

Quality of Medical Care Delivered to Medicare Beneficiaries

A Profile at State and National Levels

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AS CONCERN GROWS THAT ATTEMPTS to control the cost of health care will crowd out quality, evidence has also emerged that quality of care is and has been far more uneven than previously recognized. The public health report entitled *Healthy People 2010*¹ showed wide gaps between public health performance goals and actual achievements on many measures, including some delivered by the fee-for-service (FFS) health care system. Reviews, most notably by Schuster et al,² showed that there were major gaps in acute, chronic, and preventive care almost everywhere that studies have been done. More recently, a report from the Institute of Medicine showed serious problems of harm to patients from medical errors.³ This kind of evidence was reflected in the recommendation of a recent presidential commission that quality of health care should become a major national priority.⁴ Despite condition-specific and managed care-specific reports, there has been no systematic pro-

Context Despite condition-specific and managed care-specific reports, no systematic program has been developed for monitoring the quality of medical care provided to Medicare beneficiaries.

Objective To create a monitoring system for a range of measures of clinical performance that supports quality improvement and provides repeated, reliable estimates at the national and state levels for fee-for-service (FFS) Medicare beneficiaries.

Design, Setting, and Participants National study of repeated, cross-sectional observational data collected in 1997-1999 on all Medicare FFS beneficiaries or on a representative sample of beneficiaries with a particular condition. Data were collected using medical record abstraction for inpatient care, analysis of Medicare claims for some ambulatory services, and surveys for immunization rates. Separate samples were drawn for each topic for each state.

Main Outcome Measures Beneficiary patients' receipt of 24 process-of-care measures related to primary prevention, secondary prevention, or treatment of 6 medical conditions (acute myocardial infarction, breast cancer, diabetes mellitus, heart failure, pneumonia, and stroke) for which there is strong scientific evidence and professional consensus that the process of care either directly improves outcomes or is a necessary step in a chain of care that does so.

Results Across all states for all measures, the percentage of patients receiving appropriate care in the median state ranged from a high of 95% (avoidance of sublingual nifedipine for patients with acute stroke) to a low of 11% (patients with pneumonia screened for pneumococcal immunization status before discharge). The median performance on an indicator is 69% (patients discharged with heart failure diagnosis who received angiotensin-converting enzyme inhibitors; diabetic patients having an eye examination in the last 2 years). Some states (particularly less populous states and those in the Northeast) consistently ranked high in relative performance while others (particularly more populous states and those in the Southeast) consistently ranked low.

Conclusions It is possible to assemble information on a diverse set of clinical performance measures that represent performance on the range of services in a health insurance program. These findings indicate substantial opportunities to improve the care delivered to Medicare beneficiaries and urgently invite a partnership among practitioners, hospitals, health plans, and purchasers to achieve that improvement.

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gram for monitoring the quality of medical care provided to FFS Medicare beneficiaries.

Except for the clinical measures of the Health Plan Employer Data and In-

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formation Set (HEDIS)⁵ and the Diabetes Quality Improvement Project (DQIP)⁶ there is no clinical quality measure set in general national use. About 4 years ago, the Health Care Financing Administration (HCFA) began to implement a program to measure and track the quality of the care for which Medicare pays. Simultaneously, HCFA committed to using its peer review organization (PRO) contractors to systematically promote improved performance on the quality measures tracked under this program using a voluntary, collaborative, and nonpunitive educational strategy.⁷

This article describes the 24 initial measures used in this program and reports the baseline values measured in 1997-1999. The Medicare measurement system we developed includes most of the HEDIS clinical measures, but it addresses more conditions, measures more elements of care, and measures the care delivered to the 85% of Medicare beneficiaries who are covered under FFS. The sampling frame provides state-level results to target PRO activities, evaluate PRO and HCFA effectiveness in improving care, and create a national picture of care under Medicare FFS.

Even though purchasers and beneficiaries are primarily interested in outcomes, we focused on measuring processes of care critical to outcomes rather than on measuring outcomes themselves. Five reasons drove this choice: (1) in comparison to outcomes of care, there is more consensus on appropriate processes of care and the target rates (nearly 100%); (2) measuring processes of care generally does not require the risk adjustment that has been so controversial in comparisons of outcomes; (3) it is easier for providers, practitioners, and plans to identify and fix the reasons why critical processes of care were not carried out than to determine why outcomes are not optimal; (4) many important outcomes take years; and (5) because significant, achievable improvements in outcomes are generally much smaller in relative terms than improvements in processes, unrealistic sample sizes are necessary to measure signifi-

cant improvements in outcomes. While we report only process measures here, HCFA intends to track outcomes, risk-adjusted when possible, at the national level for the targeted conditions.

METHODS

Clinical Topic and Measure Selection

The clinical topics were selected using 5 criteria: (1) the disease is prevalent and a major source of morbidity or mortality in the Medicare population; (2) there is strong scientific evidence and practitioner consensus that there are processes of care that can substantially improve outcomes; (3) reliably measuring the delivery of these processes is feasible; (4) there is a substantial "performance gap" between current performance and desirable performance; and (5) there is at least anecdotal evidence that PROs can intervene effectively to improve performance on the measures. Using these criteria, we adopted or developed 24 process-of-care measures (TABLE 1) relating to primary prevention, secondary prevention, or treatment of acute myocardial infarction (AMI), breast cancer, diabetes mellitus, heart failure, pneumonia, and stroke.

Measures

Each measure is based on professionally developed, widely accepted practice guidelines that were translated into measures either as part of a larger partnership (HEDIS and DQIP) or national public health surveillance effort (Behavioral Risk Factor Surveillance System [BRFSS]) or by HCFA staff in consultation with experts and relevant professional groups. Whenever possible, we used measures that have wide acceptance and have been used and tested. The detailed measure specifications and the scientific evidence supporting each of these measures is summarized on the HCFA Web site.⁸

Acute Myocardial Infarction. We updated and/or expanded measures that had been used for the Medicare Cooperative Cardiovascular Project.^{9,10}

Heart Failure. We created measures based on treatment recommendations

from the American College of Cardiology/American Heart Association and the Agency for Healthcare Research and Quality, which were reviewed by clinical expert technical advisory panels and extensively field tested by PROs.

Stroke. We adapted measures based on treatment recommendations from the American College of Chest Physicians, the American Heart Association, the National Stroke Association, and the American Academy of Neurology; the measures were reviewed by clinical expert technical advisory panels and extensively field tested by PROs.

Treatment of Pneumonia. We used measures developed in collaboration with the American Thoracic Society, the Infectious Diseases Society of America, and the Centers for Disease Control and Prevention; the measures were reviewed by clinical expert technical advisory panels and extensively field tested by PROs.

Prevention of Pneumonia. We used outpatient immunization measures in the BRFSS, which correspond both to the HEDIS system and to commitments that HCFA has made to Congress under the Government Performance and Results Act and inpatient measures corresponding to recommendations of the Advisory Committee on Immunization Practices.

Breast Cancer. We adopted the breast cancer screening measure used in HEDIS,⁵ which measures the percentage of women aged 52 to 69 years who have received a mammogram in the past 2 years.

Diabetes. We selected those measures developed by the DQIP that can be computed from claims data. Indicators based on chart abstraction were not included because a representative sample of office records is not currently available to PROs.

Data Sources and Sampling Frame

In all measures except immunization status, the denominator or sampling frame is patients enrolled in FFS Medicare, and Medicare+Choice (managed care) plan members are excluded. All states in the United States

were sampled, plus the District of Columbia and Puerto Rico.

Inpatient Measures (AMI, Heart Failure, Atrial Fibrillation, Stroke, Treatment of Pneumonia). We sampled from Medicare hospital claims data in each state for each condition. The discharges were eligible for selection only if the principal diagnosis met the criteria for the target condition, except for

stroke prevention, for which we accepted any diagnosis of atrial fibrillation. We sampled the discharges for a 6-month period within each state. For a third of the states, this period was from April to October 1998; for another third of the states, July to December 1998; and for the remaining states, October 1998 to March 1999. We sampled up to 850 discharges for AMI,

pneumonia, and stroke, and up to 900 discharges for heart failure and used a census of all discharges for states with fewer than the targeted number of discharges during the period. The universe of eligible claims was first sorted by age, race, sex, and hospital, and cases were then sampled systematically from a random starting point. Data for the performance measures were

Table 1. Quality Indicators for Care of Medicare Beneficiaries

| Clinical Topic | Indicator | Short Name | Sampling Frame for Denominator | Data Source |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Inpatient setting Acute myocardial infarction | Administration of aspirin within 24 h of admission | Aspirin 24 h | All Medicare patients with principal discharge diagnosis of acute myocardial infarction and no contraindications | Systematic random sample of up to 750 inpatient records per state |
| | Aspirin prescribed at discharge | Aspirin disch | | |
| | Administration of β -blocker within 24 h of admission | BB 24 h | | |
| | β -blocker prescribed at discharge | BB disch | | |
| | ACE Inhibitor prescribed at discharge for patients with left ventricular ejection fraction <40% | ACEI in AMI | | |
| | Smoking cessation counseling given during hospitalization | Smoking | | |
| | Time to angioplasty, min | PTCA (min) | | |
| | Time to thrombolytic therapy, min | Lytic (min) | | |
| Heart failure | Evaluation of left ventricular ejection fraction | LVEF | All Medicare patients with principal discharge diagnosis of heart failure | Systematic random sample of up to 800 inpatient records per state |
| | ACE Inhibitor prescribed at discharge for patients with left ventricular ejection fraction <40% | ACEI in HF | | |
| Stroke | Warfarin prescribed for patients with atrial fibrillation | Afibrillation | All Medicare patients with any discharge diagnosis of atrial fibrillation | Systematic random sample of up to 750 inpatient records per state |
| | Antithrombotic prescribed at discharge for patients with acute stroke or transient ischemic attack | Antithrombotic | All Medicare patients with principal discharge diagnosis of stroke (nifedipine and antithrombotic) or transient ischemic attack (antithrombotic) | Systematic random sample of up to 750 inpatient records per state |
| | Avoidance of sublingual nifedipine for patients with acute stroke | Nifedipine | | |
| Pneumonia | Antibiotic within 8 h of arrival at hospital | Antibiotic time | All Medicare patients with a discharge diagnosis of pneumonia | Systematic random sample of up to 750 inpatient records per state |
| | Antibiotic consistent with current recommendations | Antibiotic Rx | | |
| | Blood culture drawn (if done) before antibiotic given | Blood culture | | |
| | Patient screened for or given influenza vaccine | Flu screen | | |
| | Patient screened for or given pneumococcal vaccine | Pneu screen | | |
| Any setting Pneumonia | Influenza immunization every year | Flu immun | All noninstitutionalized persons aged ≥ 65 y | Behavioral Risk Factor Surveillance System |
| | Pneumococcal immunization at least once ever | Pneu immun | | |
| Breast cancer | Mammogram at least every 2 y | Mammography | All female Medicare beneficiaries aged 52-69 y | All Medicare claims |
| Diabetes | Hemoglobin A _{1c} at least every year | HbA _{1c} | All Medicare patients with 2 ambulatory diagnoses or 1 inpatient diagnosis of diabetes | All Medicare claims |
| | Eye examination at least every 2 y | Eye exam | | |
| | Lipid profile at least every 2 y | Lipid profile | | |

*ACE indicates angiotensin-converting enzyme; PTCA, percutaneous transluminal coronary angioplasty; and HF, heart failure.

abstracted from the hospital medical records by 2 clinical data abstraction centers (which are administratively independent of individual PROs) using computerized abstraction tools with explicit criteria that were developed and tested specifically for these measures. The abstraction tools collected information on contraindications to the treatment process being studied. Informed consent was not required because the data were collected for administration of the Medicare program, not for research, and access to these data is given to the program by law.

Influenza and Pneumococcal Immunization Rates. We used the BRFSS,¹¹ which is coordinated by the Centers for Disease Control and Prevention and carried out by state health departments, to estimate statewide vaccination coverage. The BRFSS is a random-digit-dialed telephone survey of the noninstitutionalized adult population, and the estimates are for all persons older than 65 years; the national sample is 26 469 for this age group, with a median state sample of 430 in 1997 (estimated from the 1997 BRFSS Public Use Data File¹²). The estimates therefore differ from those for other samples by including beneficiaries who are enrolled in managed care and excluding persons younger than 65 years old. Rate estimates reported here are from the 1997 survey. Screening for or administration of influenza and pneumococcal vaccine for inpatients with pneumonia was ascertained from nursing and physician notes and other information in the medical record.

Breast Cancer (Mammography). The denominator was all women aged 52 to 69 years who were enrolled in Medicare FFS in both 1997 and 1998. Whether a mammogram had been performed in the 2 years was determined by whether Medicare had paid a claim for a diagnostic or screening mammogram in that period.

Diabetes. The denominator was all FFS beneficiaries aged 18 to 75 years who had 2 outpatient claims or 1 inpatient claim with a diagnosis of diabetes mellitus during a 1-year period

starting January 1998-July 1998, with the start date determined by the date when the PRO's contract began in that state. Whether a service had been provided was determined by whether Medicare had paid a claim for the service.

Statistical Methods

For the inpatient measures, patients found to have a clinical contraindication to the process of care were either included as having received appropriate care (heart failure measures) or excluded from both the numerator and denominator (other appropriateness of care measures). Reliability was calculated as the percentage agreement on an indicator for 2 blinded, independent abstractions at different abstraction centers. Performance was calculated at the state level for each of the measures. For 22 measures, results were calculated as the percentage of patients receiving appropriate care; for time to angioplasty or thrombolytic therapy, the result was calculated as the median number of minutes from arrival at the hospital to beginning of angioplasty or thrombolytic agent instillation. We primarily direct our attention to variation among states (including the District of Columbia and Puerto Rico). We therefore calculated, for each measure, performance of the median state rather than a national average. We also calculated the rank of each state on each performance measure and then calculated the average rank for each state across the 22 measures (we excluded time to angioplasty and time to thrombolytic therapy from this calculation because the sample size was too small in many states) and the SD of the 22 ranks for each state. We mapped the distribution of average ranks to display geographic patterns.

RESULTS

Across the 4 inpatient conditions we obtained 94.3% to 99.2% of sampled records (median, 95.3%). The reliability of measures based on medical record abstraction ranged from 80% to 95% with a median interrater reliability of 90%. TABLE 2 shows the number of charts in the denominator of each rate

in 2 ways: the individual rate or time number is formatted in a type that reflects the number of charts used; the Table also provides the median number of charts across all states. Even though more than 700 records were obtained for each condition in most states, the number of patients who qualified for a particular indicator was rarely even half that number and sometimes much less. Table 2 shows 3 kinds of results: (1) the performance of the median state on each measure, (2) the average of each state's performance ranks across the 22 measures, and (3) the rank of each state among all states based on this average rank. More detailed results are available at the HCFA Web site.⁸

The performance rates in the median state for each of the 22 rate measures range from a high of 95% (avoidance of sublingual nifedipine in acute stroke) to a low of 11% (patients with pneumonia screened for pneumococcal immunization status before discharge). When performance indicators are ranked by the rate in the median state, the median performance is 69% (patients discharged with heart failure diagnosis who received angiotensin-converting enzyme inhibitors; diabetic patients having an eye examination in the last 2 years). The range of rates for each measure also varies widely across the states, from a low of a 13-percentage point range for avoidance of sublingual nifedipine for patients with acute stroke (Nevada, 86%; Wyoming, 100%) to a high of a 54-percentage point range for antibiotic administered within 8 hours of hospital arrival to patients with an admission diagnosis of pneumonia (Puerto Rico, 38%; Montana, 93%). The median of the ranges for performance indicators (other than time to angioplasty and thrombolytic therapy) is 33 percentage points and the median interquartile range is 8 percentage points. Table 2 shows the performance of each state on each quality measure.

Table 2 also shows the average of the ranking of each state compared with other states on all of the performance measures (except time to angioplasty and thrombolytic therapy) and the SD

of these rankings; these averages of rankings range from 10 to 48 because no state is consistently at the top or bottom. Based on the average of the rankings, Table 2 shows the state's rank among all states and areas (range, 1-52). The FIGURE shows that the rankings tend to follow a geographic pattern with northern and less populous states more likely to rank high than southern and more populous states.

COMMENT

Implications

Previous studies have reported results using some of the individual measures reported here,^{1-4,10} and HEDIS provides a picture (albeit more limited) of care in Medicare managed care, but we believe that this is the first study to provide a broad picture of quality of care in FFS Medicare and the first to include data that have been verified by chart abstraction of a national sample for several conditions. This study provides strong evidence of a substantial opportunity to improve the care delivered to Medicare beneficiaries. Available data suggest that providing the services measured here could each save hundreds to thousands of lives a year, but more precise estimates of the effect of such improvement on beneficiary health are beyond the scope of this study.

The differences in average performance among states and regions are modest compared with the overall need for improvement. Nevertheless, the data suggest real underlying geographic differences in the way care is delivered to the Medicare FFS population. They also suggest that variations among states on individual measures are part of a larger pattern and not simply local variation. We do not yet understand the reasons for these differences or whether aspects of the systems in high-performing states can be easily replicated in low-performing states.

Limitations and Qualifications

These measures give a somewhat unbalanced picture of Medicare services. They overrepresent inpatient and preventive services, underrepresent am-

bulatory care, and scarcely represent interventional procedures at all.

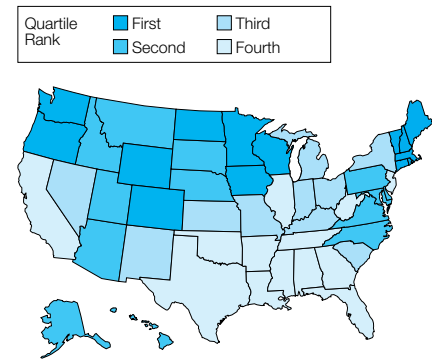
This article is generally limited to care delivered in FFS Medicare. Nationally, about 85% of Medicare beneficiaries are cared for under FFS and about 15% under managed care, but in Arizona, California, Florida, and Pennsylvania more than 25% of beneficiaries are enrolled in managed care. Comparing HEDIS data from managed care with this FFS data presents technical problems that we have not yet solved because denominators and/or measure definitions differ in the 2 systems. However, the data reported here for FFS do not differ dramatically from the HEDIS data reported for Medicare managed care.¹³

This article is limited to national- and state-level information. Information on individual practitioners and providers requires a different and more efficient data collection and reporting system designed to collect such voluminous data. Even with practitioner- and provider-level data, many practitioners and providers treat too few patients with particular conditions to generate a meaningful sample size, and it will remain difficult to determine which practitioner is responsible for delivering the process of care that is measured.

We must also consider the extent to which these measures fairly represent quality of care for the services and population addressed. There are 2 concerns: the validity of the measures as representations of quality of care and the accuracy of the data.

Each of the measures is based on both strong science and professional consensus that delivering the service would either improve outcomes or be necessary to services that would improve outcomes. Nevertheless, for almost all of the services, there are circumstances in which delivering them would be inappropriate. For the inpatient measures, we included the major contraindications in our abstraction and computational algorithms, but there are likely to be unusual circumstances that account for a few cases of undelivered care. The measures are designed to credit care as appropriate if there is doubt, and we

Figure. Average State Rank on 22 Medicare Performance Measures



Puerto Rico (not shown) is in the fourth quartile.

know from PRO field experience with the measures that valid, unmeasured contraindications are not frequent.

Small numbers are a problem for some inpatient measures, such as time to angioplasty and thrombolytic therapy, because a relatively small number of the beneficiaries in our sample received these services in some states. However, the effect of small denominators is to increase the variation among states, not to bias the median downward. We use surveys for influenza and pneumococcal immunization rates because many influenza immunizations are delivered without claims being submitted to Medicare, and because there is no immediately feasible way to accurately determine pneumococcal immunization status from existing Medicare claims data files. Surveys, of course, may have recall and sampling bias, but this does not appear to be a major problem for the other measures.

If interrater reliability is 90%, the accuracy of the individual abstractor is about 95% (each rater accounts for about half of disagreements between raters). The range of reliabilities is about 80% to 95%, suggesting that, even for the most unreliable measure, abstraction errors would not account for a performance level below 90%.

Future Steps

We believe that this article and the tracking system behind it establish a

mechanism for HCFA to move beyond its historical focus on individual cases and providers and to take responsibility as a purchaser for the care delivered to the population of Medicare beneficiaries. Although it is customary to speak of holding providers, practitioners, and health plans accountable for the care they provide, it is at least as important to hold purchasers, whether Medicare or Medicaid or commercial or government employers, accountable for the quality of the care they purchase, because they are making continual and important decisions that potentially balance quality against expenditures. As required by the Government Performance and Results Act, HCFA is beginning to assume this responsibility by reporting some of these measures to Congress as part of its annual budget submission.

HCFA intends to extend the Medicare clinical performance tracking system in 3 ways. First, for those measures based on medical record abstraction, we are now collecting a continuous sample large enough to provide accurate trending of national data every few months, although too small to provide state-level estimates more than every few years. Second, we will collect enough data to make accurate state-level estimates every 3 years (synchronous with PRO contract cycles). This will allow us to evaluate the success of each PRO in meeting its major contractual requirement, which is to improve statewide performance on the measures. Third, we will extend the system to include other settings, such as nursing homes, home health agencies, and other providers and to include other clinical priorities.

Obviously, pervasive gaps between what is being done and what could be done invite us to consider what policies might lead to improvements. A future article will describe the quality improvement strategy that HCFA is pursuing to improve performance on these and other measures. Recent reports^{3,4} have emphasized the importance of focusing on system failure rather than practitioner failure to working to close these performance gaps. The United States has poured enor-

mous resources into practitioner training and very little into improving processes in the systems within which those practitioners work, and it is time to redress that balance. Available evidence suggests that, at least for preventive services, systems changes are more effective than either provider or patient education in improving provision of services.¹⁴

The data should also remind us of the need for partnership among HCFA, beneficiaries, practitioners, providers, and health plans to achieve improvements. The HCFA PROs are charged with promoting improvement. They now have performance-based contracts with more than \$200 million a year for improving performance on the measures reported. Their contracts hold them accountable for successful promotion of improvement, and there is good evidence that they can contribute to significant improvement in care.¹⁰ Nevertheless, neither HCFA nor PROs deliver care. They can only provide technical assistance to practitioners, providers, and plans; take steps that will make it easier for practitioners and providers to deliver and for beneficiaries to receive needed care; and serve as conveners for partnerships among local stakeholders. Only practitioners and providers can make such systems changes as putting appropriate standing orders in place, installing failure-resistant information systems, and designing processes that deliver critical services within the optimum window of time. Segmenting improvement efforts according to payment source is inefficient and counterproductive. Partnerships among all of the stakeholders, regardless of source of payment, can make improvement possible and are urgently needed.

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