ABSTRACT

Healthcare providers are facing growing momentum to measure, document and improve patient care safety and quality. As the healthcare industry moves towards fee-for-outcome rather than fee-for-service, measuring patient recovery in real time will be key. New government regulations, combined with insurer and consumer demands for improving clinical performance, are forcing healthcare providers to find better ways to monitor patient care prospectively, or while patients are still in the facility, not after they have been discharged.

Clinical surveillance (the ability to continuously screen new indicator data from various information systems) has been around for some time. However, it has followed a model of capturing patient data as early as possible and then using traditional methods to measure patient care, such as trending or predictive modeling. What’s needed is continuous, real-time monitoring combined with intelligent detection and reliable intervention. These are new concepts to an industry that relies on humans to process increasing amounts of data. New approaches, such as using business rules and event-based processing to evaluate key patient indicators in real time, are the way to unlock the value of data to improve clinical performance.

By bringing quality reporting from the background to the bedside, health delivery leaders can rethink how to combine clinical roles such as case manager/care coordinator and quality nurse, or create care management roles focused on high-priority conditions such as heart failure or at-risk groups such as patients at risk for readmission or sepsis. By conveying relevant information in time to take action, organizations can create multi-disciplinary care models that respond to real-time detection of changes in patient status and care needs 24 hours a day, seven days a week.

THE FUTURE: IT’S ALL ABOUT PERFORMANCE VALUE-BASED HEALTH CARE

The Evolution of Value-Based Health Care

The steady progression of Medicare reimbursement toward tying payment to quality is no surprise, as both the overall direction and the specific approaches have been disclosed well in advance as the various programs have evolved and related regulations promulgated. In the initial stages, the focus was on external reporting and public posting to raise the awareness of quality performance among all stakeholders. The addition in 2009 of non-payment for hospital-acquired conditions, such as several types of avoidable infections, injuries due to falls and errors during surgery, was based on the philosophy that the hospital — rather than the payer — should bear the costs of these adverse events.

Upping the ante further, the Centers for Medicare & Medicaid Services’ (CMS) Value-based Purchasing (VBP) program will score individual hospitals based on relative achievement and improvement ranges for each of a set of clinical measures and, for those hospitals that qualify by performing above the median or showing substantial improvement, base the actual value-based incentive payment on a composite score. As hospitals now face the advent of VBP in FY2013, the
stakes — both financial and competitive — are becoming much higher. What’s at stake — from -1 percent to +2 percent of Medicare reimbursement rates — will be noticeable on the bottom line. Time is also at a premium: although actual payment adjustments will start in FY 2013, data collection to determine payment amounts begins in July 2011.

The urgency of preparing for VBP is true even in hospitals that do not care for large numbers of Medicare patients. The transition to value-based health care is the biggest shift in hospital reimbursement since the introduction of Diagnosis-Related Groups (DRGs) in the early 1980’s. At that time, CMS lead the way with the heavy lifting concerning the DRG classification schema itself and the changes to the claims process, but other payers quickly adopted the new model. Similarly today, the other payers have been following in CMS’ footsteps toward value-based health care, and many have already incorporated the no-pay for hospital-acquired conditions, as well as mandated reporting, into many of their contracts. They will not be far behind with value-based reimbursement.

The bottom line for hospitals is that measured performance matters a great deal. The initial focus on never events will certainly be expanded to a much broader range of preventable adverse events. As CMS and other payers build upon transparency and accountability and start factoring performance standards based on benchmarking into payment, the capacity to understand (measure) and continuously improve performance is rapidly becoming a core competency.

MEASURES, MEASURES AND MORE MEASURES
The job of managing and improving performance is made more daunting by the large and ever-growing number of external quality measures used to evaluate hospital performance. The Joint Commission, which has required hospitals to report performance data since 2002 as part of hospital accreditation, is now adding some expectations for actual achievement, with testing set to occur in 2011 and implementation as soon as 2012. Many hospitals also must report a large set of sometimes overlapping, but often differently designed, quality measures to state authorities that regulate hospitals. In one national review, researchers identified 25 different states that publicly report on hospital quality.¹

The CMS VBP Program is an excellent example of the large and growing inventory of hospital quality measures. The proposed rule includes a total of 34 measures, many of them from the Hospital Inpatient Quality Reporting Program, which has been in place for years. Plans are already in place to add many more measures to VBP in future years. According to the proposed rule, in FY 2014, three mortality outcome measures, eight Hospital Acquired Condition measures, and nine Agency for Healthcare Research and Quality measures would be added. For FY 2014 and/or subsequent years, measures would relate to efficiency measures, including Medicare spending per beneficiary as required under statute.

<table>
<thead>
<tr>
<th>FY 2013 Proposed Measures — Hospital VBP Program</th>
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<tbody>
<tr>
<td><em>Clinical Process of Care Measures</em></td>
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<tr>
<td>Acute Myocardial Infarction</td>
<td>3 measures</td>
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<tr>
<td>Heart Failure</td>
<td>3 measures</td>
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<tr>
<td>Pneumonia</td>
<td>4 measures</td>
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<tr>
<td>Healthcare-Associated Infections</td>
<td>4 measures</td>
</tr>
<tr>
<td>Surgeries</td>
<td>3 measures</td>
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<tr>
<td><em>Patient Experience of Care (HCAHPS Survey)</em></td>
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<tr>
<td>Nurse Communication</td>
<td>3 measures</td>
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<tr>
<td>Doctor Communication</td>
<td>3 measures</td>
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<tr>
<td>Cleanliness and Quietness</td>
<td>2 measures</td>
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<tr>
<td>Responsiveness of Hospital Staff</td>
<td>2 measures</td>
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<tr>
<td>Pain Management</td>
<td>2 measures</td>
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<tr>
<td>Communication about Medications</td>
<td>2 measures</td>
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<tr>
<td>Discharge Information</td>
<td>2 measures</td>
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</table>

"In the next 18 – 24 months, I think our public reportables are going to quadruple."

— Hospital VP, Operations Hospitals & Health Networks¹
One of the more recent additions to hospital quality reporting is the HITECH EHR incentive program. Quality reporting was one requirement mentioned in the original legislation, and the intention to focus “Meaningful Use” of the EHR on building the IT infrastructure for more effective and comprehensive clinical performance management is clear. Stage 1 meaningful use requires that hospitals report aggregate results for 15 measures. There are numerous hints in both the interim and final rules for Stage 1 HITECH that Stages 2 and 3 will require many more quality measures, and an extensive list of topics is under consideration. Although CMS has signaled its intention to align both measures and electronic reporting for the HITECH program with reporting for Value-Based Health Care, at the present time HITECH measures are an addition to the VBP reporting burden.

WHAT’S NEEDED: A NEW APPROACH

Accommodate Diverse Data Sources
A new approach must accommodate several realities about the typical hospital journey to the inpatient electronic medical record. First, many hospitals are in the early stages of that journey. As a result, much of the information needed for quality reporting still resides in paper documentation or dictated or clinician-entered free text. Given the urgency of reaching the next generation of quality reporting, the solution has to incorporate mechanisms for individuals, such as quality nurses and members of the direct care team, to verify and provide the structured (computer-recognizable) electronic documentation needed for quality measures. Ideally such information is immediately available to any clinician caring for the patient rather than buried in a side system.

A second reality is that measures increasingly span sites and settings of care. Many hospitals have implemented separate clinical systems for the emergency department (ED), surgical suite, and/or ambulatory care. Each of these must be able to contribute data to quality reporting. For patients admitted from the ED, critical information on status and prior care is first captured and initial treatment often initiated. The fact that care begins in the ED (and, in so far as measures are concerned, sometimes even beforehand) is reflected in many hospital measures. For example, in the 15 quality measures for the HITECH program, 14 percent of the unique data elements used to calculate performance relate to assessment and care performed in the ED. Now that measures involving surgical care have been incorporated into the core measures, documentation concerning care delivered during and immediately following surgery is the source of 26 percent of the data elements needed for medical and surgical measures.

In many larger hospitals, specialized systems are in use in these areas where many patients spend some portion of their hospital stay. Based on vendor market share information available from HIMSS Analytics, it appears that as many as 25 to 30 percent of hospitals with 200 or more beds have one or more of these separate systems capturing some of the information needed for electronic reporting of quality measures.

Move the Dial from Yesterday to Today
One reason that quality reporting has traditionally been retrospective is that hospitals have had to assemble the necessary information in a labor-intensive manual process that relies largely on the paper chart and often can’t be completed until after the discharge when patient information has been coded for reimbursement. Not
surprisingly, common practice is to use side applications (other than the clinical system) for data assembly, analysis and submission to CMS and the Joint Commission among other external parties.

The HITECH EHR incentive program has speeded up timelines for rolling out the modules of the inpatient EHR that both capture critical information (i.e., problem list, medication and allergy lists) and bring HIT to the point of care to assist clinicians in delivering the right care (decision support, patient tracking) as clinicians incorporate the EHR into many clinical tasks. The patient data and logic embodied in the specifications for quality measures is the same as needed in real time to identify patients that match measures and ensure that they receive the recommended care. Aligning measurement with care management by accomplishing quality measurement in real time is the way to unlock the value of data to improve clinical performance — this is the next generation of quality reporting.

<table>
<thead>
<tr>
<th>Action</th>
<th>Latency</th>
<th>Contribution</th>
<th>Requirements</th>
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<tbody>
<tr>
<td>Report</td>
<td>Retrospective</td>
<td>Understand what happened</td>
<td>• Patient history documented</td>
</tr>
<tr>
<td>Identify</td>
<td>Concurrent</td>
<td>Understand what is happening in time to intervene</td>
<td>• Patient information as it is documented (or soon thereafter)</td>
</tr>
<tr>
<td>Detect/Provide</td>
<td>Currently At-</td>
<td>Understand what is developing (or likely to develop) in time to prevent or</td>
<td>• Patient information as it is documented • Core set of critical indicators</td>
</tr>
<tr>
<td>Early Warning</td>
<td>Risk</td>
<td>ameliorate</td>
<td>• Continuously screen new indicator data • Use multi-combinatorial algorithms to identify and stratify patient risk</td>
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In some cases, medical evidence and clinical experience is also sufficient to apply more complex logic to patient data as it is documented in order to identify patients at risk of future, avoidable adverse events.

**Serve Multiple Audiences and End Users**

Proactive care management requires the coordinated action of many audiences and end users that have not benefitted much from traditional quality reporting. More current reporting offers some obvious advantages, but conveying *actionable* information in time to take action has far greater potential value.

<table>
<thead>
<tr>
<th>Audience or End User</th>
<th>Traditional Quality Reporting</th>
<th>Next Generation</th>
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<tbody>
<tr>
<td>Executive</td>
<td>• Understand performance according to standard measures weeks or months after the reporting period</td>
<td>• Monitor current performance on external and internal clinical measures • Understand conditions in which defects are occurring • Be aware of performance trends in advance of external requesters of clinical measures</td>
</tr>
<tr>
<td>Audience or End User</td>
<td>Traditional Quality Reporting</td>
<td>Next Generation</td>
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</table>
| Operational Manager  | • Understand performance according to standard measures weeks or months after the reporting period  
• Possibly see unit-level performance on retrospective reports on standard measures | • Access to dashboards and patient lists/worklists for tracking at-risk patients and status of all at-risk patients with respect to response |
| Care Team            | • Possibly receive historical feedback about performance on measures at unit level  
• Contacted by quality nurse concerning patients that potentially match standard measures | • Notification of patients meeting criteria for care management or with delays in acknowledgement or response  
• Patient lists/worklists including care management status of all at-risk patients  
• Guided access to entry of orders or relevant care documentation |
| Quality Nurse*       | • Receive list of potential target patients based on admission diagnosis  
• Manually verify and track patients and assemble information for quality measures  
• Uses side application or database to accumulate records for external reporting | • Notification of patients meeting criteria for care management  
• Patient lists/worklists including care management status of all at-risk patients  
• Guided access to entry of information verification or care documentation |
| Quality Improvement  | • Receive retrospective reports on standard measures indicating where to focus but rarely deeper understanding of what to improve  
• Initiate new measures and (largely manual) reporting process to support improvement efforts | • Reports concerning performance for all standard measures (any time period) on-demand  
• Drill-down to unit- and patient-level detail  
• Ad hoc reports with user-specified logic and data elements to assess progress with QI |
| Quality Reporting    | • Enter individual patient records (largely manual) into intermediate electronic application for external submission | • Electronically create and submit necessary electronic records for external reporting |

*Or other individual or staff responsible for patient tracking and quality reporting.

Unlocking the value of performance data requires blurring the traditional lines between clinical systems used to manage patient care and clinical tasks and the systems that aggregate patient information and perform reporting. As more of the information needed for measurement and care management algorithms becomes available online, the less need there will be for nurse time devoted to data extraction for external reporting. Eventually this shift will enable rethinking and possibly combining clinical roles, such as case manager/care coordinator and quality nurse as distinct from the care team, or creating new care management roles focused on high-priority conditions, such as heart failure and pneumonia, or at-risk groups, such as patients at risk of readmission or sepsis.

**How Next-Generation Quality Management Will Work**
The key to harnessing the value of data and HIT in the interest of improving clinical performance is bringing quality reporting from the background to the bedside in real time to become next-generation
quality management. How this will work is illustrated below in two examples involving sepsis and the six HITECH meaningful use measures concerning venous thromboembolism (VTE).

The Vision Applied to Sepsis

The Condition

Sepsis, the body’s response to an infection, is a medical emergency because it can rapidly lead to major organ dysfunction. Sepsis develops rapidly, diagnosis is difficult, and the condition is often not diagnosed in the early stages where it is potentially reversible. The high rate of mortality (biggest cause of death in hospital ICUs) spurred an international campaign aimed at improving the diagnosis, survival and management of patients with sepsis by addressing the many challenges associated with it.8

Given the high cost and high volume nature of sepsis in inpatient care, combined with the preventability of many cases, it is likely that CMS will include preventable sepsis among the hospital-acquired conditions for which the hospital must bear the costs of treatment, as well as incorporate measures pertaining to sepsis into the scores for VBP reimbursement in the future. Sepsis is an obvious initial target for next-generation quality management as illustrated in Figure 1 and described below.

Figure 1. Next-Generation Quality Management — Sepsis

Patient Data

Many data elements are required to speed up identification and treatment of patients with (or at risk of developing) sepsis because the individual signs and symptoms are common to many conditions. Vital signs and laboratory results provide much of the information needed, and it is important that these be available for analysis as soon as they are documented. In any hospitals with specialized ED, OR, and/or ICU systems, these need to be among the systems contributing data.
Data Analysis

As each new piece of information in the data set for sepsis prevention and management becomes available, algorithms are rerun to identify new patients at risk, or, for patients already being tracked, gaps in care measured against severity-based treatment protocols. The necessary logic can be derived from the definitions, guidelines and treatment protocols of the Surviving Sepsis Campaign.  

Notification

Sepsis is an ideal example of the value of next-generation quality management because hours, even minutes, matter in preventing or ameliorating major organ dysfunction in at-risk patients. HIT enables prompt notification via a variety of electronic means (e.g., e-mail alerts) and can be delivered according to the way front line care is organized in the hospital. One likely model, for example, would alert both the hospitalist and the infectious disease management team whenever new patients or possible treatment gaps are identified, though other members of the team could access up-to-date patient lists and patient displays at any time.

Action

Next-generation quality management delivers actionable notification by making the next steps easy, whether that involves acknowledging that a potential patient is at risk, reviewing the accumulated patient information, providing necessary additional documentation needed by the algorithms, or placing an order. Patient worklists, condition-specific patient summary displays, and guided access to protocol-based orders and order sets are critical, but must be easily accessed. Here is where the traditional boundaries between quality reporting as a back-end process and care management on the front line become blurred. However this integration is accomplished, it must be seamless for the care team.

The Vision Applied to VTE

The Condition

VTE is the third most common cardiovascular illness, occurring two-thirds of the time in hospitalized patients, many of whom die. Pulmonary embolism (PE), one form of VTE, is the third most common cause of hospital-related death and rated as the most common, preventable cause of hospital-related death. The other major form of VTE, DVT or deep vein thrombosis, is more common and can lead to PE. Not surprisingly, potentially preventable VTE, associated with some orthopedic procedures, is on the list of hospital-acquired conditions for Medicare “payment adjustments” for FY2010 and six VTE measures (five processes and one outcome) are currently included in the HITECH EHR incentive program as required Stage 1 quality reporting measures for meaningful use. In addition, it is clear that CMS intends ultimately to include the HITECH measures in VBP.

- For patients that do not have VTE at admission, two measures are looking for preventive interventions (pharmaceutical or mechanical);
- For patients with confirmed VTE, two measures examine proper medication monitoring, and a third whether appropriate discharge instructions were delivered; and
- Rounding out the set is one outcome measure: how many patients developed potentially preventable VTE. Clinical detection rules based on a combination of signs, symptoms and risk factors are used to diagnose and assess the risk of developing VTE, and there are well-established treatment protocols for assessing risk and options for risk-based treatment.

Next-generation quality management can utilize the logic and related data set in real time as shown in Figure 2 to accomplish both care management and measurement.
Figure 2. Next-Generation Quality Management — VTE

Patient Data

The data set needed for VTE prevention and management is quite extensive because many factors relating to patient history and current status come into play in determining risk and appropriate prophylaxis or treatment. Many of these would not necessarily be picked up and/or documented in assessments at admission in sufficient detail or in coded format (e.g., history of surgery within one month or patient confined to bed for more than 72 hours). Even when systems used in the ED, OR and ICU are feeding data, having the full data set in real time will require an organized process for clinicians and quality nurses to verify and extend the available data set.

Real-Time Data Analysis

Many hospitalized patients must be assessed for VTE prophylaxis, so a major contribution of next-generation quality management is to help determine the patient-specific risk and aggressiveness of treatment based on the large number of factors to be considered. The logic used simply puts the hospital protocol to work and does so more consistently. Analyzing the latest information in real time is especially important for conditions such as pulmonary embolism that are notoriously so difficult to recognize.

Real-Time Notification

Real-time quality reporting offers to speed up decision making about appropriate prophylaxis or treatment by assembling and analyzing the full set of information needed to detect patients at risk and by quickly notifying the care team). Recipients and the urgency of notification can be tailored to how care is organized in the various acute and intensive care units of the hospital. Responses to notifications can also be tracked and elevated in urgency based on elapsed time. Tracking individual patients in this way helps to ensure that important care needs are always addressed in a timely way.
Action
The critical action for any patient will be initiating the appropriate treatment. Notifications can provide both information about the options for treatment and quick access to an appropriate order or order set. Given the large data set for VTE management and the challenges in assembling much of it from free-text documentation, targeted information requests and ease of documenting (via checklists, etc.) can make this task as quick and easy as possible.

Bottom Line
Unlocking the full power of measurement requires not just bringing it into real time, but also using it to guide the appropriate response — in real time — for real patients. In many high-risk situations in hospital care (as in the examples involving sepsis and VTE above), there are many factors to be considered in detection and treatment, new information becomes available every few minutes, and quick recognition and intervention is critical to the best possible outcome for the patient. This type of situation with a large and constantly updated data set, complex logic and the need to continually reevaluate is where computers excel. What’s needed is continuous, real-time monitoring combined with intelligent detection and reliable intervention. In this way, measurement becomes meaningful in the hospital every minute of the day.

Making next-generation quality management a reality will require six major changes in approach:

- Accomplishing real-time capture of critical, structured patient data needed for measurement and monitoring, while making the greatest possible use of routine clinical documentation.
- Building bridges across currently siloed applications and proprietary data models so that all of the information needed is available and usable in real-time.
- Reengineering data analytics from looking backwards to looking forward by treating each new piece of patient information as potentially significant, evaluating its significance with complex logic, translating results into actionable information, and notifying all of the accountable participants in real-time.
- Integrating traditional EHR functions supporting care with measurement and reporting, with the goal of detecting risks of care deficiencies and care outcomes for timely intervention.
- Creating multi-disciplinary care models that respond to real-time detection of changes in patient status and care needs 24 hours a day, seven days a week.
- Sustaining organizational commitment and follow-through to set and then meet standards of care all of the time, for every patient.

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