Public Reporting of 30-Day Mortality for Patients Hospitalized With Acute Myocardial Infarction and Heart Failure

Harlan M. Krumholz, MD, SM; Sharon-Lise T. Normand, PhD

For cardiac care, the Centers for Medicare & Medicaid Services (CMS) has posted information about how hospitals perform in delivering specific types of care since 2004. These quality measures (the Table) include information about how often eligible patients are treated with aspirin, β-blockers, angiotensin-converting enzyme inhibitors, or angiotensin receptor blockers; how often smokers are counseled to quit; how rapidly hospitals provide reperfusion therapy for patients with an ST-segment elevation myocardial infarction; and how often the ejection fraction is measured for patients with heart failure. All of these measures assess care that is strongly recommended by guidelines. The measures include only those patients who should receive this care and are reported at the hospital level simply as percentages. The performance on these measures should ideally be 100%, and the rates have improved markedly over time.

On June 21, 2007, CMS expanded the measures to include outcomes and posted information on its “Hospital Compare” website regarding hospital-specific 30-day mortality rates for patients with acute myocardial infarction and heart failure. These measures used administrative claims data and were validated against measures using medical record data; the measures were approved by the National Quality Forum. In 2007, the publicly reported information was limited to describing hospitals as having rates that were higher, lower, or no different than the national average. Hospitals received information about their rates, their patients, and comparisons with other hospitals in their state and with the nation.

This year, CMS is expanding the publicly available information. For acute myocardial infarction, heart failure, and now pneumonia, CMS will post the calculated risk-standardized 30-day mortality rates (RSMRs) and the 95% interval estimates for each hospital that treated Medicare patients with these conditions; hospital volume for each condition also will be posted. As before, “Hospital Compare” will categorize hospital performance as better than, worse than, and no better than the national rate. This year’s report is based on admissions from July 1, 2006, through June 30, 2007. This Clinician Update provides information about these measures and how they should be used.

Why Report Outcomes?

Quality measures have traditionally focused on whether certain actions are performed. The development of such measures, called process measures, generally follows a standardized methodology and is based on recommendations from clinical practice guidelines. CMS and The Joint Commission have publicly reported process measures for acute myocardial infarction, heart failure, and pneumonia since 2005, and performance on these measures has increased steadily since that time.

The need to consider patient outcomes—what actually happens to patients—in quality measurement is based on several observations. The process measures provide only a narrow, yet important, perspective on quality of care; there are many more decisions and processes that occur in
the course of caring for patients. In addition, for some current process measures, there is little variation in performance, leaving little opportunity for improvement, but there is evidence of clinically important differences among hospitals in their 30-day mortality rates. In the absence of outcome measures, hospitals and clinicians have no way to assess and benchmark overall clinical performance from the patient’s perspective.

**Why Use All-Cause 30-Day Mortality?**

All-cause mortality, rather than mortality from cardiac causes, was selected because it is what matters most to patients. Moreover, noncardiac deaths may still be related to the quality of care provided during a cardiac hospitalization, eg, preventable infections related to hospitalization that could be the proximate cause of death.

The measure assesses mortality within 30 days from admission. This standardized period was chosen to ensure a fair assessment of all hospitals and to prevent differences in transfer rates or variations in length of stay from affecting the measurement.

**What Is the Attribution Rule?**

If a patient is transferred, mortality (or survival) is attributed to the hospital to which the patient was initially admitted. The hospital that transfers the patient has control over where the patient is sent. Attribution to the initial hospital encourages feedback about patient outcomes and a sense of collaboration in improving the transfer process, communication of information, and effort coordination. It also avoids the perverse incentive for hospitals to transfer patients who are doing poorly to avoid accountability for the death.

**Are Claims Data Valid?**

Prior studies have indicated that patient-level factors in administrative claims may not agree with information from the medical record. CMS therefore tested its models that used claims data against models using medical record data. In this case, the validation was not performed by comparing individual variables but by determining whether the RSMRs using claims models could serve as proxies for the RSMRs produced from models using medical record data, acknowledging that even the medical record model has limitations. The claims-based RSMRs had close agreement to the medical record–based RSMRs. This validation provided the impetus to proceed with the effort to publicly report outcomes using the claims data, the only national source of data about patient outcomes.

**How Are Rates Calculated?**

The RSMRs are calculated from a “hierarchical” regression model. Regression models use information about disease severity and comorbidity to predict outcomes. Hierarchical regression models also use disease severity information but are used when the primary objective is to compare hospital outcomes rather than patient outcomes. The hierarchical model accounts for the similarity of outcomes within a hospital that may be due to hospital quality. Each hospital RSMR is similar to an “observed”-to-“expected” ratio that is then multiplied by the national average so that rates rather than ratios are reported. The RSMR, as a specific number, is our best estimate of the hospital’s rate. The rate is best understood by comparing it with the national average. If the hospital’s rate is 14% and the national rate is 16%, then the hospital is doing better than what might be expected given the patients it has.

CMS reports a 95% interval estimate for each hospital RSMR and uses this interval to classify hospitals. The interval estimates incorporate the uncertainty in the estimation and report a range that encompasses the hospital’s true RSMR within a certain degree of probability. What defines an appropriate interval estimate, 80%, 95%, or 99%, may vary depending on the preference of the users. The interval estimate conveys the uncertainty around the estimate. If the interval estimate goes from 11% to 17% and the national rate is 16%, then we would say that the hospital could even be much better than expected with a rate as good as 11% or slightly worse than average at 17%. In this case, because the interval estimate overlaps the national average, we cannot say with

### Table. Acute Myocardial Infarction and Heart Failure Process-of-Care Measures

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<th>Heart attack process-of-care measures</th>
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<td>Percent of heart attack patients given ACE inhibitor or ARB for LVSD</td>
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<td>Percent of heart attack patients given aspirin at arrival</td>
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<td>Percent of heart attack patients given aspirin at discharge</td>
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<td>Percent of heart attack patients given β-blocker at arrival</td>
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<tr>
<td>Percent of heart attack patients given β-blocker at discharge</td>
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<td>Percent of heart attack patients given fibrinolytic medication within 30 min of arrival</td>
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<td>Percent of heart attack patients given PCI within 90 min of arrival</td>
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<td>Percent of heart attack patients who reported smoking given smoking cessation advice/counseling</td>
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ACE indicates angiotensin-converting enzyme; ARB, angiotensin receptor blocker; LVSD, left ventricular systolic dysfunction; and PCI, percutaneous coronary intervention.

Modified from Hospital Compare (http://hospitalcompare.hhs.gov), with permission.
great certainty that it is better than average, even though our best estimate is that it is. If the range were entirely below the national average, for example, if the upper limit of the interval estimate were 15%, then we would have a high degree of certainty that it is better than average.

How Should the RSMR Be Interpreted?

Despite being on the “Hospital Compare” website, direct comparisons of specific RSMRs are generally not valid. Each hospital RSMR quantifies how a hospital has performed with the patients that hospital treated. It would not be proper to compare hospitals with markedly different types of patients. The best interpretation of the results is for a given hospital to assess how it fared compared with the national average.8

What Should Clinicians Do?

Despite the limitations of the mortality measures, they hold the promise of revealing potential opportunities to improve care. Every clinician should see the reports detailing performance that have been given to hospitals, yet unfortunately many hospitals have not downloaded the reports for review. Clinicians can request that their administrators obtain the reports through “QualityNet,” the website through which CMS distributes confidential quality information to hospitals.

The goal is to use measurement as a tool to create an imperative to improve and to provide perspective regarding performance. Clinicians should engage constructively in this effort and should examine adverse outcomes within their institution. The effort is undertaken with the understanding that most deaths are neither preventable nor the result of substandard care. Nevertheless, there is undeniable evidence that some deaths in our healthcare system would have been preventable had optimal care been provided. For example, there is evidence of delays in treatment, medication misdosing, and misdiagnoses. A recent study in Ontario examined deaths among patients who underwent bypass surgery at various institutions.9 Although the Ontario hospitals had favorable mortality rates, about a third of the deaths were deemed preventable had optimal care been provided. That analysis indicated opportunities for improvement in the care of these patients. Such an approach could be generalizable to other conditions.

How Should Patients and the Community Use the Information?

Patients may use the information about RSMRs in discussions with clinicians about hospital performance and the initiatives that are being adopted to ensure high-quality care. The community and hospital boards may take an interest, and the measures may provide an incentive to hospitals to invest more fully in delivering high-quality care and improving the essential systems.

Patients should not use the measures to shop for hospitals at the time of an acute illness. All patients should be instructed to call 911 for emergencies and proceed to the nearest hospital. The measures should not cause delay in seeking care, and it is not their purpose to be used in that setting.

How Are Small-Volume Hospitals Handled?

Small institutions provide very little information on which to estimate performance. Options available to CMS included excluding small hospitals entirely, grouping them into 1 category and reporting an aggregate rate, or including them as individual hospitals and reflecting their accuracy. Because the hierarchical model is used when the primary objective is to compare hospitals, it avoids the problem of spuriously identifying small-volume hospitals as performing better than or worse than expected. The current iteration of the measures is accompanied by information about how many cases were considered in the calculations.

What Are the Limitations of the Measures?

Because of their reliance on administrative claims data, there is a delay in the availability of the data to make the calculation. In general, the publicly reported measures represent performance that occurred 12 to 24 months before the report. In addition, the models may not account for all important unmeasured factors that may differentiate a particular institution. It is possible that patient selection may contribute to the results in ways that are not accounted for by the model.
References


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