which these goals should be achieved or how to attain them.

Putting the Patient's Needs at the Center of Measurement

Since the IOM identified patient-centeredness—"providing care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patient values guide all clinical decisions"—as a core component of quality health care, there has been growing understanding that measurement as a

means to illustrate improved quality, must reflect the improved health of patients.[4] The AHIC Quality Workgroup also lists patient-centered quality measurement as a key theme.[54] More recently, a key aim of the National Quality Strategy is to "improve overall quality, by making health care more patient-centered, reliable, accessible, and safe."[59]

Despite national attention to patient-centeredness, most measures continue to represent a single provider or care setting, reflecting the reality that health care today is still mostly delivered in a fee-for-service model, which is organized by provider and care setting. Although some measures can adequately address care provided in this manner (e.g., appropriate choice of antibiotics to treat infections in the acute care hospital), there is consensus that patient-centric measures, which cross care settings, may provide a clearer picture of the quality of care provided to a patient, especially pertaining to certain conditions and their treatment (e.g., diabetes care, stroke, congestive heart failure). The IOM offers one example for this need in *Performance Measurement: Accelerating Improvement*. The percentage of diabetic patients receiving one defined intervention in a study was high (e.g., improved A_1c, annual eye check completed), thus indicating that high-quality of care was achieved.[60] However, when looking across care settings and interventions, patients scored low on receiving the entire bundle of recommended care. This illustrates gaps in prescription or compliance to the overall care plan.[60] Bundled payment has been suggested as an alternative to fee-for-service payment as a mechanism to improve care coordination through a patient-centered payment model. Despite unresolved issues around the implementation of patient-centric quality measurement in a fragmented system, it is apparent that the future of quality measurement will continue to evolve putting the patient's needs at the center of quality measurement. In other words, patient- centric quality measurement will require "collecting and connecting data over time and across care settings to build a more complete view of the patient's care than is currently possible."[54]

Patients as Users of Quality Information

The need to provide consumers with transparent measurement information so that they may make informed choices in provider selection and around care alternatives is a common theme among stakeholders.[54] Better informed, engaged, and empowered consumers can be valuable members of the care team. However, there remains disagreement on what is of most importance to patients. Although patients seek information about quality of care and care alternatives, they need information that is specific to their situation and seek insights to the value of alternative choices.[61] Receiving comprehensive communication and coordination, patient support and empowerment, and access to services are also of importance to patients.[56] Therefore, quality information for patients will need to include such considerations and quality measurement for patients is likely to emerge in a distinct form from quality measures for providers.

Without quality information that is accessible to patients and easy to understand and use, the outcomes desired—patients that are more informed, so that they can effectively engage with their providers, express preferences, and make decisions—cannot be achieved. Patient access to their health information or to their EHRs may provide one means to deliver information. Consumer-focused Web tools may be another means by which to deliver quality information and allow patients and caregivers to compare alternatives.

Patients as Contributors to Quality Information

The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS®) initiative has developed standardized tools on reporting patient experience and projects like the NIH's Patient Reported Outcome Measurement System (PROMIS®) are developing tools to measure physical, mental, and social health patient-reporting outcomes.[62,63] However, information collected from patients and caregivers should

expand as patient-centered care evolves. In a letter to the Secretary of HHS in February of 2011, NCVHS recommended further measure development to support the consumer, including measures around patient activation, patient-specific outcomes (i.e., outcomes that are stratified, not risk adjusted), functional outcomes, access, patient preference-sensitive measures, and measures incorporating patient-generated data.[61] Moreover, HITPC's November 2011 update on the Consumer e-Health Program set an objective to further assess how patient-reported information might be collected electronically and how this information could be integrated with EHRs.[64] In January 2012, the HITPC Meaningful Use Working Group reaffirmed the need for new clinical quality measures that are meaningful to patients. The working group also emphasized that patient-reported data should be captured using health IT.[58]

Determining the Measure Set

Strong consensus exists that a core set of measures should be aligned to national priorities.[54,5155,61] However, there is less consensus around the extent to which the available consensus-endorsed measure set should be parsimonious or whether considerable expansion of the consensus-endorsed measure set is required to support the multiple users and uses of quality measures. For example, there are calls to expand the measure set in support of the Meaningful Use program in order to allow physicians across specialties to qualify for incentives.[65,66] Moreover, significant gaps in available measures have also been cited for particular sites of care, clinical conditions, and dimensions of quality.[52,65,67] Consumer focused organizations cite a dearth of measures that matter to consumers and patients, and purchasers are concerned with the lack of outcome, efficiency, and appropriateness measures.[57] The future measure set will need to include measures that are longitudinal, patient-centered, and focused more on outcomes than processes.[54,65] Alternatively, those who prioritize a parsimonious set of consensus-endorsed measures argue that national quality improvement attention should focus on carefully chosen priorities in order to both reduce reporting burden and achieve the focus required to "move the needle."[68] Additionally, there is concern that very similar measures exist to support disparate functions and that this redundancy imposes undue burden on providers, taking valuable resources away from patient care itself.

Whether the measure set is broadened or narrowed, there is agreement that measures should be harmonized to reduce burden. Harmonization—the standardization of specifications for related measures—is cited as critical to the future of quality measurement and reporting.[69] Both NQF and the Federal Government have committed to measure harmonization.[70,71] In some instances, multiple measures may be appropriate if the focus of the measurement (health plan vs. hospital) or the data source (claims data vs. registries) is different. For example, NQF determined that multiple measures are appropriate for pneumococcal immunizations.[72] At the conclusion of their study, three new measures were endorsed: (1) a CMS measure for Influenza vaccination of nursing home/skilled nursing facility residents, (2) a CMS measure for Pneumococcal vaccination of nursing home/skilled nursing facility residents, and (3) a CDC measure for Influenza vaccination coverage among health care personnel (time-limited endorsement). These three measures were felt distinct enough to warrant separate measures.[70,72]

Measuring for Value

The fragmented nature of the U.S. health care delivery system often results in key stakeholders having varied and sometimes conflicting goals. This has led to divergent approaches to quality measurement.[73] Value—quality in relation to the cost of care—has been suggested as an overarching goal that could unite the interests of diverse health care stakeholders.[73,74] Patients and purchasers seek value to make health care decisions. Providers would benefit from information on value, for use in evidence-based decisionmaking, as well as in situations where reimbursement models require them to balance outcomes and cost. Regulators might use

quality information to assess health teams or the health care system as a whole, for future recommendations and rule making. Payers need methods to assess value as they define reimbursement methodologies and guide payment decisions.[61] An example of how these may come together in the future might be through Accountable Care Organizations (ACOs). ACOs bring doctors, hospitals, and other health care providers together in a collaborative environment to improve patient care across care settings. Shared savings and shared risk models are being developed and used by commercial payers and CMS to incentivize ACOs to improve quality and reduce cost. Value can be increased through quality improvement, cost reduction, or by increasing efficiency.

While many agree that outcome measures are a critical component of determining value, there is concern over the validity and reliability of such measures. There is much variability in the measurement of outcomes such as mortality, which is attributed to the various measurement methodologies and risk adjustment strategies.[75] Risk adjustment is particularly important for outcome measures, because outcomes are partially determined by a number of patient factors that are outside of the control of the provider (e.g., age, gender, comorbid conditions). Central issues with risk adjustment are the tradeoff between sensitivity and specificity and the level of precision desired for the estimate, which are often driven by policy goals. Future evolution around value will need to further assess and determine the most effective ways to measure value and risk adjust as appropriate.

Tools for Measurement

It is generally accepted that measurement must continue to evolve toward greater automation. In the desired future state, data and subsequent performance measurement is a byproduct of care and significant additional effort to manually extract data for measurement is eliminated. However, there are significant differences of opinion around how to achieve automation. In order to receive meaningful use payments, physicians and hospitals need to use certified EHRs that have the capability to automate some measurement. Although some eMeasures exist, it is still not common for even a certified EHR to fully automate quality measurement. Thus, it is not clear that EHRs alone can achieve all of the quality measurement that is desired in the future state. For example, future state measures that are longitudinal, patient-centered, and focused on outcomes will need much broader health IT support, as multiple EHRs will be involved in the capture and reporting of quality data. HIE across care settings will be required to effectively measure quality, as well as to improve coordination of care and study patterns of illness.[67,76,77]

Challenges to Achieving the Next Generation of Health IT-Enabled Quality Measurement

To move forward into the future state, there are challenges that must first be addressed. Some challenges require additional research, information, or validation. Additional measures or changes in how we measure may be required. Moreover, there may be limits to current technologies or pockets of low adoption rates inhibiting the effectiveness of using health IT to measure quality equally across the nation. These challenges can be categorized into three areas: infrastructure and incentives, measurement, and technology. Moreover, a key communication challenge remains across all three categories; better engagement and exchange of ideas among quality measurement stakeholders is needed for all of the challenges identified here.

The following section highlights some examples of challenges identified in the field of quality measurement enabled by health IT for the purpose of facilitating discussion.

Infrastructure Challenges

There are many areas in which quality stakeholders are yet to be in agreement. Consensus may be required on some topics to effectively move forward. In other areas, acceptance of parallel activities and prioritization may allow for movement forward even without full agreement.

- *The Purpose of Measurement* – Stakeholders have multiple purposes for measurement. For example, a 2011 study found that quality improvement and public reporting were the most frequently cited uses of measurement, followed by payment and accreditation, certification, credentialing, and licensure.[78] Forty-three percent of the sampled organizations used measurement for one of the purposes, 34 percent used measures for two purposes, 21 percent for three separate purposes, and 1 percent of the organizations used measures for all four purposes.[78] There is still a lack of understanding of the extent to which the various purposes for measurement impact measure development, measure selection, and prioritization of measurement. Without resolution, the tension between parsimony and comprehensive measure sets, which types of measures are optimal, how to address risk adjustment, appropriate levels of harmonization, and related issues will remain.

- *How to Move to Patient-Centricity in a Fragmented Health Delivery System* – Although there is consensus on movement toward patient-centered measurement, system fragmentation and lack of accountability across care settings makes this move difficult. The National Quality Strategy—a set of national aims and priorities to guide local, State, and national efforts to improve the quality of health care —addresses the absence of real progress toward restructuring the health care system to address both quality and cost concerns or toward applying advances in information technology to improve administrative and clinical processes. Bundling payment for services delivered to the patient for an episode of care (i.e., episode based payment) has been suggested as a mechanism to move toward patient-centered delivery. Episode-based quality measures are in their infancy, and regulators and endorsers will be challenged to determine best-in-class measures, at least in the short term. Questions remain about how to define episodes, set payment rates, and determine which providers receive payments or adjustments in payments based on quality. Moreover, variance in rates of health IT adoption across care settings may inhibit the exchange of information to support patient-centered care delivery.

- *How to Effectively Align Incentives* – In addition to incentives for care coordination, there may be a requirement to further align incentives in health IT to support data-sharing across care settings. Although early stages of meaningful use incentivize interoperability, this will need to be expanded to achieve informatics capabilities across the care continuum.

- *Responsibility for Ownership and Funding* – There is a lack of consensus about who should fund the quality measurement infrastructure to support the measurement enterprise, including new measure development, EHR adoption, and HIE. It is also unclear whether there are sufficient resources to encourage health IT vendors to make significant investments in the next generation of EHRs. Investment may be required to adapt EHRs to meet new quality measurement needs or other technologies to extract and compile data.[79]

- *Increased Information Exchange* – Increased HIE is integral to the development and use of electronic quality measures which leverage the unique data readily available through health IT. The use of such measures will remain uneven across communities until information exchange is more common.[80] There are some regional efforts to exchange information among providers as well as some private organizations engaged in HIE. Ubiquitous HIE remains elusive despite increased adoption since the HITECH Act, largely due

to funding and sustainability concerns. Moreover, lessons are being learned regarding additional challenges such as proprietary content concerns, privacy concerns, and insufficient standards.[10,13,76]

Balancing privacy and interoperability remains an ongoing concern. Despite enhanced privacy adoption under HITECH, there remains uncertainty regarding how different stakeholder privacy and security concerns will be addressed because the final Federal regulations on business associates—who remain outside of Health Insurance Portability and Accountability Act's (HIPAA's) purview—have not yet been finalized.[81] Moreover, it will be critical that patients be willing to consent to HIE or meaningful use will be limited.[81]

There are also key standards lacking for HIE. HITECH helped to create initial national standards to harmonize data exchanged between EHRs; however, it is unclear how effective these standards will be and how they might evolve with technological advances and increasing meaningful use requirements.[81] Moreover, there is a lack of widely used standards for exporting summary data from an EHR to a registry or quality measurement entity.[15] Given these gaps in standards, providers may be reluctant to make further investment if they are uncertain that they will be able to upgrade sufficiently to meet future standards.[81]

- *Ensuring Privacy, Security, and Confidentiality* – Providers and patients will be unwilling to share information, particularly across networks, unless privacy, security, and confidentiality can be assured. While ARRA enhanced the privacy protections of HIPAA, the protections only apply to certain entities (e.g., providers, health plans) while commercial organizations that provide health applications and personal health records (PHRs) are not covered entities. Such uneven coverage can be confusing to consumers, exacerbates the reluctance to share data, and creates an imbalanced playing field for entities that must adhere to the provisions and entities that do not.[82] Moreover, some providers are reluctant to share data because they are uncertain about how to comply with existing and new State and Federal laws and regulations.

  Some privacy advocates argue that a comprehensive, flexible privacy and security framework is needed, which sets clear parameters for access, use, and disclosure of personal health information for all entities engaged in electronic health information.[83] Some providers and health plans believe that better mechanisms are needed that appropriately balance patient privacy with the burden additional disclosures would place on the health care industry.[84]

  A related issue is accurately matching patients with their health information. There is concern that matching data with the correct patient will become more difficult as increasing amounts of information flow electronically. This could threaten quality and patient safety as well as lead to breaches of confidentiality.[82] However, there is not yet consensus that creating a unique patient identifier is the optimal solution. Collaboration is required to assess the alternatives and develop common solutions.

Measurement Challenges

Whether it is determined that the measure set is more parsimonious or more comprehensive, the following are some areas of measurement alluded to in the ideal future state that have yet to be fully developed.

- *Measures Valuable to Consumers* – Apart from patient experience and some patient-reported outcome measures, most quality measures continue to focus on provider processes. Measures looking at other dimensions of interest to patients must be developed.[61] Additional research is needed to better understand the types of health care decisions made by consumers as well as where they find health

information and how they use that information to support those decisions. Moreover, further validation is needed of what types of measures matter to patients the most for decisionmaking. Tools for effectively presenting information to patients, as well as to collect information from patients, need to be expanded.[54,85,86] It needs to be determined *if* and *how* patient-reported information might be integrated with EHRs and other clinical information and how accountability is assigned for outcomes.

- *Measures to Assess Value* – To ensure quality while better controlling costs, measures need to evolve to include elements of value for all stakeholders, including patients, providers, payers, and government. Further research is required to determine value and how to effectively use measures of value to ensure higher quality, lower cost care. For example, measuring the value for episodes of care presents numerous challenges. If an episode measure is defined very tightly around aspects of care for a particular condition it may be easier to determine payment across providers.[87] However, this will mean that the measure may only be applicable for a small volume of patients.[87]

- *Measures for Other Specialties and Uses* – There continue to be gaps in measures for certain specialties (e.g. dental care, mental health), care settings (e.g., hospice), and uses (e.g., bundled payment).[52,88] Subsequent to the conversation to gain further consensus on the purpose of measurement, new measures will need to be developed to fill gaps identified in the measure set.

- *Accounting for Variations in Risk in Measurement* – Further research is required to determine the most effective and appropriate way to adjust for risk within measures, tied explicitly to the purpose of the measurement and the measure construct.

Technology Challenges

The capabilities of health IT and rate of adoption of health IT have advanced more in the past 2 years than over the past two decades.[89] However, further work is required to ensure that all providers and patients can readily access and use necessary technologies and that these technologies can adequately measure the defined elements of quality.

- *Expansion of eMeasures* – Development of electronic quality measures has begun. However, the current focus is on creating eMeasures for existing measures rather than creating new eMeasures that harness the unique data available through health IT. As stated in a recent *Health Affairs* blog,

  > "As electronic quality measures are developed and gradually replace more traditional measures, measure alignment will become paramount…To calculate and report an electronic quality measure requires the ability to capture structured data, extract those data elements from multiple sources within the EHR, and then run a measure logic engine to apply the rules of the measure…The realization of the potential of electronic quality measures will require a number of challenges to be addressed through creative and innovative solutions."[69]

- *Necessary Advancements in EHRs or Other Measure Capture Technologies* – Complete solutions for reducing the burden of collecting and reporting measures are not yet available. It is unclear the extent to which EHRs will be able to adapt to be able to compile, calculate, and report quality measures to all required entities for all measures being discussed in the measure set. Despite continued EHR adoption growth, hospitals have voiced concerns about capturing and calculating quality measures within a certified EHR and the submission of electronic public health surveillance data.[90,91] Recent assessments of EHR data for use in quality measurement remain variable.[92–95] For example, a 2011 study found that measuring quality using

EHR data required substantial validation to ensure accuracy.[92] Another study found that quality measures derived from EHR data underestimated practice performance.[93] The study further demonstrated that variations in workflow and documentation habits have a significant impact in the calculation of EHR-based quality measures.[93] Even apart from this issue, EHRs need to be made more user-friendly for providers, including creative ways of capturing unstructured data. Further research is needed to determine if natural language processing can offer unique opportunities to interpret information in the EHR for the purposes of generating quality measures.

- *Necessary Advancements in Patient-Focused Technologies* – The adoption of technologies that allow patient access to their health data and facilitate patient-reported data remains low. In March 2012, the National Partnership for Women and Families reported to the HITPC that although 26 percent of approximately 2000 adults surveyed had electronic access to their health information, only 10 percent viewed that information at least once a month.[57] To improve value to consumers, mechanisms to provide patients access to their health record or to collect patient-reported data must become more user friendly (easy to access and understand), integrated, and engaging. Patient portals and other patient-focused technologies vary in ownership and in the amount of information available to patients. For example, patient portals or personal health records (PHRs) sponsored by insurers tend to contain mostly claims and self-reported information. Alternatively, technologies that are sponsored by health systems are generally limited to care provided within that health system. Such technologies may not have the ability to integrate with EHR data beyond the most basic levels and have no capacity to integrate with other clinical information outside of the system. Third-party patient-focused technologies struggle to obtain access to all relevant interactions, unless a regional HIE has been established in which it participates. Moreover, these technologies offer almost no analytical options or links to related resources to enable patients to go beyond viewing or entering clinical data. Questions around the extent in which to engage patients, system and data ownership, funding, analytics, and other value-added services will need to be resolved.

- *Health Information Exchange, Interoperability, and Standards* – Data sharing and exchange will be essential to achieve the future state, but many barriers remain. Many organizations have deployed health IT systems specifically tailored to their own needs. These systems are not mutually interoperable, meaning that patient information cannot easily be shared between providers with different systems or in different networks without significant investments. Issues exist around ownership of information and information exchange infrastructure, which expands out to issues of governance and funding. Hospitals and physicians continue to use different coding terms, reducing the ability to seamlessly exchange information. Although the Meaningful Use Stage One Final Rule for the EHR incentive program has defined specific numerators, denominators, and thresholds for activities in each EHR, additional standards will be required to incorporate metrics of usage directly within the EHR infrastructure to ensure consistency. Standardization will allow measurement to be clearly defined and make results more reliable, consistent, and achievable with minimal additional effort on the part of system vendors, implementers, or users of such systems.

- *Internet Connectivity* – For quality measurement to be fully enabled by health IT, all providers will need to exchange health information. Today's health IT requires access to reliable broadband service, which is far from universal at the present time, particularly for rural providers.[96] Patients will also require greater access to technologies. Barriers to access, for both providers and patients, will need to be removed. From a system perspective, much health information could be exchanged over lower bandwidth connections if the systems were designed to accommodate highly variable network speeds. A greater penetration of broadband would be beneficial for network deficiencies. Some progress has been made in this area;

ARRA appropriated $7.2 billion to expand access to broadband including $4.7 billion to the National Telecommunications and Information Administration (NTIA), which administers the Broadband Technology Program. This program includes grants to improve comprehensive community infrastructure, such as deploying new or improved broadband to connect hospitals, public safety facilities, and other community anchor institutions.[97]

- *Aggregation and Analytics* – As eMeasures, health IT, and HIE proliferate, the amount of data available for secure storage and analysis will increase dramatically, requiring new approaches to both storage and retrieval. Additionally, there will be greater demand to integrate structured, unstructured, and semi-structured data. New analytical approaches will be needed to handle both the scale and the scope of the abundance of information as well as to provide insights to providers and patients. Advances will also be required to produce these insights nearer to real time so that they can be used more effectively in integrated care models.

Conclusion

Prompted by the need to improve health care quality and contain cost growth, there has been an increase in Federal legislation and regulation pertaining to health care over the past decade. The passage of recent legislation has provided incentives toward the use of clinical data to measure quality as more providers adopt EHRs and other types of health IT. Many consider EHRs to be an advantageous core resource for quality measurement due to having rich clinical data from which quality measures can be generated. However, measuring quality using data from EHRs and other health IT is not without its challenges. In addition to reported administrative burden, there are also concerns about the technical limitations of EHRs. For example, the lack of interoperability across sites, necessity to foster further improvements in the functionality of health IT, and current challenges regarding the validity and reliability of health IT-extracted data. Concerns also exist around the need to identify optimal measure sets to be collected within and across organizations.

AHRQ is committed to engaging a diverse set of perspectives and stakeholders to facilitate and promote discussion around the identification of pathways to the next generation of quality measurement enabled by health IT. This environmental snapshot represents AHRQ's first step toward identifying those pathways and provides stakeholders an overview of the current state of health IT-enabled quality measurement, possible characteristics of the next generation of quality measurement, and challenges that need to be addressed to achieve quality measurement enabled by health IT. Moreover, it provides a partial catalog of many of the ongoing activities by numerous stakeholders to improve quality measurement through health IT (Appendix A).

Stakeholder input is needed to further capture ideas on how to inform and prioritize the pathways to achieving the next generation of quality measurement. AHRQ encourages stakeholders to respond to a Request for Information that seeks to advance learning on these issues as well as enable stakeholders to identify and disseminate successful strategies to improving health IT-enabled quality measurement.

For more information on the Pathways to Quality through Health IT initiative or the Request for Information, please go to AHRQ's Health IT-Enabled Quality Measurement Web page.

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Appendix A. Partial Catalog of Current Activities to Improve Quality Measurement Enabled by Health IT

The following table describes a subset of programs and initiatives at the Federal and State levels as well as efforts by private sector stakeholders, which are intended to improve quality measurement through health information technology. This catalog is not exhaustive, but rather illustrates the breadth and depth of the work being conducted in this area by a variety of stakeholders.

Name	Organization	Description	For More Information
Federal Programs			
Ambulatory Safety and Quality Program[98]	HHS/AHRQ	Develops safety and quality measures in ambulatory care settings, automates quality measurement, demonstrates the ability of electronic data systems (such as EHRs or claims data merged with EHR data) to expand potential safety and quality measures, and demonstrates improved ability to export data for reporting performance on measures and improvement.	http://www.ahrq.gov/qual/ambsafety/ambsafety.htm
Consumer Assessment of Healthcare Providers and Systems (CAHPS®)[24]	HHS/AHRQ	Supports and promotes the assessment of consumers' experiences with health care. CAHPS® program goals are twofold: • Develop standardized patient questionnaires that can be used to compare results across sponsors and over time. • Generate tools and resources that sponsors can use to produce understandable and usable comparative information for both consumers and health care providers.	http://www.ahrq.gov/
Enabling Quality Measurement (EQM) Through Health IT RFA[99]	HHS/AHRQ	Intended to develop safety and quality measures in ambulatory care settings, automate quality measurement, demonstrate the ability of electronic data systems, expand potential safety and quality measures, and demonstrate improved ability to export data for reporting performance on measures and improvement. Of the 17 total grants awarded through this RFA in 2007, 2 grants ended in 2009 and the remaining 15 projects were awarded no-cost extensions. Of these, 13 ended in 2010 and 2 are scheduled to close in 2011.	http://healthit.ahrq.gov/portal/server.pt/community/ahrq-funded_projects/654/health_it_portfolio_annual_report/16758
Learning Networks[100]	HHS/AHRQ	Disseminates and implements products, tools, and research to specific target groups as part of AHRQ's Knowledge Transfer (KT)/Implementation program.	http://www.ahrq.gov/news/kt/ktnetworks.htm#ihs

Name	Organization	Description	For More Information
National Quality Measures Clearinghouse™ (NQMC)[101]	HHS/AHRQ	A database and Web site for information on specific evidence-based health care quality measures and measure sets. NQMC is sponsored by AHRQ to promote widespread access to quality measures by the health care community and other interested individuals.	http://www.qualitymeasures.ahrq.gov/about/index.aspx
National Quality Strategy[59]	HHS/AHRQ	Promotes quality health care for patients, families, and communities and guides the actions of all those who deliver and pay for care. Incorporates the evidence-based results of research and scientific advances in clinical medicine, public health, and health care delivery.	http://www.healthcare.gov/center/reports/quality03212011a.html
National Resource Center for Health IT[102]	HHS/AHRQ	A public resource for sharing research findings, best practices, lessons learned, and funding opportunities with health IT researchers, implementers, and policymakers. More than 10,000 documents, presentations, articles, and tools are freely available on the NRC.	http://healthit.ahrq.gov/portal/server.pt/community/about/562/national_resource_center_for_health_it/5531
Selecting Quality and Resource Use Measures: A Decision Guide for Community Quality Collaborative[103]	HHS/AHRQ	Informs readers about the most critical issues to consider when selecting and adopting performance measures.	http://www.ahrq.gov/qual/perfmeasguide/perfmeasintro.htm
Portal Compares APCD, ASC X12, and NCPDP Standards Data[104]	HHS/AHRQ/CDC	A portal in the United States Health Information Knowledgebase (USHIK), AHRQ's metadata registry of healthcare-related data elements and their sources. Includes a core set of data elements from each state's All-Payer Claims Database (APCD); and the corresponding data elements in (1) the Accredited Standards Committee (ASC) X12 5010 standard, (2) the ASC X12 Post-Adjudicated Data Reporting Guides (in development), and (3) the National Council for Prescription Drug Programs (NCPDP) Uniform Healthcare Payer Standard Implementation Guide Version 1.0.	http://ushik.org/index_apcd.jsp?system=apcd&enableAsynchronousLoading=true
The Next Phase of the National Resource Center for Health IT(NRC) [102]	HHS/AHRQ/NRC	Several contractors that support the diverse needs of the NRC across the following four domains: • Domain 1 – Support for Health IT Program Management, Guidance, Assessment, and Planning • Domain 2 – Health IT Technical Assistance, Content Development, and Program-Related Projects and Studies • Domain 3 – Health IT Dissemination, Communication, and Marketing • Domain 4 – Health IT Portal Infrastructure Management and Website Design and Usability Support	http://healthit.ahrq.gov/portal/server.pt/community/about/562/national_resource_center_for_health_it/5531
CDC's Information Technology Strategic Plan (CITSP)[105]	HHS/CDC	Guides CDC's public health priorities to maximize the value of health IT to CDC programs. Promotes improved health outcomes through the provision of high-quality, timely, relevant information to CDC, its partners, and customers.	http://www.cdc.gov/od/ocio/strat_plan.htm

Name	Organization	Description	For More Information
National Committee on Vital and Health Statistics[106]	HHS/CDC	Serves as an advisory body to HHS on health data, statistics, and national health information policy. It fulfills important review and advisory functions relative to health data and statistical problems of national and international interest, stimulates or conducts studies of such problems, and makes proposals for improvement of the Nation's health statistics and information systems.	http://www.ncvhs.hhs.gov/wg-qual.htm
National Healthcare Safety Network (NHSN)[107]	HHS/CDC	A public health surveillance system that provides data from health care facilities to the CDC. Health care facilities report infections directly into NHSN voluntarily or because their State requires reporting. Data collected in NHSN are used for improving patient safety at the local and national levels. The CDC prepares Hospital Acquired Infection Summary Data Reports that include both national and State-specific data.	http://www.cdc.gov/nhsn/
Public Health Information Network (PHIN)[108]	HHS/CDC	CDC's vision for advancing fully capable and interoperable information systems to enhance public health preparedness across Federal, State, and local government. PHIN's approach supports the exchange of critical health information between all levels of public health and health care.	http://www.cdc.gov/phin/
Center for Medicare and Medicaid Innovation (CMMI)[109]	HHS/CMS	Fosters health care transformation by finding new ways to pay for and deliver care that improve care and health while lowering costs. The Center identifies, develops, supports, and evaluates innovative models of payment and care service delivery for Medicare, Medicaid, and the Children's Health Insurance Program (CHIP) beneficiaries using an open, transparent, and competitive process.	http://www.innovations.cms.gov/
Hospital Inpatient Quality Reporting Program[110]	HHS/CMS	In addition to giving hospitals a financial incentive to report the quality of their services, the program provides CMS with data to help consumers make more informed decisions about their health care.	https://www.cms.gov/HospitalQualityInits/08_HospitalRHQDAPU.asp
Integration of PQRS and Medicare and Medicaid EHR Incentive Program[110]	HHS/CMS	Introduces a common set of clinical quality measures and a reporting method through which eligible professionals can report to one program and qualify for both incentive programs. Under this pilot, individual eligible professionals who meet PQRS reporting requirements and use certified EHR technology, also meet the requirements for the meaningful use objective to report clinical quality measures.	https://www.cms.gov/EHRIncentivePrograms/01_Overview.asp#TopOfPage

Name	Organization	Description	For More Information
Measures Management System (MMS)[111]	HHS/CMS	Implements a more standardized and efficient management system for the development and maintenance of quality measures. QMHAG initiated the Measures Management System because there is increasing demand from a wide variety of stakeholders for valid and reliable quality measures to determine whether high-quality care is being provided consistently across the health care delivery system.	https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/MMS/MeasuresManagementSystemBlueprint.html
Medicare/Medicaid EHR Incentive Program[112]	HHS/CMS	Provides a financial incentive for the "meaningful use" of certified EHR technology to achieve health and efficiency goals. By putting into action and meaningfully using an EHR system, providers will gain benefits beyond financial incentives—such as reduction in errors, availability of records and data, reminders and alerts, clinical decision support, and e-prescribing/refill automation.	https://www.cms.gov/EHRIncentivePrograms/35_Basics.asp#TopOfPage
Nursing Home Quality Initiative[110]	HHS/CMS	Collects assessment data that has been converted to develop quality measures that provide consumers a source of information that demonstrates how well nursing homes are caring for their residents' physical and clinical needs.	https://www.cms.gov/NursingHomeQualityInits/01_Overview.asp#TopOfPage
Physician Quality Reporting System[113]	HHS/CMS	For each program year, CMS implements physician quality reporting through an annual rulemaking process. PQRS began as a claims based reporting program, has expanded over time to include the alternate reporting methods: registry, EHR, and group practice reporting option. The program has grown from 74 individual quality measures in 2007 to several measure groups and more than 200 individual measures that can be reported.	https://www.cms.gov/PQRS/01_Overview.asp#TopOfPage
Quality Improvement Organizations (QIOs)[114]	HHS/CMS	QIOs monitor the effectiveness and quality of care provided to Medicare beneficiaries by improving the effectiveness, efficiency, economy, and quality of services.	http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/QualityImprovementOrgs/index.html?redirect=/QualityImprovementOrgs/
IT Toolboxes [115]	HHS/HRSA	These toolboxes are used by health centers, other safety net providers, and ambulatory care providers for electronic and online resources and technical assistance to improve patient care.	http://www.hrsa.gov/healthit/index.html
PROMIS[63]	HHS/NIH	PROMIS is a system of highly reliable, precise measures of patient-reported health status for physical, mental, and social well-being. It measures what patients are able to do and how they feel by asking questions. PROMIS' measures can be used as primary or secondary endpoints in clinical studies of the effectiveness of treatment.	http://www.nihpromis.org/

Name	Organization	Description	For More Information
AHIC Quality Workgroup[54]	HHS/ONC	A Federal advisory body chartered in 2005 to make recommendations to the HHS Secretary on how to accelerate the development and adoption of health IT.	http://healthit.hhs.gov/portal/server.pt?open=512&objID=1199&parentname=CommunityPage&parentid=23&mode=2&in_hi_userid=11113&cached=true
Beacon Community Cooperative Agreement Program[49]	HHS/ONC	Provides funding to communities that have begun development of secure, private, and accurate systems of EHR adoption and HIE. These communities have specific and measurable goals for health systems improvement: quality, cost-efficiency, and population health.	http://healthit.hhs.gov/portal/server.pt?open=512&objID=1805&parentname=CommunityPage&parentid=2&mode=2&cached=true
Beacon Evidence and Innovation Network (BEIN)[49]	HHS/ONC	Provides the Beacon Communities with guidance in documenting and disseminating lessons and results of their individual efforts in a systematic way to generate actionable, rigorous evidence, and identifying strategies for leveraging health IT to improve patient care and reduce costs.	http://www.academyhealth.org/Programs/ProgramsDetail.cfm?ItemNumber=7282&navItemNumber=7283
Health IT Advanced Research Projects (SHARP) Program[42]	HHS/ONC	A collaborative research program that addresses problems that impede the adoption of health IT. Translates research into patient-centered health IT products and services to create improvements in critical areas resulting in high-performing, learning health care system.	http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__sharp_program/1806
HIT Policy Committee[116]	HHS/ONC	A Federal advisory committee that provides recommendations on policy framework for the development and adoption of health information infrastructure for HIE to the National Coordinator for consideration.	http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__policy_recommendations/1815
HIT Standards Committee[117]	HHS/ONC	Makes recommendations to the National Coordinator on standards, implementation specifications, and certification criteria for the electronic exchange and use of health information.	http://healthit.hhs.gov/portal/server.pt?open=512&objID=1271&parentname=CommunityPage&parentid=6&mode=2
Regional Extension Centers[47]	HHS/ONC	Offer technical assistance, guidance, and information on best practices to support health care providers' efforts to become meaningful users of EHRs. Provide training and support to assist doctors as well as other providers in adopting EHRs and guidance for EHR implementation and technical assistance.	http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__rec_program/1495
State Health Information Exchange Cooperative Agreement Program[48]	HHS/ONC	Supports States in establishing health information exchange capability among health care providers and hospitals both within and across States. Builds on existing efforts while moving toward nationwide interoperability. Awardees are responsible for increasing connectivity and enabling patient-centric information flow to improve the quality and efficiency of care.	http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__state_health_information_exchange_program/1488
Meaningful Use[42]	HHS/ONC/CMS	Defines the use of electronic health records and related technology within a health care organization.	http://healthit.hhs.gov/portal/server.pt?open=512&objID=2996&mode=2

Name	Organization	Description	For More Information
Behavioral Health Clinical Quality eMeasures Project[118]	HHS/SAMHSA/ONC	Develops a portfolio of behavioral health clinical quality measures suitable for inclusion in the EHR incentive program for Meaningful Use of Health Information Technology.	http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__behavioral_health/3866
National Center for Patient Safety (NCPS)[119]	VA	Established in 1999 to lead the VA's patient safety efforts and to develop and nurture a culture of safety throughout the Veterans Health Administration.	http://www.patientsafety.gov/vision.html#org
Quality Enhancement Research Initiative (QUERI)[120]	VA	Established in 1998 to enhance the quality and outcomes of VA health care by systematically implementing clinical research findings and evidence-based recommendations into routine clinical practice. In evaluating quality of care, the QUERI process focuses on three elements: structure, process, and outcomes.	http://www.queri.research.va.gov/about/default.cfm
Veterans Health Information Systems and Technology Architecture (VistA)[121]	VA	Provides an integrated inpatient and outpatient electronic health record for VA patients and administrative tools to help VA deliver the best quality medical care to Veterans.	http://www.ehealth.va.gov/VistA.asp
VA Medical Center in Indianapolis to exchange medical information using the Nationwide Health Information Network[122]	VA	Partnership between the VA Medical Center in Indianapolis and the Indiana Health Information Exchange (IHIE) to securely exchange EHR information using the Nationwide Health Information Network. Allows for safer and more secure access of electronic health information that will enhance quality of care for veterans.	http://www.indianapolis.va.gov/features/Indianapolis_VAMC_Launches_Health_Information_Exchange.asp
State/Regional Programs			
Community (CCBC) and the Primary Care Development Corporation (PCDC) announced a transformative partnership[123]	CCBC, PCDC	Seeks to strengthen the New Orleans health care infrastructure and improve care for more than 50,000 underserved patients. The partnership aims to introduce innovative health IT systems and tools designed to improve quality, care coordination, and population health.	http://www.pcdc.org/news/press-releases/crescent-city-beacon-and-pcdc-partner.html?utm_source=Crescent%20City%20Beacon%20-%20STAKEHOLDER%20MSG&utm_campaign=ccbcstakeholder&utm_medium=email
Hawai'i Island Beacon Community (HIBC)[124]	College of Pharmacy at the University of Hawaii at Hilo	Awarded a $680,000 contract to North Hawai'i Community Hospital (NHCH) to implement an HIE system throughout the North Hawai'i region, impacting more than 32,000 patients and marking the first step toward an island-wide HIE. Implementation has begun and will continue through 2012.	http://www.hibeacon.org/

Name	Organization	Description	For More Information
Colorado Associated Community Health Information Exchange: Ambulatory Safety and Quality Program: Enabling Quality Measurement Through Health Information Technology (EQM)[99]	Colorado Community Managed Care Network (CCMCN): Non-Profit	Designed, developed, and implemented an interoperable quality information system for a collaborative network of seven community health centers (CHCs). Supports Federally Qualified Health Centers in improving quality of care and health outcomes through data driven improvement processes and supports CHCs achieving meaningful use of EHR technology.	http://www.cachie.org/
Eastern Montana Telemedicine Network[125]	Eastern Montana Telemedicine Network	As one of the leading telemedicine programs in the country, EMTN takes an active role in promoting telemedicine services at a local, State, regional, national, and international level. Uses telecommunication technologies to transmit real-time video, audio, and medical images. Patients can remain in their communities and see specialists from Montana and across the Nation.	http://www.emtn.org/medical.html
eHealth Connecticut[31]	eHealth Connecticut	Facilitates the statewide adoption of EHRs, health information exchange, and quality reporting to dramatically improve the quality, safety, and efficiency of health care in Connecticut.	http://www.ehealthconnecticut.org
Tri-State Regional Extension Center[122]	HealthBridge	Tri-State RECs provide support for medical practice to implement and use EHRs effectively to meet meaningful use requirements and exchange patient information securely and qualify for incentive payments.	http://www.tristaterec.org/
HealthShare Montana (HSM) - Continuity of Care Record/Document (CCR/CCD)-Based HIE Project	HealthShare Montana	Implements statewide HIE using aggregated CCR/CCD standard data under a collaborative agreement with ONC. The CCR or CCD contains an extract of a person's medical information and can include the core data required in the CMS Final Rule for EHR programs. It has been standardized in terms of content and technical specifications, can be populated as a stand-alone document or extracted from an EHR, can be exchanged electronically, viewed using any Web browser, copied to electronic media or printed on paper; and can be used in a clinical data repository for information analysis that can provide key performance measure reports to providers and other users.	http://www.healthsharemontana.org/
Central Indiana Beacon Community[122]	Indiana Health Information Exchange	Provides information in a secure, standardized, and electronic format, enabling information to follow the patient, rather than being housed in one physician office or a single hospital system. Also assembles this health data in a meaningful way for providers to help them achieve improved health outcomes for their patients, with a specific focus on cancer screenings, diabetes care, heart health, asthma care, well-child visits, and other care interventions.	http://www.ihie.org/

Name	Organization	Description	For More Information
Indiana Heath Information Exchange[122]	Indiana State and local health departments, Regenstrief Institute, private hospitals, BioCrossroads and other health care and community organizations in Indiana.	Operates the Nation's largest HIE, partnering with communities throughout Indiana to ensure health information is where it needs to be when it needs to be there to improve care coordination and patient outcomes.	http://www.ihie.org/
Iowa e-Health[126]	Iowa Department of Health	Collaboration of consumers, health care providers, payers, and others to establish an electronic HIE for Iowa. The Iowa Health Information Network will allow participants to securely access vital patient health information throughout the State and beyond.	http://www.iowaehealth.org/
Louisiana Health Care Redesign Collaborative and Louisiana Health Information Exchange (LaHIE)[127]	Louisiana National Quality Forum	Network that will support the exchange of health information among providers and organizations in the State, according to nationally recognized standards. The Forum collects and uses data to guide improvements in health care quality.	http://www.lhcqf.org/
Minnesota eHealth Initiative[128]	Minnesota Department of Health	Funded through the State Health Information Exchange Cooperative Agreement Program, established under the HITECH Act and administered by ONC.	http://www.health.state.mn.us/e-health/hie.html
Bringing Measurement to the Point of Care: Enabling Quality Measurement Through Health Information Technology (EQM)[99]	New York City Department of Health and Mental Hygiene	Implements meaningful measurements of the quality of care that focus on public health priority issues, disadvantaged populations, and small office practices. The New York City Department of Health and Mental Hygiene (DOHMH) Take Care New York initiative has articulated 10 priority public health issues that require coordinated action between health care providers, patients, community organizations, and government agencies. The DOHMH Primary Care Information Project (PCIP) uses health IT for population-wide measurement and improvement of clinical care in these 10 domains, particularly among disadvantaged populations.	http://healthit.ahrq.gov/portal/server.pt/community/ahrq-funded_projects/654/health_it_portfolio_annual_report/16758
Medical Assistance Provider Incentive Repository (MAPIR)[129]	Pennsylvania Department of Public Welfare	State-level information system for the EHR incentive program. Tracks and acts as a repository for information related to payment, applications, attestations, oversight functions, and interface with CMS' National Level Repository.	http://www.dpw.state.pa.us/provider/healthcaremedicalassistance/medicalassistancehealthinformationtechnologyinitiative/maprovincentiverepos/index.htm
Purdue Regional Extension Center (PurdueREC)[122]	Purdue University	Partners with health care providers to leverage EHR for comprehensive patient care. They also assist providers meet EHR "Meaningful Use" compliance.	http://www.switch.purdue.edu/

Name	Organization	Description	For More Information
Minnesota Aligning Forces for Quality (AF4Q) Consumer Engagement Workgroup[130]	Robert Wood Johnson Foundation	MN Community Measurement (MNCM) leads the Aligning Forces for Quality (AF4Q) initiative in Minnesota. The mission of MNCM is to accelerate the improvement of health by publicly reporting health care information. Its goals are to be the trusted source for performance measurement and public reporting of quality data and to serve as a resource for providers to improve care and for patients to make better health decisions.	http://forces4quality.org/alliance/minnesota#facebook
Private Programs			
AMA Physician Consortium for Performance Improvement (PCPI)[51]	AMA	A physician-led program dedicated to enhancing quality and patient safety with the ongoing mission to align patient-centered care, performance measurement, and quality improvement. As one of the leading measure developers in the United States, PCPI identifies, develops, tests, and implements measures with the goal of improving care and accountability. Also a leading force in enabling the use of measures in EHRs, which often need to be re-specified from the paper measure definition.	http://www.ama-assn.org/ama/pub/physician-resources/physician-consortium-performance-improvement.page
National Quality Registry Network (NQRN)[131]	AMA	PCPI formed the National Quality Registry Network (NQRN) Coordinating Task Force to develop draft recommendations for consideration by interested organizations (e.g., government agencies such as the Centers for Medicare & Medicaid Services) of ways in which existing registries can be better used and new registries incentivized.	www.ama-assn.org/resources/doc/cqi/pcpi-102111-shiahan.pdf
ASC Quality Collaboration[132]	ASC Quality Collaboration	Formed in 2006, brings together leaders from both the ambulatory surgery center industry and organizations with a focus on health care quality and safety.	http://ascquality.org/
Bipartisan Policy Center: Transforming Health Care: The Role of Health IT; delivery System Reform and Role of HIT[82]	Bipartisan Policy Center	Drives principled solutions through rigorous analysis, reasoned negotiation, and respectful dialogue. Founded in 2007 by former Senate Majority Leaders Howard Baker, Tom Daschle, Bob Dole, and George Mitchell, BPC combines politically balanced policymaking with strong, proactive advocacy and outreach. They have written several reports on HIT.	http://www.bipartisanpolicy.org/library?type=18&project=All&keys=Delivery+system+reform
Monitoring Intensification of Treatment for Hyperglycemia and Hyperlipidemia: Enabling Quality Measurement Through Health Information Technology (EQM)[99]	Brigham and Women's Hospital	Tested the sensitivity and specificity of new informatics tools on improving diabetes quality of care measurement.	http://healthit.ahrq.gov/portal/server.pt/community/ahrq-funded_projects/654/health_it_portfolio_annual_report/16758

Name	Organization	Description	For More Information
Developing and Using Valid Clinical Quality Metrics for Health Information Technology with Health Information Exchange: Enabling Quality Measurement Through Health Information Technology (EQM)[99]	Cornell University, Joan and Sanford I. Weill Medical College	Derived a set of quality metrics, built on existing and additional metrics, that capture the effects of health IT with HIE and can be retrieved electronically.	http://healthit.ahrq.gov/portal/server.pt/community/ahrq-funded_projects/654/health_it_portfolio_annual_report/16758
eHealth Initiative[13]	eHealth Initiative	Multistakeholder organization that helps connect the dots in health care and technology. Seeks to drive improvement in the quality, safety, and efficiency of health care through information and technology.	http://www.ehealthinitiative.org/about-us.html
Quality Alliance Steering Committee[133]	Engelberg Center for Health Care Reform at the Brookings Institution	Collaborative effort aimed at implementing measures to improve the quality and efficiency of health care across the United States. Two key health care quality alliances, the Ambulatory Care Quality Alliance (AQA) and the Hospital Quality Alliance (HQA), have formed a new national Quality Alliance Steering Committee to better coordinate the promotion of quality measurement, transparency, and improvement in care.	http://www.healthqualityalliance.org/node/188
Electronic Support for Public Health–Vaccine Adverse Event Reporting System: Ambulatory and Safety Quality Program: Enabling Quality Measurement Through Health Information Technology (EQM)[99]	Harvard Pilgrim Health Care, Inc.	The goal of this project was to improve the quality of vaccination programs by improving the quality of physician adverse vaccine event detection and reporting to the National Vaccine Adverse Event Reporting System (VAERS). This project served as an extension of the Electronic Support for Public Health project, an automated system using EMR data to detect and securely report cases of statutory notifiable diseases to a local public health authority.	http://healthit.ahrq.gov/portal/server.pt/community/ahrq-funded_projects/654/health_it_portfolio_annual_report/16758
Medication Monitoring for Vulnerable Populations via Information Technology: Ambulatory and Safety Quality Program: Enabling Quality Measurement Through Health Information Technology (EQM)[99]	Johns Hopkins University	The overall goal of this project was a practice-based, cross-sectional demonstration of the ability of interoperable health information exchange and a Certification Commission for Health Information Technology-certified EHR to provide useful quality and safety measures for the vulnerable populations served by two Baltimore Medical System (BMS) Community Health Center (CHC) clinics. The quality and safety measures evaluated were developed for ambulatory care by the National Committee for Quality Assurance, supported by the National Quality Forum, and focused on safety monitoring for chronic medications commonly used by patients with heart disease and diabetes mellitus.	http://healthit.ahrq.gov/portal/server.pt/community/ahrq-funded_projects/654/health_it_portfolio_annual_report/16758

Name	Organization	Description	For More Information
Oryx[134]	The Joint Commission	Integrates outcomes and other performance measure data into the accreditation process. ORYX measurement requirements are intended to support Joint Commission accredited organizations in their quality improvement efforts. Performance measures are essential to the credibility of any modern evaluation activity for health care organizations.	http://www.jointcommission.org/facts_about_oryx_for_hospitals/
Automating Assessment of Asthma Care Quality: Ambulatory and Safety Quality Program: Enabling Quality Measurement through Health Information Technology (EQM)[99]	Kaiser Foundation Research Institute	Used specialized computer programs to analyze the electronic medical records of asthma patients and ultimately to determine (1) whether asthma patients in two different health care systems are receiving recommended care and (2) how to better monitor the delivery of asthma care.	http://www.kpchr.org/research/public/StudyView.aspx?stdID=486
Feedback of Treatment Intensification Data to Reduce Cardiovascular Disease Risk: Ambulatory Safety and Quality Program: Enabling Quality Measurement Through Health Information Technology (EQM)[99]	Kaiser Foundation Research Institute	Worked with eight primary care facilities of Kaiser Permanente Northern California to assess whether the use of systematic feedback on the need for treatment intensification in patients with poor control of CVD risk factors improves risk-factor control. This project leveraged health IT, including Kaiser Permanente's Certification Commission for Health Information Technology-certified Epic-based electronic medical record (EMR) HealthConnect and the population management software tool used for the Preventing Heart Attacks and Strokes Everyday (PHASE) program, to create and deliver this need for treatment intensification information to providers who have high CVD-risk patients.	http://healthit.ahrq.gov/portal/server.pt/community/ahrq-funded_projects/654/health_it_portfolio_annual_report/16758
Using Information Technology to Improve the Quality of Cardiovascular Disease Prevention and Management: Enabling Quality Measurement Through Health Information Technology (EQM)[99]	Kaiser Foundation Research Institute	This study sought to use EMR data to determine the relationship between patterns of preventive and disease management care for cardiovascular disease (CVD) and the occurrence of disease events that this care is designed to prevent.	http://healthit.ahrq.gov/portal/server.pt/community/ahrq-funded_projects/654/health_it_portfolio_annual_report/16758
National eHealth Collaborative (NeHC)[135]	National eHealth Collaborative (cooperative agreement partner of ONC)	A public-private partnership that enables secure and interoperable nationwide health information exchange to advance health and improve health care.	http://www.nationalehealth.org/about-national-ehealth-collaborative
Healthcare Effectiveness Data and Information Set (HEDIS) & Quality Measurement[136]	NCQA	A tool developed by the National Committee for Quality Assurance (NCQA) and used by more than 90 percent of America's health plans to measure performance on important dimensions of care and service. NCQA has developed the HEDIS as well as a broad range of measures covering overuse, underuse, value, process, and outcome measures.	http://www.ncqa.org/tabid/59/Default.aspx

Name	Organization	Description	For More Information
eMeasures[53]	NQF	Standardized performance measures in an electronic format that help ensure that measures are consistently defined, implemented, and compatible across clinical IT systems to promote higher quality and more appropriate care delivery.	http://www.qualityforum.org/.../eMeasure_Fact_Sheet.aspx
Health IT Expert Panel (HITEP-I)[33]	NQF	Panel assembled by NGQ that identified 84 high-priority quality measures, their associated common data types, and a framework to evaluate the quality of electronic information required by performance measures through EHRs.	http://www.qualityforum.org/Projects/h/Health_IT_Expert_Panel_I/Health_IT_Expert_Panel_I_(HITEP_I).aspx#t=2&s=&p=
Health IT Expert Panel (HITEP-II)[50]	NQF	Continues the work of HITEP-I (see above) by focusing on recommendations for a standardized Quality Data Model (QDM) and more meaningful quality measurement through improved clinical data flows within and across care settings.	http://www.qualityforum.org/projects/hitep2.aspx
Measure Applications Partnership (MAP)[68]	NQF	A public-private partnership convened by the National Quality Forum (NQF) to provide input to the HHS on the selection of performance measures for public reporting and performance-based payment programs.	http://www.qualityforum.org/map/
Quality Data Model (QDM)[137]	NQF	An "information model" that clearly defines concepts used in quality measures and clinical care and is intended to enable automation of EHR use. Provides a way to describe clinical concepts in a standardized format so individuals (i.e., providers, researchers, measure developers) monitoring clinical performance and outcomes can clearly and concisely communicate necessary information. Describes information so that EHR and other clinical electronic system vendors can consistently interpret and easily locate the data required.	http://www.qualityforum.org/QualityDataModel.aspx
Improving Quality in Cancer Screening: The Excellence Report for Colonoscopy: Ambulatory and Safety Quality Program: Enabling Quality Measurement Through Health Information Technology (EQM)[99]	Oregon Health and Science University	Using the Clinical Outcomes Research Initiative (CORI) software application and the National Endoscopic Database, the project developed and tested the Excellence Report—a quality report card for gastrointestinal endoscopy that focuses on nationally recognized quality process measures for colonoscopy.	http://healthit.ahrq.gov/portal/server.pt/community/ahrq-funded_projects/654/health_it_portfolio_annual_report/16758

Name	Organization	Description	For More Information
Massachusetts Quality E-Measure Validation Study: Enabling Quality Measurement Through Health Information Technology (EQM)[99]	RAND Corporation	Evaluates the readiness of structured EHR data to support ambulatory clinical quality measurement. Using the Ambulatory Care Quality Alliance (AQA) ambulatory care measurement set, the study team is comparing quality measures by applying two standard measurement methods: (1) a "hybrid method," combining claims data with medical record review and (2) a "claims-only method," based upon claims data aggregated across commercial health plans and the Medicare program.	http://healthit.ahrq.gov/portal/server.pt/community/ahrq-funded_projects/654/health_it_portfolio_annual_report/16758
Crossing the Quality Assessment Chasm: Aligning Measured and True Quality of Care: Enabling Quality Measurement Through Health Information Technology (EQM)[99]	University of Pennsylvania	Leverages detailed and discrete data from electronic medical records to develop measures that account for heterogeneity among different diabetic patient panels, credit improvement in the control of diabetes among individuals in a given population over time, recognize provider effort in medical management, and incorporate management of diabetes comorbidities such as high blood pressure and hyperlipidemia.	http://healthit.ahrq.gov/portal/server.pt/community/ahrq-funded_projects/654/health_it_portfolio_annual_report/16758
Using Electronic Records to Detect and Learn From Ambulatory Diagnostic Errors: Enabling Quality Measurement Through Health Information Technology (EQM)[99]	University of Texas Health Science Center Houston	Used data from EHRs from a Veterans Affairs (VA) and a non-VA primary care network to detect diagnostic errors and understand their causes. It lays the groundwork for future prevention strategies.	http://healthit.ahrq.gov/portal/server.pt/community/ahrq-funded_projects/654/health_it_portfolio_annual_report/16758
Surveillance for Adverse Drug Events in Ambulatory Pediatrics: Ambulatory and Safety Quality Program: Enabling Quality Measurement Through Health Information Technology (EQM)[99]	Washington University	Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management. Uses automated surveillance to measure the incidence of outpatient ADEs suffered by children with sickle cell disease, cystic fibrosis, or cancer, either in the emergency department (ED) or during the transitions between hospital admission and discharge. Analyzes data generated from BJC HealthCare system, which includes the St. Louis Children's Hospital. The St. Louis Children's Hospital ED uses the Wellsoft ED computer system and the McKesson Corporation's Certification Commission for Health Information Technology-certified Horizon Expert Documentation for inpatient care.	http://healthit.ahrq.gov/portal/server.pt/community/ahrq-funded_projects/654/health_it_portfolio_annual_report/16758

Appendix B. Methods and Approaches

Booz Allen used a four-step approach to conduct the research for this environmental snapshot (i.e., establish research criteria, identify key research questions, perform literature review, and synthesize key findings).

Establish Research Criteria

The Booz Allen team reviewed published literature and publicly available information to identify what is known about the relationship between health IT and quality measurement. Booz Allen examined existing articles, published reports, work group testimony, and other publicly available documents and Web sites released in the past 4 years to identify current or recently completed initiatives. Literature from the past 5 years was considered for more general background information on the current state of performance measurement.

The Booz Allen team also reviewed published literature and publicly available information to identify activities in the area of quality measurement enabled by health information technology for inclusion in the *Partial Catalog of Current Activities to Improve Quality Measurement Enabled by Health IT* (Appendix A). The team communicated with internal and external subject matter experts (SMEs) to develop a starter list of organizations as preliminary sources. These organizations' Web sites were then reviewed to identify their current efforts or programs. Additional Google™ searches and SME recommendations added to the list of programs. Efforts included in the "catalog" were limited to those that have occurred within the previous 5 years and were specifically focused on enabling quality measurement through health information technology.

Key Research Questions

Key research questions were identified for the major sections of the environmental snapshot. These questions directed the collection of information. The following table presents the research questions that were established for this report:

Exhibit 2. Key Research Questions

Key Stakeholders	Current Activities	Gaps and Challenges	Future Vision
• Who are the key stakeholder groups who are working at the intersection of health IT and quality? • Where are their recent work efforts/products? • What are the motivations/roles in the enterprise?	• What are the latest activities related to quality measurement enabled by health IT? • What is the desired result of these activities in the future? • Do these activities address known gaps/problem areas?	• What are the major gaps and challenges related to advancing health IT's ability to support quality measurement? • How do they hinder progress related to quality measurement enabled by health IT?	• What are areas of consensus for a future vision? • What are unresolved issues for the future vision? • How do stakeholders address known gaps/problem areas?

Perform Literature Review

Data Sources and Search Terms

To conduct the research, relevant search terms were used in both PubMed® and Google™ Scholar. Additional searches for reports, testimony, and publically available information were conducted using Google. Booz Allen also reviewed information from the Web sites of key stakeholders in the health IT and quality measurement arena including, but not limited to: Agency for Healthcare Research and Quality (AHRQ), Centers for Medicare & Medicaid Services (CMS), National Quality Forum (NQF), Health and Human Services (HHS), Indian Health Services (IHS), Office of the National Coordinator (ONC), Institute for Medicine (IOM), National Committee for Quality Assurance (NCQA), American Medical Association (AMA) Physician Consortium for Performance Improvement (PCPI) etc. A representative list of the search terms is outlined in the following table.

Exhibit 3. Table of Representative Literature Review Search Terms

Representative Literature Review Search Terms		
Health IT, EHR	Using electronic health records to collect patient-specific performance measures/quality measures	EHR, quality measure(s)/performance measure(s), barrier(s) (obstacle, roadblock)
Clinically enriched claims data	Using electronic health records to collect performance measures/quality measures	Health IT, quality measurement/performance measurement
Performance measure/ quality measure using EHR	EHR, quality measure(s)/performance measure(s)	Data requirements, EHR
Performance measure/quality measure using Health IT	EHR, quality measure(s)/performance measure(s), success(es)	Automation, quality measurement/performance measurement

Synthesize findings

Booz Allen synthesized the findings from the literature review to identify:

- Key themes as they relate to the current and future states of quality measurement enabled by health IT, and;
- Existing challenges and barriers to moving forward.