

A Study Of The Impact Of Meaningful Use Clinical Quality Measures

Appendices

Appendix – Technical and Standards Issues.....	A2
Case Study 1.....	B8
Case Study 2.....	B18
Case Study 3.....	B30
Case Study 4.....	B42

Appendix – Technical and Standards Issues

The crux of the issues identified by implementation of the eCQMs is the need to add data fields in the EHR to capture the needed information. This “hard wiring” approach is a tactical response to quickly address specific measurement needs, but it has a risk of perpetuating the current process of implementing each measure directly in the EHR. All of the organizations noted that their current process primarily hard wires measure data into the EHR for MU Stage 1 eCQMs and also for those included in the 2014 edition of eCQMs. This appendix offers additional information on the technical and standards issues raised in the report.

TEXTBOX 1

Measure Components (Chapters)

Introduction – General information about the measure, its intended purpose, evidence to support the reason good performance will improve patient care and outcomes, and information about ownership, endorsement status, version, and expiration dates.

Population – Characteristics of all patients to be evaluated by a specific performance measure set.

Denominator – The population evaluated by an individual measure including age ranges, diagnose, procedures, time windows and other information. Often identical to the initial population or a subset of it further specify the purpose of the measure.

Numerator – The process, condition, event or outcome that satisfies the measure focus or intent for all members of the denominator.

Denominator Exclusion – Patients identified in the denominator definition but who should not receive the process or are not eligible for the outcome for some other reason.

Exception – Conditions that should remove a patient, procedure or unit of measurement from the denominator only if the numerator criteria are not met. Exceptions are used to allow providers to exercise clinical judgment and make decisions about care individually for each patient. Denominator exceptions allow for adjustment of the calculated score for those providers with higher risk populations.

Data Criteria – Detailed description about the specific information used to define the population, denominator, numerator or other measure components. For example, the data criteria for blood pressure include the codes for systolic blood pressure and diastolic blood pressure and which blood pressure results are to be used to calculate the measure.

A. Quality Measures Require Use of Standards

Quality measures can be likened to a best-selling novel in that they require a standard set of vocabularies and grammar to be sure readers can understand them. The National Quality Forum (NQF) established a grammar, the Quality Data Model (QDM), but it has been used only by measure developers for electronic clinical quality measures (eCQMs). No grammar has been specified for use by electronic health records (EHRs) in the Meaningful Use or any other nationwide program. To help explain, the creation of a novel will provide a valuable metaphor. Most readers of a novel view its external experience first. It may be published in hardback, paperback or for an electronic reader, the way it is presented to the world. That presentation method does not change the content of a novel, but it does change the manner in which it is read. Electronic readers may come with a light source so the purchaser may be able to read it in a low light setting; it is also smaller so the novel can be consumed in different reading positions. A hardback novel, however, is larger and heavier and requires more leisure time and a comfortable armchair and a good nearby light source (its *workflow*).

Similarly, a quality measure can be theoretically placed in different formats to state the same content, but different formats (or *syntax*) change considerably the ability of users to understand what is stated and intended. Analogous to the hardback novel *workflow*, a traditional chart abstraction measure is designed for information that a nurse outside the hectic clinical care environment can find by carefully reading the details, including most of the narrative text, in the patient's record (the chart abstraction *workflow*). Converting the same measure for the electronic reader changes the format to describe all of the information the measure requires and how it is calculated (the *logic*) in a new and developing form to explain how the EHR should automatically extract the information and calculate the results. Similar to a novel, the presentation form impacts the users' *workflow* to consume it. Exploring deeper into the metaphor, measures, like novels, are comprised of sections, or chapters. For the measures, the chapters include the general description, the

component sections – population, denominator, numerator, exclusions – and exceptions and the data criteria (see *Textbox 1*).¹

Also similar to the novel, each chapter or section in a quality measure is further described by subsections, or paragraphs, sentences and words. And each word is defined using a specific alphabet, letters that are the most basic part of a word. The related basic component of the measure is the set of codes that define the basic concept, or *data element* (e.g., *systolic blood pressure*). Measures use different alphabets, or vocabularies to define certain types of measure data elements (see *Textbox 2*). But just as letters

TEXTBOX 2

Vocabularies Used in Measures

RxNorm – Medications

LOINC – Laboratory tests and vital signs

SNOMED-CT – Diagnoses and observations (physical examination findings*)

ICD-9-CM and ICD-10-CM – Diagnoses (during the transition to SNOMED-CT)

* A discussion of the use of SNOMED-CT is included in a subsequent section of this document.

form words and each word may be a noun, verb, adjective or adverb, measure elements may be basic definitions of information or information that defines greater detail about how the information was obtained (e.g., the systolic blood pressure measured by a specific type of automated blood pressure monitor). In the abstracted version of a measure, the hardback version, a specific description can be presented in narrative form for the nurse abstractor to understand that only automated blood pressure results are acceptable. In the electronic version, the query into the EHR must define the specific qualifying information in electronic form. Such qualifying information is often called *metadata* (e.g., the device used to measure the systolic blood pressure, the date and time it occurred, and whether the patient was resting). The data elements and their qualifying information (*metadata*) are then combined into phrases and sentences and then combined into the paragraphs and sections of the measure. Measures designed for abstraction are generally available in paper form (or electronically as unalterable documents

in PDF) with the structure of the document specific to the measure developer. The first structure to carry content for an electronic measure was developed as a draft standard by the standard development organization, HL7 in 2009, the *Health Quality Measure Format* (HQMF). The standard's first true *test* was part of the Department of Health and Human Services (HHS) EHR Meaningful Use program to deliver the eCQMs. Unfortunately, this nation-wide testing has not even benefited from evaluation.

The first use of the HQMF showed the difficulty describing even very simple measures so they could be read and understood by the human reader (clinicians) and the EHR. A number of the challenges are discussed below. The structure of the measure, like the format for presenting and reading the novel, is only the visible envelope in which the details are described. To be able to read a novel, the reader needs a basic knowledge of the alphabet, the vocabulary and the grammar used to build the sentences, paragraphs and chapters. The art of constructing a novel is what makes it readable and worthy of awards or endorsement. Similarly, quality measures require basic vocabularies and grammatical structures to help users understand their meaning and to test them to see if the results are valid and reliable. But for EHRs to be able to 'read' such measures, that same basic vocabulary and grammatical knowledge must be built into the EHR. The alternative is for each EHR vendor and user to struggle through reading the content of the measure and hard wiring the information into the EHR specific to each measure's content. The result is similar to asking the average first grade student in elementary school to explain the meaning and nuances in the novel *Finnegan's Wake* by James Joyce. The meaning and the understanding of the output would be widely different among the readers.

Creating standards to define information in EHRs is essential to allow reuse of the information for quality measurement, public reporting, registry participation and clinical research. Standardizing the structure, or format, to send information from one place to another is a first step, but it is not sufficient to allow questions (or queries) described by one organization to automatically extract information from an EHR. While the eCQMs were defined to some extent based on a common way to describe information (the NQF-developed

Quality Data Model, QDMⁱⁱ), the model was a new concept to measure developers and EHR vendors alike. EHR vendors also were not required to acquire understanding or proficiency nor were they encouraged programmatically to collaborate to improve it.

Use of such a data model was supported by the 2010 report of the President's Council of Advisors on Science and Technology (PCAST).ⁱⁱⁱ That report made some strong recommendations to move the Meaningful Use program forward to support eCQMs, as well as other uses of health data in the EHR such as public health reporting, clinical trials and patient-centered outcomes research. Specific to the eCQMs and these other uses, the report called for a "universal exchange language" to create a basis for physicians and patients to share and reassemble data across settings of care. The report referred to the current Meaningful Use program approach to use the structure called Clinical Document Architecture (CDA) standard as only a first step. CDA was developed to share information about who created a patient summary and some basic information about the patient. It does not, however, provide information about the origin and meaning of each data element included within it (also known as its *provenance*). For example, a measure that evaluates a change in blood pressure over time may be interested in only results obtained by the same type of blood pressure recording device over the time period. The CDA will indicate the author of the summary report (e.g., the physician) but it does not include the additional information about the individual blood pressure results to assure their origin was the same type of recording device.

While blood pressure may be a simple example, there are many elements in quality measures that require additional information about the information to be sure the calculation is precise and reliable. This approach eliminates the incentive for vendors to "hard wire" into EHRs the specific quality measures currently required to qualify for Meaningful Use, instead motivating them to provide a flexible framework into which specified reporting items can be easily inserted. This is important because meaningful use measures will change over time as the art and science of quality measurement improve and as more clinically meaningful measurement constructs become available. If providers are required to pay for expensive system

upgrades as new measures are implemented, their support for both the technology and for quality assurance programs will quickly dissipate.

An important piece of measure calculation is the measure logic, an area that needs more analysis. Most of the work to date has been based on the data elements and not the logic. While it may seem straightforward to describe how to add, subtract and divide, such description is not necessarily standard in EHRs. There are a number of ways to describe the logic and sometimes measures weigh results differently (example provided in *Textbox 3*).^{iv} There is no common form currently in use to describe logic for an eCQM. Although efforts are now in progress through the HHS Standards and Interoperability Framework and HL7 working groups on HQMF and other standards, a working common format is not yet available.

TEXTBOX 3

Weighted Measure Example

A sample measure of improved blood pressure over time evaluates that blood pressure is monitored at each doctor visit (the process) and that the results are at least 10 points lower after six months of observation (the outcome). The presence of blood pressures at every visit in such a measure could be given a weight of 0.3 and the improvement a rate of 0.7 so the outcome is considered more important than merely the measurement but some credit is given for just measuring blood pressure.

Example:

6 visits in 6 months – # with blood pressure taken = 6 (met expectation)

Systolic blood pressure at start = 180, Systolic blood pressure at end = 175 (did not meet expectation)

Weighted equally:

Met (100%)x.5 + Not met (0%)x.5; Result = 50%

Weighted as described:

Met (100%)x.3 + Not met (0%)x.7; Result = 30%

B. Use of SNOMED-CT in eCQMs

The Meaningful Use Stage 2 criteria published by HHS require providers to use SNOMED-CT beginning October 1, 2013 with the expectation that it will be used in EHR problem lists to support clinical decision support and eCQMs. Therefore, it has been incorporated into the eCQMs for the

Meaningful Use program. SNOMED-CT is not currently in active use by clinicians as they directly care for patients. All of the sites visited use some method to directly connect the terms physicians enter on the problem list with those in the SNOMED-CT codes provided with the eCQMs (a process called *mapping*). One of the sites is purchasing services, at additional expense, from another vendor designed specifically for this purpose. Hospitals and eligible providers also are expected to begin using the World Health Organization's International Statistical Classification of Diseases 10th revision (ICD-10) for billing at the same time they convert to SNOMED-CT.

The National Library of Medicine provides a service that allows entry of the SNOMED-CT term or code plus some patient-specific information (age, sex, and co-morbidities) to retrieve a list of ICD-10-CM codes (but not ICD-10-PCS codes) from which a provider can choose.^v There is some human interaction or programming needed to provide the patient-specific information to the service, but the search is automated. Although some crosswalks exist from SNOMED-CT[®] to ICD-10-CM they are limited to conditions in the CORE (Clinical Observations Recording and Encoding) problem list subset of SNOMED that covers 95 percent of terms used by eight large academic organizations, including the Veterans Administration.^{vi} While this set is useful, no testing or validation has been performed to determine the usefulness of existing crosswalks for coordinating clinical use with ICD-10-CM coding or for reporting eCQMs. Crosswalks are not available for procedure codes (ICD-10-PCS). Neither is analysis and validation of commercial products or services that manage crosswalks for the eCQMs. Further study and more usable tools are needed before hospitals can be expected to successfully use both SNOMED-CT and ICD-10-CM and ICD-10-PCS.

Some general crosswalk between the vocabularies is built into the eCQMs, which include grouped sets of codes (value sets) of both SNOMED-CT terms and ICD-10-CM or ICD-10 PCS codes to describe the data elements in the measures. However, the measure developers create the grouped SNOMED-CT terms and ICD-10-CM or ICD-10-PCS codes independently and there has been no direct study to determine if these codes are comparable. Further study and more usable tools are needed to allow hospitals to successfully use both SNOMED-CT and ICD-10-CM and ICD-10-PCS. While some

services are available from specialized vendors, these services come with additional cost and effort. Moreover, the eCQMs also provide lists of codes from SNOMED-CT but most commercially available EHRs are not able to take advantage of the terminology's full value. See the Appendix for a more detailed description and an explanation of advanced functions required if EHRs were to provide the full value of SNOMED-CT.

Background – SNOMED-CT

SNOMED-CT is a systematically organized collection of clinical terms providing codes, terms, synonyms and definitions covering a wide range of clinical concepts (see *Textbox 4*).^{vii} It allows concepts documented using synonyms to be combined (e.g., a finger is also a digit) and it provides relationships between concepts used in clinical settings (e.g., the finger is part of the hand which is part of the forearm which is part of the arm). The same sets of relationships apply to all of the concepts included. The strength of SNOMED-CT is in these relationships and the ability to extract meaning (reasoning) from a very wide range of statements in a clinical patient record. To provide a simple example, a fractured right index finger

TEXTBOX 4

SNOMED-CT Concepts

- Clinical finding
- Procedure
- Observable entity
- Body structure
- Organism
- Substance
- Pharmaceutical / biologic product
- Specimen
- Special concept
- Linkage concept
- Physical force
- Event
- Environment or geographical location
- Social context
- Situation with explicit context
- Staging and scales
- Physical Object
- Qualifier value
- Record artifact

may make a right-handed diabetic person unable to perform self-injection of insulin. While that may seem to be an obvious conclusion, a computerized decision-support system can potentially use the SNOMED-CT structure to connect the dots and recommend the clinician offer alternative options to the patient. Used for such reasoning, the SNOMED-CT structure can potentially benefit patient care directly. It also can add significant benefit to evaluating existing information in the record to evaluate processes and outcomes of care (quality measures, clinical research, clinical trials, and adverse event reporting). The US National Library of Medicine (NLM) licenses SNOMED-CT to support the effective clinical recording and use of data with the aim of improving patient care.^{viii}

Automating the type of reasoning described, however, is still in the realm of research except for a few academic centers.^{ix, x, xi} The NLM incorporates SNOMED-CT in the UMLS along with untested and partial mappings to the World Health Organization's International Statistical Classification of Diseases 9th and 10th revisions (ICD-9 and ICD-10). The use of these mappings is to allow direct billing using the ICD-9 or ICD-10 codes without requiring clinicians

to understand the details of the terminologies. These mappings require formal testing to ensure they are consistent with requirements for eCQMs.

eCQM Use of SNOMED-CT®

The eCQMs that are part of the Meaningful Use Stage 1 and 2014 programs all use lists of codes (value sets) to describe each data element that is part of the measure calculation. Where appropriate, the value sets use SNOMED-CT terms and their codes are included in a list. EHRs in general do not take advantage of the extensive SNOMED-CT relationships between individual data elements and certification criteria for the Meaningful Use program do not require EHRs to do so. The values are somewhat helpful by providing terms that have more meaning to the average clinician than billing codes. However, most hospitals and physicians use local terms to document in their EHRs. Organizations must perform additional work to connect local terms to synonyms in the SNOMED-CT lists or have purchased additional consulting services and/or applications to manage the process merely to comply with the program but without the intended benefits. Therefore, the organizations and patients do not derive any significant value from the efforts to include SNOMED-CT in their systems. The work may provide a platform for future EHR capabilities but the effort may outweigh the value for current systems. In addition, the use of mappings poses a risk of miscounting data, as they are not uniform or rigorously tested. It is like relying on automated language translation software to turn your letter written in English into French, without the knowledge or ability to verify that it was translated correctly.

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Case Study

1

Executive Summary

The American Hospital Association (AHA) commissioned a study to investigate hospital experiences with implementation of Meaningful Use (MU) Stage 1 electronic Clinical Quality Measures (eCQMs). This case study describes the experience and impact of eCQM implementation in a non-profit hospital located in the mid-Atlantic region of the U.S. The findings described in this case study are based on interviews conducted with key leaders and operational staff directly involved in the oversight and management of eCQMs.

The hospital was well situated for success in the implementation of MU and eCQMs. Leadership had a strong commitment to health IT as infrastructure to enable change with more than 10 years of experience of evolving electronic health record (EHR) use. The CEO and COO set a high bar for achievement in EHR implementation and the organization had a well-developed oversight and decision-making structure for Meaningful Use implementation.

Despite these many enablers for success, this organization encountered many barriers in its attempt to implement eCQMs, including:

- **High human and financial cost.** Staffing and capital needs were greater than expected leading the hospital to divert resources from other critical projects needed to improve patient care and outcomes including: (a) connectivity in the community, (b) adoption of EHRs, and (c) growth of ambulatory practices.
- **Lack of results consistent with manually abstracted measures.** eCQM data collection required certain information to be in one specific place in the EHR rather than where it was documented as part of the clinicians' current workflow (the routine actions, including documentation used during patient care) and could not recognize narrative text. As a result, the reports generated from the vendor's product significantly under-reported actual performance.
- **Problems with the usability of model certified software.** The forms prescribed for use in the eCQM tool did not align with the clinicians' workflow for documenting routine patient care.

■ **Workflow and technology-induced rework.**

The hospital had to reconfigure established workflows solely based on data requirements for the eCQM content, a process that was time and resource intensive.

■ **Tools not available when needed.** Tools needed to manage essential functions such as medication reconciliation, ePrescribing and quality scorecards that provide valid data were not available at the point needed. Hospital IT staff had to develop interim solutions that reported results in the absence of a vendor product.

■ **Limited internal interoperability.** EHRs are not designed to capture information from other department systems at the level of detail needed for eCQM reporting. The work effort to access all required data was left to hospital staff.

Ultimately the organization was unable to obtain information usable for quality improvement efforts.

Hospital Overview

This not-for-profit hospital in the Mid-Atlantic Region is a regional tertiary care referral center. Its workforce consists of more than 3,000 physicians, staff and volunteers including employed ambulatory physicians and hospital-based physicians, among them hospitalists, intensivists, endocrinologists, neurosurgeons and other specialists. Employed ambulatory physicians use a standard EHR; non-employed ambulatory physicians use a variety of EHRs. The organization has been on a journey of EHR implementation with its current vendor for more than 10 years as a strategic approach to extracting data to improve outcomes. Measurement and attention to care transitions and care coordination are embedded in the organization's culture. The hospital was technically sophisticated, using its EHR successfully to improve care before the Centers for Medicare & Medicaid Services (CMS) MU Program existed.

The basic EHR work started more than 16 years ago. The hospital now has a well-established foundation based on a close partnership with its vendor and 10 years of EHR use. The organization was one of the first hospitals to implement bar code scanning for medication administration. Computerized Physician Order Entry (CPOE) has

Hospital Profile

Financial Classification: Not-for-Profit

Location: South-Atlantic Region

Regional Tertiary Care Referral Center

Bed Size Range: 300-500

Staff: More than 3,000 physicians staff and volunteers

Annual visits:

500,000 inpatient, outpatient, diagnostic, sub-acute and emergency services;

Annual deliveries – > 1,000

Annual ED visits – > 50,000

Annual surgical procedures – > 15,000

Annual admissions – > 20,000

Employed ambulatory physicians: < 100

Employed hospital-based physicians: Hospitalists, Intensivists, Endocrinologists, Neurosurgeons, and other specialties.

EHR: Vendor A

Ambulatory EHR: One EHR Vendor for primary care, and a mixture of EHRs for non-employed.

been in place for five to seven years and it is now rolled-out to approximately 70-80 percent of medication orders. As the hospital considered attestation for meaningful use, the leadership and staff believed they used their EHR meaningfully and they derived significant value from its robust use. Thus, many believed they would have a relatively straightforward path to implementing the MU program requirements, including the related eCQMs. However, key senior leadership recognized that significant work was required and created a multidisciplinary team to address all requirements, including the eCQMs. The team developed a stoplight status report for each MU Stage 1 objective as a baseline and then prioritized focus areas for improvement. The same team managed compliance with all components of the MU program and eCQMs. One impact of the new focus was the launch of a nursing documentation optimization project to specifically address the requirements for the eCQMs and the establishment of a new position – Director of Nursing Informatics. Much of the documentation change involved modifying data

entry screens or creating new smart web pages (HTML forms) to capture specific structured data for exclusions and a few nursing data entry screens valuable only for eCQM reporting.

Individuals Interviewed:

Vice President Finance / CFO

Vice President, Medical Affairs, Chief Medical Officer

Chief Medical Information Officer

Director of Clinical Performance Improvement

Director of Nursing Informatics

Chief Information Officer

Vice President, Continuum Services

Vice President, Patient Care Services (Chief Nursing Officer)

eCQM Implementation Process

Gap Analysis

The first step in the process was to assess whether the forms that appeared on the computer screens would support capture of the requisite data, or *screen flow*, within an efficient sequence of clinician activities, so that the data was effectively captured as the clinicians delivered patient care, also known as *workflow*. The hospital's intent was to use the assessment tools developed by the EHR vendor since the leadership generally looked to the EHR vendor as the technology developer. The gap analysis, however, identified significant disconnects.

The eCQM to assess whether the treatment to prevent clots (e.g., aspirin) had been prescribed at discharge for patients with a diagnosis of stroke provides a good example of one such disconnect. At this hospital, the discharge form was used to document a number of routine actions. To meet the

needs of the eCQM, the vendor added a check box on that form for the physician to indicate whether the treatment had been prescribed. The vendor had not made it clear to the MU Oversight Team that this specific check box was the only location the eCQM reporting tool would check to see if such medication was given to stroke patients. Therefore, the medication information was routinely documented with medication reconciliation¹ that occurs at discharge, but the certified eCQM reporting tool only looked for the information in the discharge form. This created a disconnect: the eCQM reporting tool's *prescribed* workflow (the only way the software is programmed to find the required information) is different than the hospital staff's workflow (medication reconciliation in this example) for capturing the information appropriate to the eCQM. The prescribed check box was not mandatory (the software allowed physicians to complete and sign the form without checking it).

Workflow Redesign

The most significant part of the eCQM effort was related to workflow redesign, i.e., closing the gap between the screen flow and the workflow. The hospital's clinical workflow redesign efforts led to processes most consistent with what their physicians could accommodate in patient care. However, a number of these efforts led to lower performance levels, as measured by the eCQM reporting tool. Most of the certified eCQM vendor software used data entry screens to collect the information the eCQMs required. The forms include check boxes that physicians or nurses could use to indicate a specific action had happened. As in the above example, when the placement of the check box was out of sync with the organization's workflow, the organization either needed to modify the tool or change the workflow. In most cases the organization modified workflow.

Data Extraction and eCQM Calculation

The hospital has attested to 15 eCQMs for MU Stage 1, including many data elements that were not routinely available for one of three reasons: (a) the data element was not documented at all (for example, reasons for not ordering a specific

1. Medication reconciliation is the process that compares the medications to be used after discharge with the inpatient medication list and, when available, the previous medications the patient took before the hospital admission. The goal of reconciliation is to prevent omitting important medications and also to prevent potential interactions with the medication the patient may take at home after discharge.

medication) or, (b) the information was documented in narrative text (i.e., unstructured so it could not be recognized by the computer for analysis) or, (c) the information was structured but was entered in a location in the EHR different than the software was designed to use as the information source, resulting in information not being included in measure calculations. Much of the work to comply with Meaningful Use and the eCQMs included building data fields within the software installed at the hospital and evaluating the workflow clinicians used to input data. The hospital added most of the screens for physicians to capture eCQM exclusions (e.g., the reasons certain medications or activities are not ordered) into the CPOE process to align with physician workflow.

Validation

The eCQM scorecard is the certified software provided by the vendor that shows the performance results for the eCQMs. This scorecard also produces other operational reports to which the hospital staff were accustomed. The results for the eCQMs were quite different from the results obtained from the manual abstraction process. For the example of providing clot preventing medication at the time of discharge for patients with a diagnosis of stroke, the manual abstraction results were 100 percent; the eCQM reporting tool performance results were 30 percent. The vendor directed the hospital to not focus on the results provided by the certified software, based on the CMS directive that eCQM reporting was necessary but did not have to be accurate. CMS originally required hospitals to attest that the eCQM data were accurate, but it changed policy in October 2011 based on early hospital experience that certified EHRs did not generate accurate data due to the complexity of the eCQMs. The new policy only required hospitals and physicians to report the data generated from their certified EHR, however, providers were worried that attesting to the accuracy of data that they did not consider to be correct would create a compliance issue. Additionally, hospital leadership attempted to create some value from the eCQM output and supported work to produce an eCQM scorecard that accurately depicts the information captured by the clinical staff. As a result, the hospital staff performed 70-80 percent of the EHR modifications required for the eCQMs (primarily creating new

forms for clinicians to enter information into the EHR), while the vendor provided only 20-30 percent of the modifications. The vendor might have made other modifications, but the time for the vendor to complete them would have exceeded the timeline for attesting to the MU eCQMs.

It is notable that a significant number of the modifications performed by the hospital staff were made without clear understanding that, for reporting to be successful, only single prescriptive fields, or check boxes, on the forms supplied by the vendor could be used. To enable clinical staff to trust the results produced by the eCQM scorecard, the hospital staff has expended many hours to modify software and communicate with the vendor in an attempt to assure consistent reporting. Validation continues at the time of this report; no measures have been validated to date.

The eCQM reporting tool programming is very complex. Hospital leadership reviewed the details with the vendor's highly trained technical staff to understand how the system worked. They continue to work with the vendor to gain some assurance that patient-centered clinical workflow will guide the development of prescriptive fields for the vendors' MU 2014 eCQM reporting tool. As most of the eCQMs in MU Stage 1 are being updated for the MU 2014 (Stage 2) eCQM program, the vendor will only update the software to be certified for the 2014 program. The hospital leadership is working with physicians and nurses to find the most effective workflows and collaborating with the vendor to ensure that the local workflows are consistent with the prescriptive fields the 2014 eCQM product will use. Proving that the proposed workflow will be acceptable to the physicians and nurses will require real testing. This new version is also expected to meet the needs of hospitals still reporting for the MU Stage 1 program since CMS has indicated the updated measures are acceptable for that program. Although there are improved efforts to address software prescriptive fields that are more consistent with real physician workflow, prescriptive fields remain the only method used to capture information for the 2014 eCQMs due to their complexity.

Prior to the eCQM effort, the hospital was a Beta site for the vendor's software implementations, specifically for physician documentation and

medication reconciliation. These functions later were important to the Meaningful Use eCQM efforts. The benefits of serving as a Beta site included:

- Receiving new software in advance of the vendor's other hospital customers,
- Direct access to vendor product managers and developers, and
- Discounted licensing costs once the software became generally available.

Challenges to the Beta site designation included:

- Software that did not run as quickly as desired, and a
- Software development timetable that was imprecise due to unanticipated development rework by the vendor.

The Beta site designation did not include training or instructions on the ideal software implementation. Due to the significant "sweat equity" experienced in the Beta site role, the hospital leadership decided to step back from serving in this capacity.

Findings

The case study evaluates: (a) facilitators of eCQM implementation, (b) barriers to implementation, and (c) impact on organizational activities and goals. Specific examples are provided in each section.

Facilitators of eCQM Implementation

Four essential factors made the organization well-situated for success in Meaningful Use and eCQM implementation:

1. Commitment to health IT as infrastructure to enable change
2. Leadership
3. Governance and process improvement
4. Empowerment

Commitment to health IT as infrastructure to enable change

The organization has forward-looking leadership that sees future success linked to the ability to extract data to manage and improve outcomes. Their foundation for health IT is based on 10 years of evolving EHR use; for example, the organization was one of the first hospitals to implement bar code scanning for medication administration. CPOE is not mandatory at the hospital, but has been in place for five to seven years and is used for approximately 70-80 percent of medication orders. Medication management is implemented as a start-to-finish process beginning with the physician order, to medication dispensed by the pharmacist followed by nurse review and bar code-assisted administration and ending with documentation.

Leadership

The CEO and COO set a high bar for achievement for the EHR implementation. The hospital leadership includes forward thinkers with high energy and commitment to success and a clear focus on quality care and outcomes. The hospital embraces change to maintain the organization's values and achieve its goals.

Governance and process improvement

The organization has a well-developed oversight and decision-making structure (governance model), empowering all staff to improve the hospital's efficiency and effectiveness through a Meaningful Use oversight team. The team includes leaders from Quality, the Director of Nursing Informatics, the Pharmacy Director, and clinicians to represent usability of documentation. The Meaningful Use Oversight Team evaluates all use of the EHR incorporating Meaningful Use and eCQMs as part of its purview. This team meets weekly to approve all content, formats, utilization and other changes recommended by individual care process teams to the entry and flow of information through the EHR.

Empowerment

The hospital takes an approach of providing information to physicians and staff to enable them to perform better and to help fellow staff enhance performance. This commitment to "activation" of staff is illustrated by the significant effort to validate

the eCQMs in order to assure trust among clinicians before disseminating any results.

Barriers to eCQM Implementation

Due to prior successful utilization of their EHR, internal operational stakeholders initially believed the transition to meaningful use would be a relatively straightforward process. However, the IT department quickly understood the complexities of meeting the Meaningful Use program requirements and the eCQMs. The other operation departments soon began to process the challenges as well.

Barriers of eCQM implementation include several significant factors:

1. High human and financial cost
2. Lack of results consistent with manually abstracted measures
3. Problems with usability of model certified software
4. Concern about audits
5. Rework – workflow and technology induced
6. Tools not available when needed
7. Limited internal interoperability

High Human and Financial Cost

The hospital did not budget separately for IT or workforce costs to implement the eCQMs. The workforce cost was absorbed directly into the IT staffing and Nursing Education budgets; the associated cost for additional staff resources is not quantified separately within those budgets. While the specific costs for eCQMs and for MU as a whole are not discernable, there are specific findings that are noted in relation to other health IT work that has been slowed, repeated or delayed indefinitely. These experiences are discussed in the section highlighting the impact to organizational activities and goals in this report.

The effort to implement MU Stage 1 included upgrading to a new version of the vendor's software. The hospital previously used the vendor's software to construct tools to develop a reporting package supporting quality measurement reporting to multiple government and private organizations. The hospital required consulting services from the

vendor to upgrade their reporting package due specifically to the eCQM requirements. Staffing changes and realignments occurred, but additional staff was not hired solely for eCQM implementation. The Nursing Department increased efforts for education and training sessions using existing staff and incorporated non-itemized costs within the Nursing Education budget. The Director of Nursing Informatics position was added at a cost of over \$100,000 annually and is devoted almost exclusively to the MU and eCQM program. Three full-time equivalent employees (FTEs) support the effort, with two positions permanently assigned and another filled by flexible staff, retired nurses and overtime.

In the future, the hospital leadership anticipates that the maximum extra staff required to support the quality program, including manual abstraction, will consist of five FTEs. The organization does not itemize the costs for eCQMs but incorporates them with the total costs for quality evaluation. The total expenditure for the eCQM program is mostly within the IT Department. The proportional expenditure of eCQM to the total IT spend is 10 IT dollars for every one Quality Department dollar. There has not been appreciable change in staff turnover since the implementation of the Meaningful Use program. Most staff is committed to the culture and mission of the organization. The current economy also may encourage staff to remain, as the hospital is the only tertiary care center in the region.

Lack of results consistent with manually abstracted measures

There is considerable inconsistency between the eCQMs and the manually abstracted measures from which they were derived. One difference is the specific codes used to describe some of the data elements in the eCQMs in comparison to the dictionary terms for the original measures. Another difference is the ability for nurse chart reviewers (abstractors) to find information in various locations in a clinical record in the original measure versions; the eCQMs expect the information to be in one specific location in the EHR. The ability to evaluate the narrative information in the record is lost in the eCQMs. Additionally, the scorecards provided by the vendor required considerable rework of tools for front line clinician users in order to facilitate data entry in the modified data fields or new fields designed solely to capture information for eCQM reporting.

Problems with usability of model certified software

The certified vendor product delivered each data element within a predefined computer screen (HTML form), prescribing which field the eCQM reporting tool used for reporting. Relevant information entered anywhere else on the same form or in a different workflow was not used to calculate the results of the eCQM. Note, the example provided in the validation section of this report (only the specific check box on the discharge form “counted” for the eCQM, treatment documented in the medication reconciliation process did not). These prescribed forms did not align with the hospital clinicians’ workflow for documenting routine patient care. In some instances, the local workflow supported data capture but the location of the data within the workflow was not consistent with where the vendor’s reporting product searched to find the data. Therefore, the reports generated from the vendor’s product significantly underreported actual performance by at least 70 percent (30 percent compliance with one stroke measure compared with 100 percent compliance when measured by the manual abstraction process). The hospital plans additional analysis to determine the magnitude of the discrepancy for all of the 15 eCQMs; that work is in progress.

Reporting the two eCQMs that address the timing of treatment in the Emergency Department (ED) is another example of a usability challenge. The initial certified eCQM reporting tool reports showed negative numbers that could be interpreted that the patient was seen before he or she arrived. Understanding this result was highly improbable, the staff worked closely with the vendor and learned a specific software workflow had to change. Since that change is not yet available, the hospital reports its actual results derived from manual abstraction, not those reported by the existing version of the eCQM reporting tool. The hospital expects the updated reporting tool for 2014 to resolve the issue.

For Meaningful Use Stage 1, the hospital was the 10th organization to take delivery of the vendor’s eCQM package, in January 2012. The hospital staff needed six months to evaluate and validate the software generated reports. As a result, they were not able to begin their first attestation period for

Meaningful Use until mid-June 2012. September 30, 2013 will denote the end of their second year of reporting for Meaningful Use Stage 1 eCQMs. Due to the amount of rework associated with the vendor’s Stage 1 product, the hospital scheduled a delayed delivery of the 2014 edition of the software to allow the vendor time to resolve technology and implementation challenges.

Concern about audits

The hospital leadership reported the results of the certified vendor eCQM reporting tool for attestation of Meaningful Use eCQMs. The information is not used for internal business intelligence and staff improvement activities or for reporting to hospital quality reporting initiatives. For those purposes, the hospital uses the results of the manual abstraction versions of the measures. Hospital leadership voiced concern about being audited to confirm their eCQMs reports and having to explain why the reported cCQM results are different than the results reported for the comparable manually abstracted measures. While CMS has published advice that reporting, and not results, was the focus of the Meaningful Use Stage 1 eCQMs, the leadership’s desire to be prepared is one of the significant drivers for the extensive efforts described to validate results. After multiple discussions with the vendor, the hospital found the discrepancy in results is due to each data element in the certified eCQM reporting tool looking in only one prescriptive location in the EHR to find the information needed. Only recently has hospital leadership become somewhat comfortable that they understand the details causing the difference in results, but concerns about external auditing persist.

Workflow and technology induced rework

Rework occurs when a successfully established workflow is reconfigured solely based on data requirements for the eCQM content. As an example, the venous thromboembolism (VTE) measures require evaluation of order sets routinely used to assess whether appropriate orders are included without interrupting a physician’s routine activities. To achieve the most accurate score for the VTE eCQMs, the EHR must present the physician with a screen to document valid reasons why specific orders are not placed, in order to explain an exclusion of the patient from the

measure. If the information is entered as narrative text in the progress notes but the eCQM software is constructed to seek the information in a specific field, the narrative text entry is missed. Evaluating if a VTE occurred in a patient, and verifying the expected treatment was provided, requires clinical decision support to identify when a VTE might be present (a trigger event) and the order sets a physician used to order the appropriate tests. The hospital's eCQM rework effort required duplicate locations for information entry in order to analyze the eCQM results. In instances where the data location did not align with the location where the software searched for it, the hospital was required to negotiate with the vendor or change the way their clinicians work. The hospital experience with the MU Stage 1 eCQMs is that 70-80 percent of required changes were ultimately performed by the hospital, specifically modifying the workflow to support the reports generated by the software. The vendor provided software changes for only 20-30 percent of the instances of misalignment. When considering which approach to pursue, the hospital must decide whether it can afford to wait for updates once the vendor agrees to develop them.

Tools not available when needed

The availability of tools from the vendor to manage essential functions such as medication reconciliation, ePrescribing and quality scorecards that provide valid data is a big challenge in eCQM implementation. The hospital IT staff implemented interim solutions to report the results from their interim efforts rather than relying on the vendor's product.

Limited internal interoperability

Some of the information required for eCQM reporting comes from departmental systems. This information is incorporated into the EHR only if it is used directly to evaluate changes in patient status (trends). A good example of information that is shared in structured form is laboratory results for blood counts and chemistry tests. However, X-ray reports are generally not incorporated into the EHR in structured form. Such data often are presented for the clinician to read and interpret from narrative text. The structure to the data remains in the original department computer system. Other examples of data present only in the departmental system include medications administered during

surgical procedures and incision times, both of which are present in the Operating Room or Anesthesia records but not in the EHR. Similar to other hospitals, this organization has implemented a number of products acquired by different vendors over time. Intra-hospital interoperability remains a very significant challenge for implementing the eCQMs. The MU program does not address intra-hospital interoperability and, thus, the effort to access all required data is left to the hospital staff.

Impact on Organizational Activities and Goals

Value has been described as outcome divided by cost. As noted, work effort to implement the eCQMs is hidden within the IT and Nursing budgets and not specifically captured as itemized costs. The direct financial benefits are based on the direct revenue captured as a participant in the MU program. Other value is generally not easily defined in dollars and cents, but can be described as clinical and operational benefits. This section of the case study includes a Value on Investment section that addresses benefits that may accrue due to the eCQM implementation (positive value) as well as opportunities that may have been missed due to the attention required for the eCQM work effort (negative value).

No financial return on investment

The Ambulatory practices received approximately \$400,000 in MU Stage 1 money for primary care physicians (PCPs) and \$3.5 million in incentive payments for the hospital. No increase in revenue is evident based on compliance with the MU eCQM program. The financial return on investment analysis is challenging because an intense level of human capital is spent on implementing the eCQMs. That effort is two-fold, including software design and implementation and the significant amount of extra time physicians and nurses must apply to enter the information required for the measures. Such time is absorbed into IT and clinical department budgets and cannot be separated; from the community physician's perspective, the time is essentially a volunteer effort.

No value of investment

Mostly, eCQM implementation is an IT function. The data gathered at this time is used to support reporting to CMS. The organization does not

Annual Capital and Operational Factors for Health IT and eCQM Efforts

IT Expenditures (Organizational Health IT Activities)	IT Expenditures - indicator of organizational activities for health IT																	
	Total IT budget	\$12.4M																
	% of hospital operating costs	3.3%																
	Contracted services (3rd Party Support) as % of total IT budget	5%																
	Capital IT budget	\$2.8-4 M																
	Percentage of annual hospital capital expenditures	17%																
eCQM Cost	<table border="0"> <tr> <td data-bbox="230 569 673 667">EHR vendor upgrade costs</td> <td data-bbox="683 569 998 667"> \$100-200 K Software \$100-200 K Service costs Frequency – 12-18 months </td> </tr> <tr> <td data-bbox="230 674 673 726">IT component of reporting quality (not broken down into different quality reporting programs)</td> <td data-bbox="683 674 998 726">5-10% of IT operating and capital costs (approximately \$620 K-\$1.2 M)</td> </tr> <tr> <td data-bbox="230 732 673 785">IT Department FTEs partially assigned to Meaningful Use and eCQMs</td> <td data-bbox="683 732 998 785">5 maximum</td> </tr> <tr> <td data-bbox="230 791 673 844">Quality Department FTEs assigned to Meaningful Use and eCQMs</td> <td data-bbox="683 791 998 844">3-4</td> </tr> <tr> <td data-bbox="230 850 673 903">Cost: eCQM Training</td> <td data-bbox="683 850 998 903">Not quantified (incorporated in Nursing Education budget)</td> </tr> <tr> <td data-bbox="230 909 673 961">Cost: eCQM Validation</td> <td data-bbox="683 909 998 961">Not quantified (incorporated in overall Quality Measurement)</td> </tr> <tr> <td data-bbox="230 968 673 999">Cost: Staff Costs for Increased Data Entry</td> <td data-bbox="683 968 998 999">Not quantified</td> </tr> <tr> <td data-bbox="230 1005 673 1066">Planned activities put on hold</td> <td data-bbox="683 1005 998 1066">Single sign on to all applications Nursing documentation optimization</td> </tr> </table>		EHR vendor upgrade costs	\$100-200 K Software \$100-200 K Service costs Frequency – 12-18 months	IT component of reporting quality (not broken down into different quality reporting programs)	5-10% of IT operating and capital costs (approximately \$620 K-\$1.2 M)	IT Department FTEs partially assigned to Meaningful Use and eCQMs	5 maximum	Quality Department FTEs assigned to Meaningful Use and eCQMs	3-4	Cost: eCQM Training	Not quantified (incorporated in Nursing Education budget)	Cost: eCQM Validation	Not quantified (incorporated in overall Quality Measurement)	Cost: Staff Costs for Increased Data Entry	Not quantified	Planned activities put on hold	Single sign on to all applications Nursing documentation optimization
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eCQM Benefit	<table border="0"> <tr> <td data-bbox="230 1073 673 1125">Benefit: Personnel savings (e.g., reduction in abstractors)</td> <td data-bbox="683 1073 998 1125">None due to eCQMs</td> </tr> <tr> <td data-bbox="230 1131 673 1184">Benefit: Improved documentation for coding accuracy, quality reporting</td> <td data-bbox="683 1131 998 1184">None due to eCQMs</td> </tr> <tr> <td data-bbox="230 1190 673 1289">Revenue from incentives</td> <td data-bbox="683 1190 998 1289">\$400 K Ambulatory Practices (Eligible Providers) \$3.5 M Hospital</td> </tr> <tr> <td data-bbox="230 1295 673 1360">Increased Revenue from other sources due to eCQMs or Meaningful Use</td> <td data-bbox="683 1295 998 1360">None</td> </tr> </table>		Benefit: Personnel savings (e.g., reduction in abstractors)	None due to eCQMs	Benefit: Improved documentation for coding accuracy, quality reporting	None due to eCQMs	Revenue from incentives	\$400 K Ambulatory Practices (Eligible Providers) \$3.5 M Hospital	Increased Revenue from other sources due to eCQMs or Meaningful Use	None								
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Delayed or reconfigured efforts

The work on implementation of eCQMs resulted in the delay of two other important projects that were intended to improve the efficiency of using the EHR for busy clinicians. For this hospital, the work on the eCQMs had significant opportunity costs because it put on hold a single sign-on project. The project is important, as it would allow clinicians to sign on once to the hospital computer and have access to all applications without having to enter identification and passwords for each application separately. Similarly, a Nursing Department project to enhance efficient and effective documentation to support improved care planning by nurses was specifically put on hold to address the implementation of eCQMs.

Conflicting quality reporting requirements

The inability to use results directly reported from the certified vendor software interferes with the goal of developing a standard approach for quality reporting. The current quality measurement work in the hospital includes parallel processes: (1) manual abstraction,

receive additional value from the Meaningful Use eCQM program in terms of benchmarking or comparative data. As an example, with respect to VTE, documentation of antithrombotic stockings has improved, but the system is unable to track and measure their use. The hospital does not directly attribute the documentation success to eCQMs reporting, but view it as the result of a strategic initiative for coordinated care improvement across the organization. The hospital also takes an approach of activating physicians, i.e., providing sufficient information on which they can act to improve results for each patient and the eCQMs do not support that process. There are no data to indicate that eCQMs or MU has resulted in any change in patient safety.

(2) eCQMs, and (3) reporting to other organizations (e.g., State, Premier, specialty registries, The Joint Commission, etc.). Each of these is a separate expenditure. A standard process that defines information in the same manner across all of these reporting requirements is lacking. Therefore, each request for information from the EHR must be evaluated individually, often requiring the assignment of additional staff to interpret the data for reporting or clinician entry of the information more than once support a separate calculation of the measures for reporting. This issue is especially problematic for the eCQMs, as tools for most of the reporting efforts are not externally validated to ensure the information included is correct. The

hospital remains concerned that individual hospitals can unintentionally underreport denominators, thereby limiting the ability to accurately compare data across sites.

Distraction from patient-focused culture

The eQMs represent a distraction from key organizational goals. The hospital has a strong commitment to keeping the patient the central focus point of all activities. A new position, Vice President for Continuum Services, is expanding services to provide care across the community (for example a new outpatient pharmacy to provide patients with medications for the first 30 days post-discharge). The Stage 1 eQMs limit the evaluation of care transitions to education provided at the time of discharge and divert attention to documenting education in detail rather than to providing the services to successfully transition the care. The hospital believes that managing readmissions will require true coordination of care and patient engagement across settings of care, especially for patients with complex conditions. Care Management needs access to information across care settings to work with physicians to focus on impacting 30-, 60- and 90-day readmissions, a very real reimbursement issue today.

Lessons Learned

The hospital's culture of quality and physician activation enhanced by robust use of the EHR is an essential factor for success in implementing eQMs. However, the strong commitment to quality and EHR use can be strained when regulators add new mandates with limited time for compliance. The hospital has learned that implementing the eQMs is highly complex. Attempting to force the documentation of information best described in narrative form interrupts clinical workflow and leads to questions regarding the reliability of the data.

The primary lesson shared by the hospital is that implementation takes careful planning and effort. Rather than attempting to be an early implementer of MU Stage 2 eQMs, the hospital plans to take delivery of the certified vendor software later in the MU Stage 2 cycle to allow the vendor to resolve technical or implementation issues with the product. The hospital staff also recognizes that the data requirements for the eQMs far exceed the certification requirements for EHR vendors to manage information in their software. The eQMs set the bar at a level that requires significant clinical workflow interruption. For the future, the hospital staff will very carefully review the requirements for each eQm to determine which fit best with their clinical workflow and which measures will trigger the expenditure of time and resources to support accurate reporting.

Case Study

2

Executive Summary

The American Hospital Association (AHA) commissioned a study to investigate hospital experiences with implementation of the 15 required Meaningful Use (MU) Stage 1 electronic Clinical Quality Measures (eCQMs). This case study describes the experience and impact of eCQM implementation in a large southern health system. The findings described in this case study are based on interviews conducted with key leaders and operational staff directly involved in the oversight and management of eCQMs.

The health system leadership, driven by their commitment to health information technology (IT) and their success in implementing their electronic health record (EHR), set a goal to be among the first to attest to MU, including the eCQMs. The eCQM implementation process was an intense exercise. The organization had difficulty accessing and understanding the eCQM specifications provided by the Centers for Medicare & Medicaid Services (CMS). With the active involvement of the Quality Department, the implementation team had configured the organization's existing EHR to capture all information required for the measures based on the measure specifications designed for manual chart abstraction. The certified eCQM reporting tool subsequently received from their vendor, however, produced eCQM reports that were inconsistent with results from the same measures obtained by validated manual chart review. Therefore, the measures could not be used as a direct driver of clinical quality improvement. Instead the health system chose to approach the project as a first step in building an infrastructure for eCQM reporting.

The health system has worked to accomplish a significant cultural shift to embed quality into the daily clinical workflow (the routine patterns of actions, including documentation, clinicians use during patient care). However, the eCQMs posed additional challenges because they required structured data that were either not captured routinely or were documented in narrative text. In addition, the extremely compressed timelines from publication of the eCQMs to required attestation and reporting created enormous pressure on already constrained resources, leading the organization to divert staff from other critical projects.

The organization's leadership recognizes the potential benefits of eCQMs; however, the eCQM results from certified software are yet to be trusted as drivers to improve clinical processes and outcomes. Deriving the meaningful use quality measures from automated reporting has proven to be a lengthy and intense people-driven undertaking that has yet to result in accurate data that can be used for quality assessment or improvement activities. In contrast, the system has been able to leverage the EHR to make the calculation of measures designed for manual chart abstraction more efficient.

Health System Overview

The health system started as a collection of independently functioning hospitals and has now grown into a tightly integrated system of inpatient and outpatient providers. The network includes a number of acute-care, short-stay and rehabilitation hospitals, as well as community-based access points and outpatient facilities. The organization offers comprehensive services, including behavioral and home health as well as preventive services. The system has acquired ambulatory practices, some of which are using the same EHR as the inpatient facilities and others that use a different vendor product. Thus, they are working with at least two vendors to manage the ambulatory practices. As part of its long-term strategic transformation plan, the network vision is to refocus on continuity of care and population health. The implementation of a single EHR across the health system more than seven years ago has been a driver in fulfilling that unifying vision, as well as establishing the system as a top health care provider. A recent expansion to include additional ambulatory practices that predominantly use a different EHR has increased the workload by requiring attention to products from two different ambulatory EHR vendors.

While the organization has long been committed to health IT adoption, the Medicare and Medicaid EHR Incentive Programs have been seen as a catalyst for the ongoing journey towards integrated care supported by integrated technology.

Individuals Interviewed

The organization made available a number of staff at the network level, as well as hospital-level

Hospital Profile

Financial Classification: Not-for-Profit

Location: South Central Region

Network Size Range: 10-20 acute care hospitals; network includes acute care, transitional, rehabilitation, short-stay and outpatient facilities, >3,500 licensed beds

Staff: > 15,000 employees, > 3,500 physicians on staff

Annual visits: > 1.3 million annual inpatient and outpatient visits (> 500,000 ED visits, 20,000 annual deliveries)

Employed ambulatory physicians: > 500

EHR: Vendor B

Ambulatory EHR: Two EHR vendors for primary care

staff, ranging from senior leadership to front line operational staff directly involved in the eCQM implementation process:

- **Health system leadership:** Chief Medical Information Officer, Chief Nursing Information Officer, Enterprise Data Management Director and Managers, Executive Director of Information Technology and Services, Chief Quality Officer, Senior Vice President for Performance Improvement, Vice President for Patient Safety
- **Health system meaningful use implementation team:** Project Manager, clinical informatics staff, systems and clinical data analysts, data warehouse administrators and implementation specialists
- **Hospital level:** Quality Improvement Director, Chief Medical Officer, EHR physician champion

eCQM Implementation Process

In MU Stage 1, hospitals must report on 15 eCQMs that reflect care for patients with stroke (seven measures) and venous thromboembolism (VTE, or blood clots) (six measures), as well as measures of how patients move through the emergency department (ED) (two). This reporting is in addition to other Medicare quality reporting requirements that are generally based on manually abstracting

data from the chart, with varying degrees of automation. The meaningful use measures overlap with measures hospitals must report to CMS in either the inpatient (stroke and VTE measures) or outpatient (ED measures) quality reporting programs.

The organization uses a system-level approach to eCQM implementation, and the effort to use the EHR to capture data required for quality measure reporting is accomplished completely at the system level. Individual hospitals are marginally involved in the development of the reporting framework.

The organization recognized in 2009 that they expended considerable effort to submit data to the Medicare Hospital Inpatient Quality Reporting Program (IQR) and began to automate at least some of the process. Patient conditions (problems) were often buried in physician notes and nurse chart abstractors had to search multiple progress notes to find all conditions. There was no clear method to improve documentation except through manually notifying many individual clinicians. The leadership made a strategic decision to use their EHR, by using the EHR's problem list function as the method to transition to a systematic approach to evaluating care. The problem list was designated as the central location in the EHR to store condition information that can trigger decision support to nurses, physicians, pharmacists, case managers and others to coordinate care and to assure compliance with quality measure requirements. For example, the patient may have reported a significant episode of bleeding in the recent past as an outpatient that was not listed as a hospital diagnosis. Including the bleeding episode on the problem list makes it available for the EHR's decision support to recommend the use of special stockings rather than blood thinners to prevent clots, and the information is available to justify the treatment for the eCQM.

Beginning in November 2009, the leadership established multidisciplinary teams to determine the most effective way to assure conditions were entered into the problem list accurately and reliably to support the existing hospital IQR measures for acute myocardial infarction (AMI), heart failure (HF), pneumonia (PN) and the surgical care improvement project (SCIP). The teams consistently found the problem list to be underused and set out to "do the right thing" by aligning with MU program

objectives and encouraging team members to keep the problem list up to date. Since the problem list is not considered part of the legal patient record, leadership gave the performance improvement nurse coordinators permission to update the problem list, especially with conditions relevant to the hospital IQR measures. All such problem list entries included a reference to the physician documentation that drove the decision to add the condition. A paper sticky note was also attached to the paper record to notify the attending physician so he or she could remove or modify the entry as appropriate.

At the start of the project, less than 80 percent of physicians correctly documented problems on the problem list for all patients in the EHR. Six to eight months after initiating this project, 97 percent had accurate problem lists. The organization applied the same effort proven to be effective for the hospital IQR measures to the measure groups included in the eCQMs – VTE and stroke (STK). All of this work was accomplished in advance of receiving the certified EHR vendor product for MU Stage 1.

Once the organization received the certified EHR product, the staff connected the data elements in the product to the sites in their EHR where the data were captured (some refer to the process as "mapping the elements"); many elements were in different locations than where the vendor product expected the data to exist. The process was iterative to ensure that: 1) the required data were documented in the appropriate format and location in the EHR screens used by clinicians (data capture); and 2) the data extracted from the EHR were appropriately fed to the eCQM reporting tool to enable the calculation of the measures. Even after all of these efforts, the implementation team was unable to validate the results from the certified eCQM reporting tool with those they obtained using their own processes.

The organization engaged in a two-tiered validation process of data capture and reporting mechanisms for the eCQMs:

- **Technical validation:** Assessing the availability of fields in the EHR to capture data in a structured format (e.g., checkboxes, drop-down lists, controlled vocabulary fields) as opposed to narrative (free text). In addition, the vendor

provided MU eCQM reports that were then validated by the hospital against internally developed reports of individual patient-level data to ensure that the data sources were used consistently.

- **Clinical validation:** Assessing whether the data on the meaningful use report reflects the actual care processes found in the medical record (regardless of field or format in which they were documented). Clinical validation was achieved by performing chart abstraction of a sample of cases included in the meaningful use eCQM reports and cross-checking the automatically extracted discrete data with the actual account of events as interpreted by a human reader. This process enabled the organization to verify to what extent the discrete fields used to compute the electronic measure were accurately reflecting the care provided.

Even though the team found significant issues with the clinical validity of eCQM results produced by the certified EHR product, the organization attested to MU Stage 1. Although CMS had originally required hospitals to attest that the eCQM data were accurate, the agency changed policy in October 2011 based on early hospital experience that the certified EHRs did not generate accurate data. Providers were worried that attesting to the accuracy of data that they did not consider to be correct would create a compliance issue. Therefore, the new policy only required hospitals and physicians to report the data generated from their certified EHR. However, in anticipation of the 2014 eCQM implementation for MU Stage 2, the organization plans to perform a detailed analysis to ensure the vendor's 2014 certified product reports accurate results, consistent with the actual care provided. At the time of the visit, the 2014 certified EHR was not yet available.

Findings

The case study evaluates: (a) facilitators of eCQM implementation, (b) barriers to implementation, and (c) value derived from eCQMs, as well as their impact on organizational activities and goals. Specific examples are provided in each section.

Facilitators of eCQM Implementation

The organization's Quality Department addresses all quality measures equally and implements them all directly within the EHR to capture expected data. Once they had completed implementing the STK, VTE and ED measures, they received the certified vendor product for 2011 and the results could not be validated. As the earlier work successfully reported the results of the quality measures, they elected to use the vendor product to attest for the MU program because it pulled some data from the EHR. However, they did not use the data for internal quality assessment or reporting to CMS for the existing Medicare inpatient and outpatient quality reporting programs. The facilitators listed here support quality measurement from the EHR, in general. The challenges reported later in the document discuss issues with the eCQM specifications and the certified vendor product.

The main factors that enabled the organization to quickly and successfully report results for the measures used in the eCQM program were:

- Commitment to IT as infrastructure to enable change
- Leveraging IT for quality measurement and reporting
- Effective governance
- Strong leadership with a clear vision
- Culture of collaboration and empowerment

Examples are provided explaining how each factor plays a significant role in the organization's success using their EHR for quality reporting and improvement.

Commitment to IT as infrastructure to enable change

When the health system started its journey to comply with the MU program, the current EHR had been in place for more than five years. Being an early adopter of EHR technology was a determining factor in enabling the organization to be one of the first organizations to demonstrate meaningful use, including calculating eCQMs. The ambitious target of attesting in early 2011 was set by the desire to be an industry leader based on successful and robust EHR implementation.

Leveraging IT for quality measurement and reporting

The notion of taking advantage of the EHR for quality measurement and reporting is not new to the organization. One of the cornerstone value proposals for EHR adoption has always been quality improvement, along with patient safety.

The enterprise data management department has worked hard to achieve a highly sophisticated IT infrastructure to support data sharing across the departments within the hospital, as well as with ambulatory providers. The department also is investing in an enterprise-wide data warehouse to support integration of data from multiple sources and provide analytical power to enable the organization to continue to progress in the “data to wisdom continuum.”

Historically, the organization shows a tight coupling between quality measurement and IT through a clinical informatics function. This function allows the hospital to leverage its EHR to support adequate documentation for manually abstracted measures reported under federal programs other than MU. A near real-time “concurrent review” feedback loop has been established between clinicians and quality improvement staff, anchored in EHR documentation tools and clinical decision support. This concurrent review approach seeks to ensure: 1) measure populations are appropriately identified in the problem list to trigger assistance to physicians, nurses, case managers, etc.; 2) recommended interventions occur within the appropriate timeframes; and 3) appropriate documentation. As an example, the nurse coordinator updates the problem list based on unstructured physician notes during concurrent review. The problem list entry is structured (currently using ICD-9-CM coding) and, therefore, it can trigger clinical decision support to offer order sets to physicians to provide care expected by the measure if it is appropriate for the patient.

One such alert provides the order for outpatient medications expected for stroke patients at the time of discharge. The concurrent review process replaces purely retrospective abstraction for quality reporting and moves it to the point of care where doctors or nurses can address any missing actions or document missing information appropriate to patient care before the patient is discharged. The

organization has created innovative mechanisms to amplify the impact of concurrent review. One example is to allow concurrent reviewers to enter valid conditions on the patient’s problem list in the EHR to ensure the problem list is complete in order to trigger clinical decision support and documentation actions. Such entry into the problem list is supported by information in physician progress notes.

The organizational predisposition to leverage the EHR to support quality reporting – as well as staff’s experience with configuration, data manipulation and quality reporting from the EHR – proved to be important catalysts for eCQM implementation but did not lead to successful implementation of the eCQMs using their certified vendor product due to problems with the CMS measure specifications and the vendor product.

Effective governance

As part of the EHR implementation and continued management, the organization established multiple steering committees comprised of corporate and individual hospital representatives. The steering committees assure a balance of stakeholders as decisions are made to modify workflow or EHR screens across the network. The governance process has allowed input from physician and nursing champions who support communication and change management. This governance process was a significant factor in generating EHR changes related to the eCQMs that are accepted and used by the respective hospital medical and clinician staffs.

Strong leadership with a clear vision

The CEO and CMIO drove the organization’s journey of EHR adoption and, together, they have guided change across the organization, with a clear vision of where effective EHR deployment and use could make a difference.

The organization’s view on the relationship between quality improvement and IT is evident in the network’s hierarchy. The CMIO role is not limited to information technology, but has quality improvement and quality reporting leadership responsibilities as well. The leadership team includes the CEO, the Chief Medical Officer, the Chief Nursing Officer, the Chief Nursing Informatics

Officer and the Chief Information Officer. The close relationship of the team assures the coordination of activities to support the continuum of care and patient safety and quality.

Culture of empowerment and collaboration

The organization's culture of empowerment and collaboration drives their success in achieving quality outcomes outside of the eCQMs. It is striking that positive change was effected by the organization's use of the EHR-based implementation of the same measures, accomplished prior to the availability of the MU-certified vendor software. The close collaboration between enterprise data management and clinical informatics was a key factor in their success. The clinical informatics department participated heavily in the implementation process, providing measure content expertise based on the detailed specifications for manual chart abstraction. This drove the identification of required changes in the EHR configuration to support the successful reporting of the originally specified VTE quality measures for organizational clinical quality improvement activities.

The MU team also had a dedicated project manager, who was brought on board specifically as a central point of contact to coordinate input from various stakeholders and escalate issues as needed. While the MU program implementation efforts were well under way when the project manager was assigned, this role proved to notably enhance the coordination among the team members from various departments and to standardize processes. For example, the team started using structured tools such as the Situation, Background, Assessment, and Recommendation (SBAR) framework to document and escalate issues identified by operational staff.

Finally, the team had a strong sense of mission, anchored in the active engagement of senior leadership on the technical and clinical side. An important catalyst for fast-tracking decisions and effecting change is the ability for all staff to directly reach out to senior leadership.

Barriers to eCQM Implementation

Specific challenges the organization faced in implementing eCQMs included:

- Uncertainty around eCQM specifications;
- Unexpected cost of meaningful use and eCQMs;
- Defining success for eCQM implementation;
- Availability and usability of certified software; and
- Addressing the disconnect between EHR documentation and eCQM requirements.

These issues are explored in detail below.

Uncertainty around eCQM specifications

The organization had trouble identifying the “source of truth” on which to rely to implement eCQMs. Although the team was aware of documentation on eCQM specifications specific to the Meaningful Use program, they did not know where to find this information or how to interpret it in the context of the vendor provided documentation for the eCQM reporting tools. The organization experienced significant challenges finding and accessing the eCQM specifications by searching through the links provided on the CMS website. Once the reference and link was identified on the CMS website, it led to a 429-page technical note produced by the Health Care IT Standards Panel. Three versions of the document were available; it was not clear which version should be followed. The document was written from the perspective of a technical engineer and was not clear to experts in quality measurement. The document further identified a number of gaps in making the measures work effectively in an EHR. The specific codes required to find each data element referenced in the document (the value sets) were updated November 3, 2011, but they were available only in a read-only document (pdf). Access to a file that could be downloaded to work in the hospital system required access to a different website, the US Health Information Knowledge Base (USHIK). Due to the confusion, the organization used the original, manually-abstracted measure specifications to define the information needed from the EHR.

While the vendor recognized that there were significant differences between the eCQM specifications and the manually abstracted

measure specifications with which the hospital was familiar, these differences were never enumerated. In light of the lack of clear guidance, the organization chose to rely on the documentation provided by the vendor as well as the specifications manuals for the chart-abstracted measures, which the team knew to be reliable and detailed.

Unexpected cost of meaningful use and eQMs

The implementation of eQMs was not recognized as an effort in itself, but rather bundled with meeting the requirements of the MU program as a whole. Because the health system had matured in its EHR adoption journey, the initial perception was that the effort required to meet meaningful use objectives would be minimal, with an initial estimate of no more than 200 hours. In fact, the work leading to the entire MU program attestation amounted to a tracked investment of more than 4,000 hours for assigned IT staff and an additional 2,000+ hours for clinical informatics staff. Eighty percent of the IT staff work is specifically in support of the MU Stage 1 eCQM reporting. The organization's work to implement the MU and eQMs requirements was absorbed by existing staff, some of whom were heavily involved throughout the project. This impacted staff's regular work responsibilities and required reorganization of priorities, with MU compliance taking precedence over most other activities. The constrained timelines for MU implementation further exacerbated this issue. The organization also indicated a significant but scattered part-time investment from various staff that was not part of the MU team.

eCQM reporting also uses new vocabularies, including SNOMED-CT® for problem lists. Since the problem list is currently based on ICD-9-CM for coding patient conditions, the organization licenses another vendor's software to crosswalk the problem list entries to the SNOMED-CT codes required for the eQMs. To support clinical workflow, the problem list entries continue to use ICD-9-CM.

The eCQM implementation process absorbed resources, albeit unquantified within the overall effort of MU, to change EHR documentation screens or create new ones and training associated with changes in workflow. While the organization's approach to use the specifications designed for

chart abstracted measures shielded them from known content issues with the MU Stage 1 eCQM specifications, it also put a very significant burden on the team to parse and reconfigure measure elements (designed and documented specifically to direct human chart abstraction) into discrete constructs amenable to EHR data capture. Throughout this process, the organization was faced with the many challenges of converting chart-abstracted measures into measures derived from EHR data. A challenge frequently encountered was the lack of specific lists of codes in the measure specifications to describe a certain clinical concept (e.g., mechanical compression devices used on the legs to prevent VTE). The MU program eCQM specifications included such lists of codes, but the organization was unaware of their existence.

The staff had additional work to connect the certified vendor software to EHR locations they had developed to support their clinicians' needs to document. Even after this effort, the staff was not able to validate the eCQM reports produced by certified software. The organization did not attempt to improve the eCQM results based on the discouraging clinical validation results. They choose instead to accept that the results provided by the certified eCQM reporting tools represented their technical ability to report eQMs, which was sufficient to meet MU criteria. The intensity of the work leading to attestation was also evident in the amount and frequency of various regular workgroup meetings, sometimes as many as two per day. These activities went above and beyond what the vendor could provide, as they were specifically related to the organization's environment.

Defining success for eCQM implementation

The organization faced a challenge when trying to define what success looked like for eCQM implementation. The MU dashboard, distributed across the enterprise, provided a regular report for all meaningful use objectives indicating what was going well, and what required improvement; eCQM results were the only objectives for which there was no positive or negative indication. The eCQM results were hard to interpret and often disregarded especially when compared to the manually abstracted measure results. Hospital staff does not recognize the eCQM results as providing

an accurate picture of their performance. The eCQMs were regarded more as an initial attempt to demonstrate a technical capability: “most people have come to accept we’re at a structural stage, and we can report [eCQMs], but the reports do not reflect clinical processes and outcomes yet.”

Availability and usability of certified software

The organization reported timely delivery of eCQM reporting tools as one of the biggest challenges of the eCQM implementation process. While the organization recognizes the extensive work that the vendor had to accomplish before being able to deliver a certified product, updates to the EHR and the reporting tools provided are not plug-and-play. A great amount of work needs to be performed by the organization, including adjustments in how clinicians document in the EHR and how the quality team extracts the data to create reports, as well as extensive validation that the certified eCQM reporting tool functions with the specific organization’s content.

The vendor’s certified model system is not necessarily applicable to the organization’s real world environment for several reasons. First, the system does not necessarily provide valid information for calculating the eCQMs when operating outside the controlled model environment (i.e., in the vendor’s development laboratory). Hence, the organization must validate the results locally. The EHR vendor assumes a specific EHR structure and certain connections to other applications (e.g., the Operating Room software product) in developing the product that is delivered. The organization, however, started its use of the EHR long before the specific certified version of the vendor’s EHR system. Each organization installs each EHR component specifically to fit how the staff works locally. Each time the basic system, a component, or a departmental system is updated, the organization must evaluate the changes to reconnect the existing components to work correctly. Secondly, the certified vendor “model” product assumes the organization is using other applications provided by the same vendor, which was not the case for this organization. The

MU implementation team reported the vendor had to go back and create a whole new reporting structure to accommodate customers that did not use that vendor’s administration system (known as Admission, Discharge, Transfer, or ADT). The organization had to wait approximately three months for the vendor to provide this “fix.” It took an additional 45 days to ensure the updates functioned correctly. Given the time for the vendor to create and/or modify products for the program, as well as the local installation and validation work, the organization estimates they needed at least as much time to implement the eCQMs, in order to effectively report eCQM results, as the vendor required for building and certifying their software.

Addressing the disconnect between EHR documentation and eCQM requirements

A lot of the data capture for the eCQMs was accomplished “behind the scenes” – the team was able to identify fields in the EHR where data were being recorded discretely. However, some data elements required by the eCQMs were simply not documented in the current clinical workflow, or could only be found in narrative text, making them inaccessible to automated data extraction and reporting. This disconnect was evident in the results of the clinical validation performed by the team, which showed the eCQMs were not accurately capturing the care provided, i.e. “[the data] is all there, just not in the place where we are looking for it.” Figure 1 shows the discrepancy between the frequency that the EHR has a location to document the required information (technical validation) and the frequency that there is actually data documented by doctors or nurses in that location (clinical validation). As can be seen in the figure, the closest alignment is about 80 percent (one measure) compared with 20 percent or less for four measures.

Additional challenges in matching EHR documentation and eCQM requirements are described below.

Figure 1

Technical and clinical validation results across stroke and venous thromboembolism Meaningful Use Stage 1 eCQMs

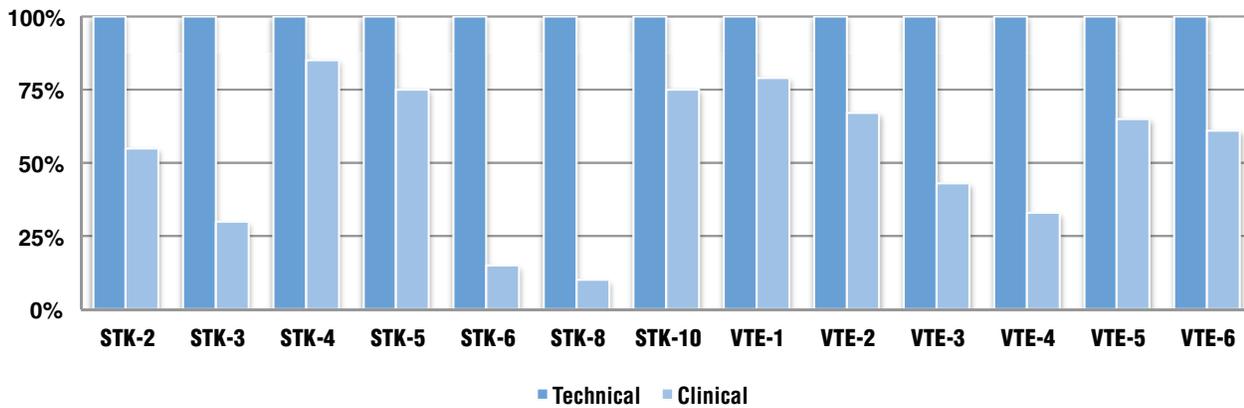


Figure 1. Results for each measure in the Stroke (STK) and Venous Thromboembolism (VTE) eCQM measure sets --- Technical validation means that the certified EHR product delivered by the vendor includes a place to put all eCQM data elements; i.e. there are specific fields present in the EHR to store the information needed. Clinical validation means that doctors and nurses enter the information needed by the eCQMs in the individual patient’s record in the EHR as they care for patients. While the certified EHR product has a place to store all of the required information (technical validation), the information is not routinely documented in the locations the EHR product is programmed to understand (i.e., lack of clinical validation).

The difficult balance between efficient workflow and standardization

The organization, as noted, spent considerable effort to identify appropriate sources in their EHR to capture and find information needed for the manual abstracted versions of the measures. Those specifications allow nurse abstractors to use information documented in multiple areas of the paper clinical record that provide the answer to the questions posed by the measure. Allowing the same freedom to document a particular element in multiple places in the EHR presented a challenge to automatic retrieval of the data from multiple sources (and determining which information is the most accurate when there is duplicate and potentially conflicting documentation in the record). Conversely, restricting the sources from which the information can be derived significantly impacts clinical workflow, i.e. the number and order of tasks that doctors and nurses complete while caring for patients. Any changes to the EHR workflow are highly significant and can either improve or disrupt patient care and cause significant inefficiencies.

The organization stressed that measure requirements had a dramatic effect on clinical workflow. Each eCQM data element required some change to clinical workflow, even those for which the EHR system was designed to capture the data automatically. As one example, the ED throughput measures require a time for each transition. The ED tracking board captures the date and time the transition is entered, but since entry of the data may occur after the transition occurs, clinicians had to enter the exact time the transition occurred in a new field. The team was extremely careful in designing solutions for documentation gaps, striving to minimize extraneous documentation for the sole purpose of quality reporting and devising creative documentation tools and strategies. They were not always successful, however, as some of the elements required by the measures were not intuitive or part of any clinician’s routine. For example, some measures required documentation that the patient received appropriate discharge instructions. While the quickest way to comply with the requirement would be to include a checkbox on the EHR form for a nurse to attest to delivering the discharge instructions, the organization decided to

approach this issue differently. The team created a mechanism to have clinicians deliver discharge instructions electronically through the patient portal, creating a meaningful process for both clinicians and patients that further supports the organization's commitment to care coordination. This kind of intervention requires a significant implementation effort, including training and change management, as it represents a completely new workflow for the clinicians. Another example is the requirement to identify if a patient had an elective procedure to remove plaque from a main artery supplying the brain (carotid endarterectomy), since such a procedure could exclude the patient from any of the eCQM stroke measures. The coding for the procedure in the EHR does not specify if the procedure was performed as an emergency or as an elective procedure (scheduled in advance). This information is not part of any routine documentation.

In addition, the organization sees the very strict structure of certified eCQM reporting tools as having a very significant and negative impact on workflow to extract accurate data for eCQM calculation. The eCQMs and the resulting certified reporting tool restrict the sources from which data can be drawn. Thus, only fields determined appropriate by the vendor can be used to meet the eCQM reporting requirements. In many cases the location specified does not fit how clinicians document; stated by one hospital staff member as, "it's not good enough that you [the clinician] document it; we need to you to document some place where we can report on it."

Hitting the limits of EHR design

The organization recognized that the EHR is not designed to contain all of the information that the eCQMs require. For example, certain events (e.g., past inpatient hospitalizations and surgical procedures) are stored in the EHR database in a method most consistent with requirements for billing for reimbursement. Such data are not clearly available as part of the concurrent clinical hospitalization record, creating challenges to link information to produce eCQM reports. In addition, the segmentation of certain EHR components can create additional workflow challenges. For instance, computerized physician order-entry (CPOE) and medication reconciliation are separate processes in the organization's EHR, thereby requiring the

physician to switch screens to see all relevant information. For this issue, the vendor was able to provide an option to include the current medication list within the medication ordering screen to allow physicians to reconcile medications as they order.

The change management elephant in the room

The organization identified buy-in from operational staff, particularly physicians, as one of the most important barriers to implementing all quality measures, including the eCQMs. Resistance from operational staff was due to a number of factors including increasing structured documentation demands without perceived clinical value, lack of a real-time feedback loop, excessive time to interact with the EHR and a perception of quality measurement as "cookbook medicine." While not all of these issues can be directly attributable to eCQMs, they underscore both the massive culture shift that is in play and the importance of usability and logical workflows as factors in clinician acceptance of EHRs. As some of the organization's staff pointed out, meaningful use is about change management, "it's not a technological issue, it's a certainly a process and people issue."

Challenges with interoperability

Most of the hospitals and providers in the network are tightly integrated, primarily a result of using a shared EHR. However, a more recently acquired group of ambulatory providers use a different EHR. While the health system is making significant investments to support information exchange, data visibility issues are significant for providers who do not share the same EHR, particularly for quality reporting purposes. To circumvent this, some data from one system must be re-entered into the other system.

Intra-hospital data sharing between the EHR and departmental applications also is a challenge. As an example, the same vendor produces the EHR and the operating room application. However, some data required for SCIP measures originate in the Operating Room but are not available in the EHR (e.g., surgical incision time and antibiotics administered after the patient arrives in the operating room and before the incision). eCQMs that require information available only in operational systems will continue to cause additional work.

Impact on Organizational Activities and Goals

Human and financial return on investment

The organization did not provide information regarding the financial benefit or cost of MU and eCQM implementation, including any revenue from incentive payments. While some financial benefits may be anticipated from integrated quality measurement and care coordination activities, the large majority of capital costs associated with EHR adoption preceded the MU program. Resources for the MU program and eCQMs specifically were absorbed in the existing budget at the cost of other activities and initiatives. eCQM implementation was centralized at the corporate level and leveraged across multiple hospitals. Costs related to deployment of workflow changes and impact on productivity could not be quantified. Specifically, there was no realized financial or human capital benefit from automated reporting, as the eCQMs did not replace abstracted measures.

Value of Investment

Seeing the forest through the trees

Senior leadership at the organization views great potential in eCQMs to provide results available within a meaningful timeframe that can have a real-time impact on patient care. In addition, the transition to eCQMs is regarded as a necessity in view of the ever-increasing abstraction burden for quality reporting programs. While the organization recognizes these potential benefits of eCQMs, none has yet been realized. The organization attributes the lack of benefit to the fact that eCQMs are not yet providing an accurate picture of patient care and the challenges associated with efficiently deriving accurate data.

Concerns about the validity and reliability of eCQMs

The validation process carried out by the organization confirmed the technical capability to position placeholders for capturing and

extracting the required data elements from the EHR, but the clinical validation results suggest the eCQMs do not accurately portray patient care. There is enormous variation across measures (Figure 1). The organization recognizes it could probably stop abstraction for some of them. Others, however, show variances of up to 90 percent when compared to their manually abstracted counterparts. This generates a lack of trust in eCQM results across hospitals, and the reported rates are very often dismissed or ignored by leadership and staff.

In addition to MU Stage 1 eCQM implementation, the organization has invested significant time and

Annual Capital and Operational Factors for Health IT and eCQM Efforts

Annual Capital and Operational Factors for Health IT and eCQM Efforts		
IT Expenditures (Organizational Health IT Activities)	IT Expenditures - indicator of organizational activities for health IT	
	Total IT budget	Not provided by organization
	% of hospital operating costs	Not provided by organization
	Contracted services (3rd Party Support) as % of total IT budget	Not provided by organization
	Capital IT budget	Not provided by organization
	Percentage of annual hospital capital expenditures	Not provided by organization
eCQM Cost	EHR vendor upgrade costs	Not provided by organization
	System and hospital level clinical informatics, quality informatics and Meaningful Use program leadership and staff	\$1.3 M
	IT Department FTEs partially assigned to MU and eCQMs	Not provided by organization. No additional FTEs were hired
	Quality Department FTEs assigned to MU and eCQMs	3
	Total Quality Improvement, Measurement and Reporting Budget (134 FTEs)	\$8.1 M
	Cost: eCQM Training	Not quantified (incorporated in overall Quality Measurement)
	Cost: eCQM Validation	Not quantified (incorporated in overall Quality Measurement)
	Cost: Staff Costs for All of Meaningful Use	\$330,000
	Planned activities put on hold	EHR user screen improvements Documentation enhancements for efficiency Hospital IQR reporting directly from the EHR
	eCQM Benefit	Benefit: Personnel savings (e.g., reduction in abstractors)
Benefit: Improved documentation for coding accuracy, quality reporting		None due to eCQMs
Revenue from incentives		Not provided by organization
Increased Revenue from other sources due to eCQMs or Meaningful Use		None

effort in implementing a single MU 2014 (Stage 2) measure that can be leveraged for internal improvement and reported to multiple programs as a fully electronically derived measure. This effort highlights the time it takes to successfully implement the eCQMs in the EHR. The project has proven challenging for many of the reasons identified in the MU Stage 1 eCQM implementation process. Many of the elements required by the measure are documented in narrative text, and the few that can be found in discrete fields are not necessarily reliable for use in the measure report. It has taken the network about a year to develop confidence on the measure's population (denominator) as an automated report out of the EHR; the work on whether each case meets measure numerator criteria is just starting out as a collaborative effort among all participating hospitals in the network and is expected to take an additional six months.

The leadership also is concerned that the lack of a common format for EHRs can create eCQM comparability issues, and also that the co-existence of eCQMs and manually abstracted measures can further exacerbate comparability issues.

Delayed or reconfigured efforts

In addition to the unrealized benefits of eCQM implementation, it is important to note that the effort put into eCQM implementation has diverted resources from other activities. eCQMs have contributed to decreased organizational bandwidth for EHR interface improvements, often requested by clinicians. This has prolonged clinician's exposure to sub-optimal workflows. It also has generated a sense of frustration as clinicians are asked to document in what they perceive to be inefficient ways, and their suggestions for documentation improvement cannot be used due to eCQM requirements. There is a perception that "nobody's listening," in that the vendor certification requirements do not address clinical workflow, CMS eCQM measure requirements are complex and difficult for hospitals and vendors alike to understand, and that vendors do not address clinical workflow in designing their eCQM products. In addition, updates to documentation tools that are supporting concurrent review and reporting of abstracted measures have also suffered delays. Currently on hold is the focus on using the EHR for

reporting all of the CMS hospital IQR measures. The project was stopped due to the effort required to generate eCQM reports.

Lessons Learned

The experience with MU Stage 1 has reinforced the organization's multi-disciplinary team-based approach, particularly the importance of creating more structure around implementation with a specified position of MU Project Manager.

The time and effort required to implement eCQMs does not correlate with the constrained regulatory timelines for hospitals to be in compliance. Consequently, the organization plans to continue its early analytical work identifying documentation gaps in the EHR before it has access to the vendor's MU 2014 certified eCQM reporting tools. Time is of essence not just for technological aspects, but also to effectively manage change, particularly at the operational staff level. A good example of the time constraints is the single MU 2014 eCQM that is expected to take a full 18 months of work to achieve consensus among all hospitals in the network. Stage 2 requires reporting on a total of 16 measures.

The organization has striven to implement "out of the box" documentation tools, and explored creative ways to engage clinicians with as little impact on their patient care activities as possible. The commitment to include clinicians in the process of designing effective documentation mechanisms that are both non-intrusive and support accurate data for eCQM reporting is a critical success factor for both EHR design and implementation.

Finally, the challenges associated with accurate eCQM reporting have influenced the network's strategy for future eCQM implementation. The selection of eCQMs for MU Stage 2 is being driven by a number of factors, including the organization's experience with clinical validity for Stage 1 eCQMs and anticipated impact on clinical workflow, as well as the alignment with other reporting programs and internal improvement priorities.

Case Study

3

Executive Summary

The American Hospital Association (AHA) commissioned a study to investigate hospital experiences with implementation of Meaningful Use (MU) Stage 1 electronic Clinical Quality Measures (eCQMs). The findings described in this case study are based on interviews conducted with key leaders and staff directly involved in the oversight and management of eCQMs.

This 250-bed hospital in the northeastern region of the U.S. is part of a national health system comprising 30-50 acute care hospitals and regional medical centers. The hospital started implementing its electronic health record (EHR) eight years ago and is now recognized for its successful implementation of computerized physician order-entry (CPOE) and nursing documentation. The organization expected implementation of the eCQMs and MU Stage 1 to be relatively straightforward based on its previous success with implementing the EHR. The vendor's eCQM reporting tool was programmed to find data to calculate the measures in specific locations in the EHR. However, these locations were not consistent with the way physicians and nurses entered the data during routine clinical care. A team of eight staff from the quality and cardiovascular disease management departments was assigned to individual care units across the hospital to read daily reports from the eCQM reporting tool and encourage patients' primary nurses and physicians to enter data required for the eCQMs. Hospital leadership viewed this *concurrent review* process as helpful, in that it encouraged collaboration between the quality and disease management staff and the primary nursing staff; however, the process is not sustainable long term as the number and complexity of measures increase and due to the considerable replication of effort the concurrent review process consumes.

Hospital clinical and IT staff also had to program rules to redirect the eCQM reporting tool they received from the vendor to locate appropriate information in the EHR where physicians and nurses can enter it in the most efficient way. Efforts were challenged by the complexity of the eCQM specifications and the fact that much of the information was routinely captured in narrative text rather than structured fields (check boxes or drop-down menus). The result was that physicians

and nurses caring for patients had to expend extra effort to enter structured information into the EHR, often duplicating information already in narrative notes solely to support reporting of the eCQMs. The eCQM vendor's instructions were often out of date as eCQM requirements changed, adding to the work hospital staff had to perform to use the tool. Part of the extra effort was because the hospital served as a test (Beta) site for the vendor's software. However, even after the test phase was completed, the vendor was able to support only 20 percent of the extra effort to modify the EHR to better support clinical workflows; the hospital absorbed 80 percent of the additional work.

The organization's leadership is committed to using the EHR to enhance quality and safety and understands the potential benefit of measuring quality with existing information in the EHR. However, the eCQM effort expended significant human resources, delaying other critical projects and interrupting clinical workflow. Overall, the eCQMs were difficult to access and understand, outdated and inconsistent with clinical practice.

Health System Overview

The health system consists of full-service hospitals and hospital-centered regional systems and associated outpatient providers. It provides a central management and leadership structure that includes centralized IT services. This case study focuses on a single hospital in the northeast region. The hospital is one of three similar facilities in its mid-sized city. The hospital offers comprehensive inpatient services and also has purchased ambulatory practices, directly employing approximately 135 physicians. The health IT infrastructure consists of a main inpatient EHR from one vendor, pre-existing departmental systems from other vendors, and a separate ambulatory EHR, which may be transitioned to the main vendor's product over time. The implementation of a single EHR at the hospital began eight years ago and includes CPOE and nursing documentation. The EHR acquisition, management and operations are managed in conjunction with a "sister" hospital in the system to cross-subsidize the costs. The hospital's local IT and Quality staffs, however, manage the content of the EHR (e.g., order sets and forms) used in their facility. As the

Hospital Profile

Financial Classification: Not-for-Profit

Location: North Eastern Region

Network Size Range: 30-50 Acute Care Hospitals and Regional Medical Centers

Hospital Beds: 250-bed capacity; 125-bed average census load

Staff: Over 1750 FTE staff, 180 contracted

Annual visits: 315,000 annual visits; 10,000 annual inpatient admissions

Physicians, Providers: ~135 employed, ~200 non-employed medical staff

EHR: Vendor C

Ambulatory EHR: Alternate EHR vendor for primary care

hospital's IT and Quality staffs manage all local EHR efforts, the recent expansion to include additional ambulatory practices that predominantly use a different EHR has increased the workload by requiring attention to two different vendor products. The Quality Improvement staff has a direct role in completing documentation and reporting on each individual patient's quality of care using the EHR and associated information tools. The MU and electronic quality reporting implementation team included key staff from the national hospital system IT organization.

Individuals Interviewed

The organization made available a number of staff at the hospital level, as well a few system-level staff, ranging from senior leadership to front line operational staff directly involved in the eCQM implementation process:

- **Hospital leadership:** Vice President of Nursing, Assistant Vice President of Care Continuum, Senior Vice President of Operations/Chief Nursing Officer, Chief Medical Information Officer, Vice President of Quality & Risk Management, Cardiovascular Nursing Director, Chief Financial Officer, Controller
- **Hospital meaningful use implementation team:** Director of Clinical Systems Implementation / Meaningful Use Program Project Manager, IT

solutions staff, quality and clinical data analysts, outcomes and disease management staff

- **Health System level:** National Meaningful Use Program Manager, IT solutions staff

eCQM Implementation Process

In MU Stage 1, hospitals must report on 15 eCQMs that reflect care for patients with stroke (seven measures) and venous thromboembolism (VTE, or blood clots, six measures), as well as measures of how patients move through the emergency department (ED) (two measures). This reporting is in addition to other Medicare quality reporting requirements that are generally based on manually abstracting data from the chart, with varying degrees of automation. The meaningful use measures overlap with measures hospitals must report to the Centers for Medicare & Medicaid Services (CMS) in either the inpatient (stroke and VTE measures) or outpatient (emergency department (ED) measures) quality reporting programs.

In this hospital, the approach to eCQM implementation was primarily driven by the workflow requirements for entering data into the certified quality reporting tool supplied directly from the EHR vendor and the reaction of the different staff communities to these quality data requirements. This dynamic affected all phases of the eCQM implementation process, including gap analysis and planning, workflow redesign, eCQM technical implementation and data validation for the eCQM reports.

Gap Analysis and Planning

This first phase of activity began more than a year before the MU Stage 1 electronic quality reporting target date. The hospital created and empowered a MU Steering Committee, consisting of members of the senior management and key operational leaders. Additionally, the hospital consulted with local nursing and physician leadership, as well as national MU program leads. Additional Stage 1 regulations and policies were issued throughout the planning phase, requiring ongoing interpretation and incorporation into the hospital's plan.

Workflow Redesign

Parallel with the first planning phase, the hospital MU implementation team also engaged with the vendor to be an early adopter, or Beta site, of the certified vendor's eCQM reporting tool and accompanying EHR components. The vendor's eCQM reporting tool was designed to calculate eCQMs by using data from specific locations in the EHR. Hospital staff assumed the reporting tool would use data captured as a result of routine physician and nursing patient care documentation. As originally designed, the certified software provided a webpage to track all data elements required by an eCQM that were missing from the EHR, and nurses were expected to track and respond to notifications provided on this webpage. The hospital sent a core group of quality staff to the vendor to do some of the design work. On returning, this group reviewed their findings with the senior leadership team of front line clinical leaders, staff nurses and quality staff to determine the workflow. The front line nursing staff felt they could accommodate the workflow, but would need additional resources.

Since the vendor recommendations for implementing the eCQM reporting tool could not be handled with existing staffing levels on patient care floors, the quality staff redesigned their own workflow to work with the eCQMs. The eCQM reporting tool was being implemented concurrently with CPOE, which was the only process by which physicians were entering structured data. EHR documentation for physicians was not active. The eCQMs require information about what services the provider supplied and did not provide, which requires a documentation system. Physicians dictated notes that were transcribed into the EHR as narrative text, but the vendor-recommended workflow to report on eCQMs relied heavily on structured data being entered into the EHR by clinicians.

To address these barriers, hospital leadership decided to directly involve the Quality Improvement Team in implementing the vendor's eCQM tools using a process termed concurrent review. In this process, each member of the team of eight staff (two quality managers, four quality analysts and two cardiovascular disease managers) is assigned to individual care units in the hospital. In addition to their regular daily duties, each staff member is

responsible for reviewing the medical records for all of the patients on that unit each day. They ensure that any data not automatically extracted from the EHR into the eCQM reporting tool are manually entered by staff into the data fields the eCQM reporting tool is designed to recognize. The quality staff informs a patient's primary nurse of each piece of missing data; the primary nurse is responsible for entering the appropriate missing documentation or contacting the physicians to enter missing orders that could not be found in the EHR or electronically scanned documents from the medical chart. The concurrent review process was used to improve documentation for other measures, such as those used by the CMS Hospital Inpatient Quality Reporting (IQR) program.

The hospital deliberately chose to use the Quality Improvement Team in this manner for two reasons. First, it encouraged the complete capture of needed electronic data to support eCQM reporting. Second, this strategy provided an opportunity to better integrate the Quality Improvement Team staff with the nurses directly providing patient care, encouraging enhanced collaboration and teamwork.

eCQM Implementation

The technical implementation of eCQMs posed a great challenge to the hospital. Although the product was certified to meet all requirements of MU Stage 1, including eCQM reporting, the delivered product required significant alteration by the hospital to make it usable. One of the primary reasons behind the need for this rework was the manner in which the vendor's product calculates eCQMs. The vendor's quality reporting tool uses "rules" written into the EHR software to search specific parts of the EHR for data needed to calculate a measure. Using the data the rule asks it to find, the eCQM reporting tool then calculates the measure result.

However, the sample "rules" provided by the vendor did not work without the hospital using its own technical staff to re-program them. Some of the rules provided by the vendor needed to be modified or adjusted to fit with where the information is present in the hospital's EHR. Another reason for adjusting rules was to crosswalk the eCQM's name for required data with the term the hospital's EHR used for the same data. Hospital

staff also had to create new rules that were not provided by the vendor due to problems with the original code. In fact, each hospital in the national system using the same vendor product had to develop its own rules to address the local clinical physician and nursing workflow to fit the eCQM reporting tool.

For example, the hospital devoted considerable work to reporting on its VTE prophylaxis measures. This measure assesses whether a hospital ordered care, such as providing patients with compression stockings to prevent VTE, to patients within 24 hours of arrival. However, there is no standard way that hospitals describe compression stockings. The hospital quality staff had to connect the eCQM reporting tool's definition to the locally used definitions. Finding the order for a compression stocking should be relatively straightforward, but the vendor provides a catalogue of orders; each hospital has to put those orders into their physician order sets for the eCQM reporting tool to find them. The measure also requires that, in addition to being ordered, the stockings are actually placed on the patient. Nurses document that information in narrative notes. The hospital's solution to this problem was to require nurses to use the specific check boxes in a patient assessment form in the EHR that the eCQM reporting tool was programmed to recognize. However, if the nurse documents two different interventions in that assessment at the same time, the system does not capture the time each occurred. The vendor recommended that nurses document just one intervention, sign the document electronically and then reopen the document to enter the second intervention and sign again. The suggested solution was cumbersome and created extra work for care providers.

This example explains issues with a single data element for one of the MU Stage 1 eCQMs. To implement all 15 measures, the hospital used three full-time IT staff who also continuously consulted with the hospital's clinical staff to re-design and re-program the rules needed to collect eCQMs.

Validation

This final phase of the eCQM implementation had two interrelated activities that, taken together, were intended to ensure the certified vendor eCQM reporting tool generated valid (i.e., correct and complete) reports. The first activity, technical

validation, evaluated that the EHR had a location to document the information required to calculate the measures. The second activity, clinical validation, reviewed the EHR to determine if physician or nurses documented data in that location.

To perform technical validation, the hospital paired an IT solution staff member with a clinical specialist. These clinical specialists were reassigned on a part-time basis from their “home” departments such as the ED or the pharmacy service to support the implementation of a measure from start to finish. This allowed a phased, coordinated approach to technical and clinical validation.

The results of the first year of technical and clinical validation showed gaps in the ability of the eCQM reporting tool to generate eCQM reports. Clinical validity was hindered because information was not present where the eCQM reporting tool was programmed to look for it. Physicians and nurses document much of the information the eCQMs need in narrative (text) notes and not in structured fields. Thus, during the first year of implementation of eCQMs, approximately one-third of the data elements needed by the eCQM measures were available directly as a result of information entered during CPOE. The remaining two-thirds of the needed information required a change to physician or nurse workflow to use the EHR fields the eCQM reporting tool could recognize. The result often duplicated information already present in nursing narrative notes.

The initial (baseline) clinical validation in the first two to three months of the concurrent review process showed that only 20 percent of the expected information was present in the fields recognized by the eCQM reporting tool (20 percent clinical validity). Eight to 12 months after initiating the concurrent review process, clinical validity increased to more than 85-90 percent. While the improvement in clinical validity of eCQM reporting is significant, hospital leadership does not expect to be able to improve validity beyond current levels until such time that physicians and nurses document all of their patient information directly into the EHR as they care for patients. The concurrent review process takes more time, but it does provide education to staff and captures more patients for quality reporting. Concurrent review also encourages care that is consistent with the measures’ intent while the patient is in the hospital.

Findings

The case study evaluates: (a) facilitators of eCQM implementation, (b) barriers to implementation, and (c) value derived from eCQMs, as well as their impact on organizational activities and goals. Specific examples are provided in each section.

Facilitators of eCQM Implementation

The main factors that enabled the organization to make progress toward implementing the eCQMs were:

- Commitment to health IT as infrastructure to quality improvement;
- Empowerment and collaboration; and
- Effective governance and leadership.

Examples are provided explaining how each factor plays a significant role in the success of the organization and the success of MU and eCQM implementation.

Commitment to HIT as infrastructure to quality improvement

As part of its commitment to health IT, the hospital had successfully implemented a number of essential functions of its EHR and had broad participation by the physicians and nurses. CPOE and nursing documentation were already in place. However, the robust use of the EHR did not translate to a straightforward process for eCQM reporting. A significant amount of effort was required to work with the eCQM reporting tool.

Coalescence between MU eCQM with existing quality improvement efforts

Health IT and Quality staff collaborate closely to support all quality reporting efforts, including eCQM reporting. The eCQM work required adjustments in work effort for both the health IT and Quality staffs. The staff initially expected the eCQM reporting tool to manage reporting for all quality measures, including IQR reporting and eCQMs, especially since some of the eCQMs were developed directly from chart abstracted measures in the IQR program. The staff worked closely to improve data entry using concurrent review for both programs. However, the hospital sends data from retrospective chart abstraction on a monthly basis to a

contracted service to submit IQR measure results to CMS. Results of all quality reporting through the EHR, including the eCQMs, are regularly reviewed by the outcomes review committee and other senior management committees. The hospital staff's extensive work with the eCQM reporting tool vendor placed this hospital on the leading edge of the eCQM adoption curve in comparison with other hospitals in their national system.

Direct use of health IT infrastructure for patient care improvement across the enterprise

The hospital IT and Quality staff direct their health IT efforts to improve care throughout the organization to support new approaches to quality improvement. As an example, the Quality staff and the IT team that programs rules into eCQM reporting tool used their skill and the EHR content to solve some of the operational waiting time issues in the emergency department, an internal organizational performance indicator. They were able to reduce overall waiting time and report the results from the eCQM reporting tool.

Empowerment and collaboration

Up and down the management chain in the hospital, there is strong commitment to partner clinical leaders with IT staff counterparts, empowering them to jointly lead changes to the EHR and to clinical processes, or workflow. Hospital committees have strong integration between clinical, operational and IT leadership. The collaboration led to a clear understanding of the issues, capabilities and limitations of the EHR and the eCQM reporting tool. The concurrent review process also enhanced communication and established collaboration among the IT staff, the clinical quality management staff and clinicians directly involved in patient care. This collaboration has successfully expanded beyond the requirements for eCQM reporting.

Effective governance and leadership

Hospital leadership and governance is a blend of local leadership and national system support that provides guidance and staff support. The governance helps coordinate the EHR use and its impact on physicians and nurses providing care directly to patients. Somewhat unique to the hospital is a joint leadership effort with a "sister" hospital located in another region of the country.

Both hospitals shared the EHR purchase and licensing; the EHR structure is located at the sister hospital's site. Decisions about adding or implementing new EHR components and departmental systems are made jointly and are coordinated with the clinical needs at both of the hospitals, while each is governed by its own mission, market area, and governing board.

Excellent project leadership and control from hospital system and at hospital site

This hybrid management structure added a more careful set of management controls and a more deliberate and thoughtful project management process that was on balance a very positive feature for the implementation of the MU program and the related eCQMs. The national system provides access to similar hospitals using the same EHR. This hospital was a national leader in the system as the first to use the vendor's eCQM reporting tool. The national system support provided significant leverage in interactions with the vendor.

Organizational commitment to MU and eCQM reporting at hospital

Finally, as in all large programs in the hospital, the hospital leadership was a key element in its success with use of the EHR and with the MU program and eCQM reporting. Hospital financial and operational leadership was directly involved supporting the eCQM program, providing direct guidance on strategy and tactics, and organizing the management structure and staff commitments for the efforts. Leadership remained engaged in the entire MU program and eCQM reporting process as it unfolded over the three-year period.

Barriers to eCQM Implementation

Specific challenges the organization faced in implementing eCQMs included:

- Intensive human resource requirements;
- Uncertainty around eCQM specifications;
- Disconnect between documentation and eCQM requirements.
- Availability, usability and workflow requirements of certified software;
- Lack of cross-vendor and intra-hospital

interoperability; and

- Outdated information in the eQMs inconsistent with clinical practice.

These issues are explored in detail below.

Intensive Human Resource Requirements

Perhaps the largest barrier to eQM implementation was the intensive human resource cost of the concurrent review process for quality reporting. The hospital expected its certified vendor's eQM reporting tool to directly report results. However, in this case, the hospital staff had to develop processes for clinical staff to supplement and, in some cases, entirely reprogram the automated reporting process. The eQM reporting tool was developed to find every data element required by the measure from a specific location in their EHR and to alert the patient's primary nurse (via a dashboard) if information to calculate any of the eQMs was missing. As noted previously, the hospital quality management staff used the dashboard to provide a concurrent review service because the hospital staff determined the eQM process was inconsistent with their process of caring for patients and a distraction from their patient care duties. The nurses were still required to document what was necessary and to contact physicians to place any required orders using CPOE. This hybrid process to implement the eQM reporting tool improved collaboration between the quality management staff and the clinicians providing direct patient care; however, it required shifting of staff to eQM duties when they were already stretched thin with their usual activities.

Hospital leadership recognized that the complexity and sheer volume of the information required were at the root of the challenges presented by the eQM reporting tool design. Basically, the eQM requirements, the eQM reporting tool and the EHR design for capturing and storing information were mismatched. The eQM reporting tool assumed: (a) all EHR components were working and used by physicians and nurses to enter information as part of the care they provided directly to patients, or (b) physicians and nurses would augment the information available in the EHR by completing additional assessment forms designed specifically for the eQMs. The eQMs were derived from measures designed for nurses who read through all information in the medical record, including

extensive narrative notes, to glean the data needed for the measure. Some of that information (for example laboratory results and medication orders) can be found directly in the EHR. Other information is available in the EHR because it is part of nursing routine (e.g., entering a number for blood pressure or choosing from drop-down lists or check boxes to select items on a computer screen).

However, there is a limit to what information can be successfully entered in this structured manner. Some of the information in the eQMs can only be determined by reading narrative (unstructured) notes, or free text. The result of the overall effort was that the quality staff specialists and managers spent approximately 50 percent of their efforts on concurrent review; routine work had to be shifted so that staff could spend time filling in gaps in the information in the EHR to support the eQM reporting effort. No resources were added; the workload was redistributed.

Part of the work effort to implement the eQMs was due to difficulty finding and understanding the eQM specifications. These specifications differed from the manually abstracted measure specifications from which they were derived. There were also issues with making sure physicians and nurses documented the information needed for the eQMs, as noted above. All of these issues required extra staff time for the IT analysts and quality management staff; however, physicians and nurses spent significant time that cannot be quantified to enter information into the EHR that ultimately added no benefit to their patients. Hospital leadership noted that each measure took at least two to three months to implement; the whole process for the 15 eQMs took about a year to implement.

Uncertainty around eQM Specifications

The eQMs are difficult to understand. Hospital staff noted the original chart abstracted measures from which the eQMs were derived require less effort for reviewers doing manual chart abstraction than the effort required to automate the process in the EHR. The eQMs also require new vocabularies, including SNOMED-CT®.¹ Some of the work requires crosswalks from SNOMED-CT to vocabularies currently used, such as ICD-9-CM for diagnoses. Other items, such as compression stockings, one of the acceptable treatments to

prevent VTE, is coded using SNOMED-CT in the eCQMs, but the hospital EHR identifies them only to manage inventory as equipment taken from the central storage area. There is no standard coding system to describe these stockings. To implement the eCQM directly, the hospital staff would need to program the eCQM reporting tool to find the items in the local EHR that correspond to one of the SNOMED-CT® codes listed by the eCQM.

The hospital's Meaningful Use eCQM implementation team noted that, of the total implementation effort to achieve validated results from the eCQM reporting tool the vendor was able to support about 30 percent while the hospital staff performed the remaining 70 percent of the work effort to modify the tool.

The Disconnect between EHR Documentation and eCQM Requirements

Another barrier identified by many of the hospital staff interviewed for eCQM implementation was the lack of alignment between the eCQM reporting tool instructions (documentation) with the eCQM and MU certification requirements. The hospital staff reported the vendor documentation was out of date; multiple EHR components had to be updated by the vendor and implemented by the hospital to support MU certification. With each update to EHR components, there existed a risk that links to information needed by the eCQM reporting tool could be broken. Due to the speed required for delivering and implementing these updates, the vendor documentation avoiding such risks could not keep pace. For instance, this hospital's EHR was certified two years previously, but frequent modifications and updates to the certified EHR, either to fix bugs or simply to keep up with changing regulations or federal MU program requirements, meant that the eCQM reporting tool and the basic EHR documentation were not synchronized.

This lack of alignment added to the time and effort required of the hospital's eCQM development teams and all of the staff implementing the rest of the MU program. The testing instructions the

vendor provided to let the hospital evaluate if it had correctly installed the product were also too simplistic, while the eCQM specifications available from CMS were not provided with the testing instructions. The hospital IT staff had to expend time and effort to re-write or develop the testing instructions locally to assure they were comfortable that the reports developed by the eCQM reporting tool were correct. The hospital wanted to be sure the information was correct before attesting the system worked as part of the MU incentive program requirements. Due to the amount of rework they experienced, the hospital has since decided against participation as a Beta site for future versions of the eCQM reporting tool.

Availability, Usability and Workflow Requirements of Certified Software

The vision of eCQMs is that the EHR should make it easier to automatically gather data for quality reporting. While this may be true in a general way, there are many areas in which the process gathering of data for quality measurement introduces its own demands on clinical workflow, or is completely distorted by small changes in workflow. An example is a measure of treatment for community-acquired pneumonia. The measure required blood cultures to be taken before the administration of intravenous antibiotics. However, the EHR system might record a time of 9:02 PM for the time the blood cultures were collected and the time of IV antibiotic administration at 9:00 PM. The blood culture collection time seems late by the measure standards, but it may be the EHR documentation that was late since the nurse was busy caring for the patient when the laboratory technician stopped by to draw the blood specimen prior to 9:00 PM. This discrepancy might then be reported as non-concordance with the quality measure. This simple but ubiquitous example clearly illustrates the relationship between clinical workflows and quality measurement and the need to carefully review and validate clinical workflow as eCQMs are developed to be sure they are feasible.

The hospital staff summed up the issue with the comment that quality measurement “should

1. SNOMED-CT® can be described as a vocabulary, or an organized collection of clinical terms providing codes, terms, synonyms and definitions covering a wide range of clinical concepts (conditions, procedures, events, devices, parts of the body, and more). Managed by the International Health Terminology Standards Development Organization (IHTSDO), SNOMED-CT® is the vocabulary recommended for certain components of the eCQMs by the Health Information Technology Standards Committee, an advisory committee to the Office of the National Coordinator for Health IT (ONC). The US National Library of Medicine makes maps available from SNOMED-CT® to other coding systems such as ICD-9 and ICD-10.

be simpler if it's on the computer.” In fact, the electronic measurement development did not account for the way EHRs are designed to capture and store information. The hospital's clinical and quality management staffs have years of experience using paper charts for review. Therefore, they found it “hard to put the story together” for the patient when compared to reviewing the paper chart, even for the examples presented here. In many cases in this hospital, nurses use alternative health IT departmental systems to record data, such as the event response system, bypassing the EHR system entirely to record information that would be vitally important to eCQM reporting.

Lack of Cross-vendor and Intra-hospital Interoperability

The hospital leadership cited internal interoperability of computer systems as an additional challenge to eCQM reporting. Interoperability refers to the ability of different electronic systems to share information. There are a number of departmental systems used in the hospital, each of which may contain information that would support the eCQMs, but unless the information is shared between the departmental systems and the EHR, hospital staff must do additional work to find the information. The current MU EHR certification requirements do not focus on intra-hospital sharing of information between systems (interoperability). A second frequent issue is the use of departmental systems (old or new), often from a different vendor than the EHR vendor. The issue is evident using an example from the Surgical Care Improvement Program (SCIP) measure set evaluating antibiotic use around surgery. The EHR may include the time an antibiotic was administered, but the Operating Room or Anesthesia departmental system records the time of the incision during the operation. To compare the two times, information from both systems is required, and they do not routinely share such information. Another intra-hospital interoperability issue for the eCQM measures is the evaluation of the results of imaging studies for VTE. The results of imaging studies (e.g., X-ray, Ultrasound) may be in a radiology information system. If information is shared at all with the EHR from the radiology department, it is in narrative text and not in a structured (coded) form that can be used to calculate the results of the eCQMs (in the

case of VTE measures, the results of the pulmonary imaging study).

Outdated Information in the eCQMs Inconsistent with Clinical Practice

The hospital purchased a product from another vendor that provides up-to-date information about clinical treatments that have been shown by published evidence to improve how often and how fast patients get better. The product allows the physicians to create sets of orders for use in the hospital's EHR that are consistent with the latest evidence, and to keep them current as new evidence becomes available. Diseases that are also the subject of measures used in government reporting programs (including the eCQMs) are specifically highlighted in this product to provide physicians with the tools they need to give the best care they can for these conditions. Other hospitals use similar products for this purpose. The treatments required by the eCQMs, however, are based on the evidence available at the time the measures were created. The eCQMs are included in government regulation and, therefore, the vendors are not required to update their certified software as evidence leads to improved practice. Any optional updates to the eCQMs that are published by CMS are made available much later than updates to the manually abstracted quality measures from which the eCQMs were derived.

Therefore, the clinical information embedded in the eCQM calculation is out of date. Physicians who follow the up-to-date clinical evidence to create new order sets in their EHR find themselves in a difficult situation. They may be providing evidence-based care that is best for the patient, while at the same time causing the hospital to have worse compliance with the eCQM requirements, leading to lower scores on the measures. One example is that better medications than were previously available may be approved by the Food and Drug Administration (FDA) to treat a condition that is the subject of an eCQM, but the measure requirements are not updated in a timely manner to reflect the new medication's suitability for the condition. Including the new medication in the sets of orders in the EHR is consistent with good medical practice, but if physicians order it, the hospital will report poorer results for treating the condition in the eCQM reports. The hospital leadership supports physician and clinical staff efforts to “do the right

thing” and treat patients based on the most recent knowledge. However, the lack of timeliness in updating the eCQMs causes confusion among the physicians and impacts the hospital’s ability to show the value of the up-to-date care it provides.

Impact on Organizational Activities and Goals

Human and Financial Return on Investment

Summary information about the financial costs and benefits of EHRs, MU and eCQM implementation, including any revenue from incentive payments is presented in the accompanying table. The capital costs for the EHR implementation had already been expended about five to eight years before the EHR MU incentive program was instituted. The information presented about costs is therefore

mainly about the MU-specific costs and the EHR costs associated with MU and eCQM efforts most specifically. Even in this post-EHR phase, the hospital continued to spend heavily on IT, with about 6 percent of the operating costs of the hospital devoted to IT. With the excellent support of the national system, the use of external third-party consultants was a modest 3-4 percent of total IT costs. Of note on the eCQM-specific costs, there were three additional FTE quality analysts required to keep up with the more stringent data entry and data completeness requirements of the EHR-based eCQM reporting. The total additional FTE effort included 15 FTEs for MU in general, among which six FTEs focused specifically on the eCQM component. These FTEs were distributed among IT program staff, clinical staff assigned to the eCQM effort, and additional quality staff for the concurrent review process used to enhance electronic quality reporting. There were additional capital costs of

\$122K to purchase the certified eCQM reporting tool and the capital depreciation cost of the initial investment to acquire the EHR.

Thus, the expense is approximately \$1M to \$1.5M per year on MU and the eCQMs for the hospital.

Value of Investment

The direct financial costs of EHR and eCQM investment were not fully subsidized or reimbursed from the MU program. Thus, hospital leadership and staff identified a number of areas where EHR investment, and in particular eCQM, provided a broader value to the hospital and health system than the direct financial return on investment would show.

Value-based purchasing, accountable care and the care continuum

The hospital leadership uniformly viewed the investment programs in EHRs, electronic quality measurement and

Annual Capital and Operational Factors for Health IT and eCQM Efforts		
IT Expenditures (Organizational Health IT Activities)	IT Expenditures - indicator of organizational activities for health IT	
	Total IT budget	\$14M (includes hardware and network)
	% of hospital operating costs	6%
	Contracted services (3rd Party Support) as % of total IT budget	3%-4%
	Capital IT budget	\$0.6M/yr post-EHR, specifically for MU
	Percentage of annual hospital capital expenditures	Varies
eCQM Cost	EHR vendor upgrade costs	Varies - but ~hundreds \$K/yr
	IT component of reporting quality (not broken down into different quality reporting programs)	\$122K
	IT Department FTEs partially assigned to MU and eCQMs	8-10 (including 3 FTE nurses, 2 FTE national IT staff, 2 local PM)
	Quality Department FTEs assigned to MU and eCQMs	6.6
	Cost: eCQM Training	Varies
	Cost: eCQM Validation	Varies
	Cost: Staff Costs for Increased Data Entry	3 FTE additional in quality department to enter quality data to support eCQM
Planned activities put on hold	Clinical documentation, voice recognition	
eCQM Benefit	Benefit: Personnel savings (e.g., reduction in abstractors)	No reduction increase of 50% quality staff as above staff as above
	Benefit: Improved documentation for coding accuracy, quality reporting	Reduced ED wait-times as side-effect of repurposing eCQM reporting for ED
	Revenue from incentives	\$10M (including inpatient and outpatient)
	Increased Revenue from other sources due to eCQMs or Meaningful Use	0.993% of CMS revenues were VBP bonus payments due to quality, as a side-effect of eCQM reporting infrastructure

health data interoperability as key elements in the transformation of the care model towards value-based purchasing, accountable care and care coordinated across the continuum of outpatient and inpatient episodes. The leadership believed that adding more EHR functionality, assuming additional reporting burden from electronic quality measurement, and improving the interoperability of their data systems were all pre-requisites to meeting the organization's goals. These goals include coordination of care throughout their region, including patient-centered medical home and accountable care models, and achieving improved accountability for outcomes at a health system and population level.

Lessons Learned

This hospital's implementation of its electronic quality measurement for MU and related programs provides a number of important lessons. First, the effort involved additional resources and intense commitment from and close collaboration between health IT, clinical and functional staff in quality. Second, the hospital had to be willing to provide direct interpretation and internal IT expertise to complete the picture around quality and MU program specifications. This involved both additional resources, but also a decision to take ownership of the implementation strategy. The hospital needed to be able to create its own strategy for process, knowledge and outcomes related to the MU and eCQM programs. Third, all staff, from the top leadership to the direct care clinical staff, needed to have a common understanding and appreciation for the why, where and how of the EHR and quality reporting effort and to work together to achieve success. Lastly, a key driver for the hospital's efforts with eCQM implementation is the sense of mission and the common future goal of patient-centered and coordinated care. Regardless of the extensive efforts applied to eCQM reporting, as of the date of this report, the hospital has yet to achieve success with clinical validation of the eCQM reports, or to validate the results from its eCQM reporting tool with the known results for the corresponding chart-abstracted measures.



Case Study

4

Executive Summary

The American Hospital Association (AHA) commissioned a study to investigate hospital experiences with implementation of Meaningful Use (MU) Stage 1 electronic Clinical Quality Measures (eCQMs). This case study describes the experience and impact of eCQM implementation in a mid-sized non-metropolitan, non-profit facility in the Midwestern part of the U.S. The findings described in this case study are based on interviews conducted with key leaders directly involved in the oversight and management of eCQMs.

The organization used a set of tools supplied by its electronic health record (EHR) vendor for eCQM reporting and attestation. The process to report the eCQM results used the tools created by the EHR vendor to extract data from specific fields in the EHR. Where the tools looked for data within the EHR was inconsistent with where the information was documented by care providers during clinical workflow. In order to resolve this issue the EHR vendor modified some tools (20 percent of the effort), while hospital quality and information technology (IT) staff built screens in the EHR to capture information for eCQM reporting consistent with clinician workflow (80 percent of the effort). Some of the data the eCQMs required was available in structured form; other data were embedded in clinician notes and, therefore, were not recorded in a form recognized by the EHR. The organization expended significant time and resources to validate that all necessary data elements for eCQM calculated were present in the EHR; 100 percent of eligible patient records were validated using a resource-intensive concurrent review process - Quality Department staff reviewed charts while patients were still in the hospital to ensure that any data not automatically extracted from the EHR into the data warehouse were manually entered by the staff on the unit into the required fields in the EHR. Although physicians and nurses are becoming more accurate in documenting information in the expected fields for the eCQMs, hospital leadership believes 100 percent validation will be an ongoing requirement as quality indicators are updated and new measures are added. Moving forward, the hospital will invest in additional software tools and technical consulting services to deal with new vocabularies

to manage the increased requirements for eCQM reporting. These products and services will be provided by vendors other than the EHR vendor.

Health System Overview

The organization is a mid-sized non-metropolitan hospital that offers comprehensive inpatient services and also has purchased two ambulatory practices, directly employing approximately 16 hospital-based physicians. The hospital has been nationally recognized for its leadership in EHR implementation. The health IT infrastructure consists of a main inpatient EHR, a clinical quality measure (CQM) reporting tool from another vendor for reporting Centers for Medicare & Medicaid Services (CMS) Inpatient Quality Reporting (IQR) program measures, pre-existing departmental systems from additional vendors, and different ambulatory EHR vendors among physicians on the medical staff. Some medical staff physicians do not have EHRs in their offices and have no plans to purchase them.

The hospital began evaluating EHR products eight years ago based on a need for a new financial system. Leadership wanted a single system to manage financial and clinical activities. The vendor was selected seven years ago and implementation started one year later. The hospital completed implementation of the primary EHR within eight months and used all of the EHR functionality within twelve months. Hospital leadership noted in retrospect, rather than the “big bang” approach of implementing the EHR all at once, six months additional time to implement might have been preferable. The hospital considered patient safety to be paramount in making decisions about the EHR implementation. They also trusted the EHR vendor to manage all regulatory requirements. Computerized physician order-entry (CPOE) has been implemented; only seven physicians on the medical staff are not performing CPOE, including anesthesiologists and a few physicians nearing retirement. Documentation of medication administration using bar code technology has been implemented, with 98 percent of medications successfully scanned. A new Emergency Department (ED) application was installed three years ago.

Hospital Profile

Financial Classification: Not-for-Profit

Location: Midwest

Hospital Beds: 100-200 bed capacity

Staff: > 750 FTE staff

Annual visits: 160,000 annual visits; 5,500 annual inpatient admissions

Physicians, Providers: ~16 employed, ~50 non-employed medical staff

EHR: Vendor D

Ambulatory EHR: Alternate EHR vendor for primary care

The hospital recently started providing reports to physicians about their length of stay and cost for the top three Diagnosis-Related Groups (DRGs). Their ability to provide these reports, also known as *dashboards*, will expand as the hospital plans to purchase a national database of comparative physician information to provide comparative analytics. The current EHR does not provide the information to support this type of physician benchmarking. A physician champion provides encouragement for the physician staff to engage with the EHR. Hospital leadership works closely with staff to coordinate projects, including the eCQM implementation.

Individuals Interviewed

Senior hospital leadership is deeply involved in the planning and operation of all MU and eCQM efforts. Interviews included most of the senior leadership:

- **Hospital leadership:** Chief Executive Officer, Chief Financial Officer, Director Patient Care Coordination, Director Clinical Quality Improvement, Director Special Projects, Director Information Technology, Physician Champion, Chief of Staff.

eCQM Implementation Process

Hospital leadership trusted their EHR vendor to address all requirements for MU, including capturing data needed for the eCQMs. They noted the vendor has a dedicated team set up for MU with specialists assigned to each EHR component. The EHR vendor offered a set of tools to extract data to assist hospitals in reporting the eCQM results. The hospital uses some of the EHR vendor's reporting capabilities for MU objective reporting, such as the percentage of orders placed using CPOE. The hospital's Quality Department uses a different vendor product to report quality measure results to the CMS IQR program and to The Joint Commission National Quality Measures program (ORYX®). This product's vendor has a separate component that is certified for MU eCQMs, but the hospital did not purchase that component. Rather, they relied on the tools provided by their EHR vendor which also was certified for eCQM reporting. To use the EHR vendor's tools, the hospital staff had to ensure the data required were included in EHR assessments and order-entry screens their nurses and physicians use in caring for patients. They also had to ensure the data entered was sent to their data warehouse, the part of the EHR the queries draw from for reporting the eCQMs. Some of these data fields were used for both the eCQMs and the chart-abstracted measures. Quality staff validated information for the eCQMs consistent with the way they report the other quality measures. The hospital also received some assistance from a local university that set up an institute to help rural hospitals meet MU requirements.

In this hospital, the approach to eCQM implementation was primarily driven by the specific workflow requirements for capturing data in the EHR, extracting data to the data warehouse to support the eCQM-specific queries, and the reaction of staff to these quality data requirements. These considerations affected all phases of the eCQM implementation process, including gap analysis and planning, workflow redesign, eCQM technical implementation and data validation for the eCQM reports.

Gap Analysis and Planning

Senior leadership directed this first phase of activity. A Physician Advisory Committee and a Nursing Documentation Committee analyzed where data capture and documentation within the workflow were inconsistent or not sufficient to meet the needs of the eCQM tool.

Workflow Redesign

The hospital expanded the roles and scope of work for three Quality Department nurses to ensure all information required by the eCQMs was documented by physicians and nurses. These documentation responsibilities include *concurrent review* - a process of reviewing charts while patients are still in the hospital to ensure that any data not automatically extracted from the EHR into the data warehouse is manually entered by the staff on the unit into the required fields in the EHR. Some of the workflow redesign included combining the order-entry screens with relevant laboratory results that will help physicians enter orders based on the individual patient's status. For example, the results of a test to show how much the patient's blood has been thinned, international normalized ratio (INR), is displayed on the screen used to order blood thinners.

The hospital's IT Department hired two nursing informaticists to modify the order entry screens for physicians and the patient assessment screens for nurses by adding fields to encourage entry of information required by the eCQMs. The purpose of these additional fields is to ensure information needed for the eCQMs can be entered where it makes the most sense and where it is least likely to interrupt the care clinicians provide to patients. For example, information about a history of previous clots, or venous thromboembolism (VTE), and recent surgery is displayed on nursing assessment screens, while possible reasons for not ordering blood thinning treatment to prevent a VTE is displayed on the physician ordering screen to assist physicians with ordering alternate therapy, such as compression stockings, when appropriate. The IT Department also increased the number of full-time equivalent employees (FTEs) covering the help desk from two to three to support questions from clinical staff.

eCQM Technical Implementation

The technical implementation of eCQMs posed a great challenge to the hospital. Although the EHR was certified to meet all requirements of MU Stage 1, including eCQM reporting, the delivered EHR product required significant alteration by the hospital to make it usable. A primary reason for the rework was the manner in which the EHR vendor's tools extracted data from the EHR to allow calculation of the eCQMs; the EHR required data elements to be entered in a very specific location in order to be included in the eCQM measurement. After extensive communication, the EHR vendor modified some of the tools. However, the process design still limited the number of places in the EHR that clinicians could enter information that is subsequently available for the tools. The hospital expended numerous hours to evaluate the tools provided by the EHR vendor to assure the correct field in the EHR was used to extract data for the eCQMs. To ensure required data are documented, nurse reviewers check the results of the queries and provide feedback to clinicians if additional documentation is needed.

Validation

The hospital attested for the MU eCQMs using the results of the queries to the EHR database. The EHR vendor provided the ability to send the attestation data directly to CMS in a computer-

“If you're naïve enough to rely on everything to work automatically, you're going to get garbage in, garbage out.”

-Director, Clinical Quality Improvement

readable format (extensible markup language, or XML). CMS was not able to accept the results in this format, so hospital staff was required to manually enter the data for attestation into the screens provided on the CMS website. The hospital did not directly compare the results of the eCQMs and the corresponding chart-abstracted measures from which the eCQMs were derived. However, the hospital validated that all eCQM-required data elements were properly recorded in the EHR for 100 percent of patient experience measured by the 15 eCQMs.

Findings

The case study evaluates: (a) facilitators of eCQM implementation, (b) barriers to implementation, and (c) value derived from eCQMs, as well as their impact on organizational activities and goals. Specific examples are provided in each section.

Facilitators of eCQM Implementation

The main factors that enabled the organization to make progress toward implementing the eCQMs were:

- Commitment to health IT as infrastructure for quality improvement;
- Coalescence between MU eCQM efforts and existing quality reporting and processes at the hospital; and
- Leveraging health IT for quality measurement and reporting

Examples are provided explaining how each factor plays a significant role in the success of the organization and the success of MU and eCQM implementation.

Commitment to health IT as infrastructure for quality improvement

As part of its commitment to health IT, the hospital had previously successfully implemented a number of essential functions of its EHR and solicited participation by physicians and nurses. CPOE, bar-coded medication administration documentation and nursing documentation were already in place prior to the implementation of MU. However, what really made the EHR and related IT applications a facilitator for eCQMs was the strong culture of teamwork and belief in the benefits of EHRs, as shown by the senior leadership and reflected throughout the organization.

Coalescence between MU eCQM and existing quality reporting efforts

The hospital has a strong commitment to addressing quality and patient safety. In support of the hospital's commitment to quality reporting, dashboard performance information is provided to physicians regarding their length of stay, case mix

and their use of CPOE. Currently, these reports are created manually by the Quality Department. The hospital will purchase a new eCQM reporting tool for the MU 2014 eCQMs because it will provide reports and online access to allow physicians to compare their clinical quality results. The hospital also plans to purchase a national benchmarking service to allow them to compare their organization's performance with other hospitals in the region and nationally.

Leveraging HIT for quality measurement and reporting

Initially, the hospital's commitment to use its health IT systems to report on quality measures generated anxiety for nurses, who performed chart abstraction for other measures. They were concerned that reporting directly from the EHR would cause their positions to be obsolete. Other new technology, such as voice recognition software that transcribes dictation directly into the EHR, especially in the clinic and Emergency Department (ED) setting, added to those concerns. However, efforts to implement the eCQMs did not prove to decrease the need for chart abstraction. In fact, eCQM implementation demonstrated an ongoing need for nurses to work closely with others on the clinical staff to extract value from the health IT; the amount of work effort has actually increased. Although entering data into the EHR in specific ways is time-consuming for nurses, the MU requirements have led to some improvements in documentation, e.g., improvement in recording smoking status. The eCQMs were not direct facilitators of improved documentation for quality measurement. However, the requirement to report directly from the EHR caused a change in practice that allowed nurses familiar with quality improvement efforts to facilitate improvement in documentation during eCQM implementation.

Barriers to eCQM Implementation

Specific challenges the organization faced in implementing eCQMs included:

- Intensive staff effort required to support eCQMs;
- Disconnect between EHR documentation and eCQM requirements; and
- Measures in the eCQMs inconsistent with clinical practice.

These issues are explored in detail below.

Intensive staff effort required to support eCQMs

The scope of practice has changed for nurses at this hospital increased the workload for RNs and LPNs. More nurses are needed at the hospital because of the extra documentation required to successfully support eCQM reporting. The hospital has a limited budget and a streamlined staff; the current eCQM processes are placing an extraordinary burden on current staff. Staff are working 12 to 16 hour days and voluntarily coming in on weekends – a testament to the organization's commitment to quality measures at all levels of staff and leadership. Despite this commitment, the staff runs the risk of “burning out” due to MU reporting requirements, as currently constructed, and the hospital's commitment to validating the eCQM quality data. Finding employees with the aptitude and skill to work with the EHR at the level required for the eCQMs is difficult and the hospital has limited resources to hire additional FTEs; regardless, the IT Department hired two nurse informaticists and an FTE to increase the help desk support from two to three FTEs. Hospital leadership also noted the challenges involved in recruiting additional technically skilled staff to a hospital in a non-metropolitan area.

The hospital staff noted that the eCQM implementation effort required significant work to build screens in the EHR and to train doctors and nurses to use those screens (mostly in nursing assessments and CPOE screens). The EHR vendor supported about 20 percent of the work effort through modifications to queries or the EHR screens, while the hospital staff performed the vast majority (80 percent) of the work. Three nurses, two of whom work in nursing informatics, performed most of the local modifications.

“Training is a big resource drain: it starts new with every physician.”

-Director, Special Projects

The disconnect between EHR documentation and eCQM requirements

The EHR vendor's tools to extract data from the EHR database required changes to screens physicians and nurses use to enter data. These changes did not align with clinical workflow (the routine patterns

of actions, including documentation, clinicians use during patient care). The hospital leadership had to communicate frequently with the EHR vendor to ensure the queries would extract data from the appropriate field in the EHR in a way that fit with local clinical care.

Measures in the eCQMs inconsistent with clinical practice

The hospital purchased a product from another vendor that provides up-to-date information about clinical treatments that have been shown by published evidence to improve patients outcomes. The product allows the hospital's physicians to create sets of orders for use in the hospital's EHR that are consistent with the latest evidence, and to keep them current as new evidence becomes available. Diseases that are also the subject of measures used in government reporting programs (including the eCQMs) are specifically highlighted in this product to provide physicians with the tools they need to provide the best care possible for these conditions. Other hospitals use similar products for this purpose. The treatments required by the eCQMs, however, are based on the evidence available when the measures were created. Government regulation, however, does not require eCQM vendors to update their certified software as evidence leads to improved practice after the creation of the original eCQM. Any optional updates to the eCQMs that are published by CMS are made available much later than updates to the manually abstracted quality measures from which the eCQMs were derived. This is due to the disconnect between the measure developers that support the CQMs included in most quality reporting programs and the eCQMs supported by a contractor and included in meaningful use. The lack of comparison testing of the eCQMs with the quality measures included in quality reporting programs that rely on manual chart abstraction for measure calculation exacerbates this challenge for hospitals seeking to validate e-measure accuracy.

This hospital does not have the staff

to evaluate these differences, but leadership understands there is a discrepancy.

Impact on Organizational Activities and Goals

Human and Financial Return on Investment

Summary information about the financial costs and benefits of EHR, MU and eCQM implementation, including any revenue from incentive payments, is presented in the accompanying table. The capital costs for EHR implementation had already been expended six to seven years before the MU program was instituted. The information presented about costs is, therefore, most specifically relates to the EHR costs associated with MU and eCQM efforts. The implementation included five new connections with external systems (interfaces)

Annual Capital and Operational Factors for Health IT and eCQM Efforts		
IT Expenditures (Organizational Health IT Activities)	IT Expenditures - indicator of organizational activities for health IT	
	Total IT budget	Not provided by hospital
	% of hospital operating costs	Not provided by hospital
	Contracted services (3rd Party Support) as % of total IT budget	Not provided by hospital
	Capital IT budget	Not provided by hospital
	Percentage of annual hospital capital expenditures	Not provided by hospital
eCQM Cost	EHR vendor upgrade costs	EHR upgrade \$50,000 New 3rd party product \$90,000 New vocabulary services \$33,000
	IT component of reporting quality (not broken down into different quality reporting programs)	Not quantified
	IT Department FTEs partially assigned to Meaningful Use and eCQMs	Not quantified
	Quality Department FTEs given expanded roles for Meaningful Use and eCQMs	3 FTEs
	IT Department additional staff hired	2 Nursing informaticists 1 Help desk
	Cost: eCQM Training	Not quantified
	Cost: eCQM Validation	Not quantified
	Cost: Staff Costs for Increased Data Entry	Not quantified
	Planned activities put on hold	EHR documentation in Labor and Delivery, the Oncology Center and the Post-anesthesia care unit (PACU)
	eCQM Benefit	Benefit: Personnel savings (e.g., reduction in abstractors)
Benefit: Improved documentation for coding accuracy, quality reporting		Not quantified
Revenue from incentives		Not quantified
Increased Revenue from other sources due to eCQMs or Meaningful Use		Not quantified

at a cost of approximately \$13,000 per interface. Examples of interfaces include those for public health reporting and syndromic surveillance, both MU requirements that are unrelated to eCQMs. The hospital did have to expand the roles of three nurses in the Quality Department. eCQM efforts by staff are not tracked directly; they are considered part of operational expenses. There are no plans to track hours by task in detail. The IT staff assigned to quality was increased by adding two new nurse informaticists, plus support staff mostly from the Nursing Department. An additional FTE was added to support the help desk.

Time required to address the eCQMs is a distraction from other organizational considerations, such as patient length of stay. Hospital leadership notes that other IT projects were delayed due to the eCQM implementation, including adding documentation in Labor and Delivery and the Oncology Center in the Post-anesthesia Care Unit (PACU). In addition, time and funding to recruit and hire specialists has slowed due to the distraction of the eCQM efforts.

The hospital is limited by a very conservative budget because of its high percentage of elderly and Medicaid patients. Looking ahead, the EHR software to support MU Stage 2 will cost approximately \$50,000. Internal efforts to implement the update will be taken from the operational budget. Hospital leadership also has decided to purchase an eCQM reporting tool from a different vendor that works more closely with their EHR and allows the hospital to more easily adapt eCQM reporting to local workflow. The cost of this change is projected at approximately \$90,000 and includes education and training of staff. The new eCQM reporting tool supports Medicare IQR program and Joint Commission reporting. The new product will provide the hospital with the ability to provide quality measure results to physicians as reports and through online access. The hospital will purchase additional services from a national organization to provide enhanced benchmarking services to compare the hospital with others in the region and nationally. There is also concern that the staff will need to adjust to different trend and analysis reports that are not specific to eCQMs from their current benchmarking product. The hospital also will purchase additional services at approximately \$33,000 annually to

use SNOMED-CT as required by MU and as included in the eCQMs. The additional services also will help the hospital crosswalk information entered using SNOMED-CT and ICD-10-CM (used to define conditions) and ICD-10-PCS (used to define procedures) required for claim submission beginning October 1, 2014.

The challenge with the EHR is that it does not make physicians, nurses or other clinicians more productive. The efforts to implement the eCQMs did not prove to decrease the need for chart abstraction and increased the time required for nurses to support correct documentation for the EHR and eCQM reporting. The requirements for eCQMs add to burden and do not improve patient quality, in the hospital's experience.

Lessons Learned

The eCQM implementation required considerable effort and resources from the hospital; the hospital and its staff remain committed to MU and eCQMs and continue to make considerable investments in health IT. Expenses required to implement Meaningful Use 2014 (Stage 2) requirements will have a very significant impact on the hospital's budget.

Collaboration between leadership, health IT, clinical and functional staff, reliance on the EHR vendor's eCQM-specific tools and a culture of "getting things done" led to this hospital's ability to attest the eCQM results for MU Stage 1, even though staff perceives no real clinical value. The hospital understands the vision that EHRs can provide sufficient information to evaluate and improve clinical processes and outcomes; however, limited resources prevent this hospital from performing the type of clinical validation and benefit it desires from electronic measurement.