



Lumetra
Brighter insights. Better healthcare.

Efficiency

Quality

Measure

Compare



PBGH
Pacific Business
Group on Health

Advancing Physician Performance Measurement

*Using Administrative Data to
Assess Physician Quality and
Efficiency*

September 2005

Acknowledgements

Preparation of this report reflects significant contributions by numerous individuals listed below. In particular, we wish to acknowledge Patricia Sinnott for organizing the "State of the Art and Road Map for Public/Private Collaboration for Performance Excellence" conference and Joachim Roski for providing the material contained in the section on performance measurement standardization.

Cheryl Damberg, Ph.D. (Pacific Business Group on Health)
Kyle Grazier, Dr.P.H. (University of Michigan)
Sheldon Greenfield, M.D. (University of California at Irvine)
David Hopkins, Ph.D. (Pacific Business Group on Health)
Sherrie H. Kaplan, Ph.D. (University of California at Irvine)
Peter V. Lee, J.D. (Pacific Business Group on Health)
Arnold Milstein, M.D., MPH (Pacific Business Group on Health)
Joachim Roski, Ph.D. (National Committee for Quality Assurance)
Patricia L. Sinnott, Ph.D. (Pacific Business Group on Health)

We are grateful for the generous financial support provided by our project sponsors: The Robert Wood Johnson Foundation (RWJF) and The Commonwealth Fund (CMWF). In particular, we would like to thank the staff from each foundation for their thoughtful comments regarding the design of the meeting and preparation of this report.



PBGH
Pacific Business
Group on Health

The Pacific Business Group on Health (PBGH) is one of the nation's top business coalitions focused on health care. Our large purchaser members spend billions of dollars annually to provide health care coverage to more than 3 million employees, retirees and dependents. In addition, PBGH operates PacAdvantage, a small group purchasing pool providing health coverage to the employees of thousands of California's small businesses. PBGH is a respected voice in the state and national dialogue on how to improve the quality and effectiveness of health care while moderating costs. Partnering with the state's leading health plans, provider organizations, consumer groups and other stakeholders, PBGH works on many fronts to promote value-based purchasing in health care. Reflecting the vision of its member organizations, PBGH plays a leadership role in an array of health care quality initiatives that includes providing consumers with standardized comparative quality information and developing methods to assess and communicate the quality of care delivered by health plans, medical groups, physicians and hospitals. For additional information or an electronic copy of this report, visit www.pbgh.org.



Lumetra is a San Francisco-based independent, non-profit organization dedicated to improving the quality, safety, and integrity of health care for providers and consumers. Lumetra provides innovation services and solutions in the areas of medical review, quality improvement, data analysis, and fraud detection and prevention. Since 1984, Lumetra has been contracted by CMS to be the Medicare Quality Improvement Organization (QIO) for California. For more information, please visit www.lumetra.com

Advancing Physician Performance Measurement

Using Administrative Data to Assess Physician Quality and Efficiency

September 2005

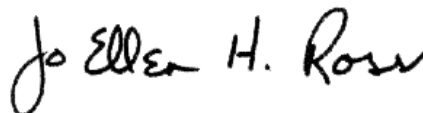
The convergence of a host of forces – most notably rapid and unabated growth in health care costs and serious deficits in the quality of care that is delivered – has underscored the urgent need to identify and implement new strategies to address these serious problems facing the U.S. health care system, and at a personal level, our ability to afford and receive health care. A key strategy on the policy agenda is advancing performance measurement at all levels of the health care system, and in particular, at the physician level where there is substantial unexplained variation in practice that leads to poor quality, inefficient delivery of care, and wasteful spending on care.

This report was developed as part of a joint Pacific Business Group on Health (PBGH) and Lumetra-sponsored project to examine the current state of physician performance measurement and to map a research and policy agenda moving forward to advance physician performance measurement. Measuring and using physician-level performance information is critical to national efforts to improve the quality of care and efficiency with which care is delivered. Physicians want and need better tools to help them deliver the high quality care they desire to provide for their patients. And, in an environment where consumers increasingly are being asked to play a greater role in health care decision-making and cost control, consumers need comparative information to use to make value-based health care choices.

We hope that this report stimulates thinking and action to advance our collective ability to measure and improve the performance of our health care system. These are necessary steps that must be taken to improve the quality and affordability of health care in America.



Peter V. Lee, J.D.
President and CEO
Pacific Business Group on Health
San Francisco, CA



Jo Ellen H. Ross, MNA
President and CEO
Lumetra
San Francisco, CA

Table of Contents

<i>Executive Summary</i>	1
<i>Background and Context</i>	3
<i>Goals of Physician Performance Measurement</i>	7
<i>Data Issues in Physician Performance Measurement</i>	9
<i>Data Availability</i>	9
<i>Data Sufficiency</i>	10
<i>Measures and Measurement Methods</i>	12
<i>Quality Performance Measures and Measurement</i>	12
<i>Cost-Efficiency Measures and Measurement</i>	15
<i>Performance Measurement Standardization</i>	16
<i>Transparency in Measurement</i>	16
<i>National Initiatives in Measurement Activities</i>	16
<i>Implementation Issues in Physician Performance Measurement</i>	20
<i>Risk Adjustment</i>	20
<i>Attribution of Patients, Procedures, and Episodes of Care to Physicians</i>	21
<i>Peer Group Comparison of Physicians for Scoring</i>	22
<i>Utility of Output to Enable Physician Performance Improvement</i>	23
<i>Summary and Next Steps</i>	24
<i>Meeting Participants</i>	26
<i>References</i>	27

Executive Summary

Rapid and unabated growth in health care costs and serious deficits in the quality of care that is delivered underscore an urgent need to identify and implement new strategies to address these serious problems facing the U.S. health care system, and at a personal level, our ability as individuals and families to afford and receive health care. Health care costs continue to rise at five times the rate of inflation and this growth in the cost of financing health care place considerable pressure on our national economy, the cost of employment, and on the personal finances of individual consumers. While well-trained caring physicians touch the lives of millions, on average patients receive recommended care 50% of the time, and patient safety errors in our health care system contribute to the needless death of more than 100,000 patients annually.^{1, 2}

The performance failures of our health care system are largely invisible and will continue to be invisible as long as we do not have systems that allow us to track the cost-efficiency and quality performance of the providers and organizations that are the central suppliers of our health care. The lack of transparency contributes to the invisibility of the failures. Currently, our payment systems reward (i.e., pay) providers for care irrespective of the level of quality of care or the efficiency with which care is delivered. In order to address the cost and quality problems in American health care, we need to develop new systems of care that include performance measurement and feedback, transparency and public accountability, and rewards to incent optimal performance.

A key strategy on the policy agenda is advancing performance measurement at all levels of the health care system, and in particular, at the physician level where there is substantial unexplained variation in practice that leads to poor quality, inefficient delivery

of care, and wasteful spending on care. Physician performance measurement, including both quality and cost-efficiency, is an important vehicle to support individual physician desires to improve as well as value-based purchasing, which will in turn stimulate improvements in quality and costs of delivering care.

Pacific Business Group on Health (PBGH) and Lumetra sponsored a project to examine the current state of physician performance measurement and to map a research and policy agenda moving forward to advance physician performance measurement. As part of this project, PBGH and Lumetra hosted a meeting of major stakeholders, measurement experts and leading foundations to:

- discuss the current state of physician performance measurement,
- explore how administrative data can be effectively used to assess physician performance; and,
- begin laying out a road map to achieve accountability for and transparency of physician performance on quality and cost-efficiency.

During the two-day meeting, it was noted that there are existing tools in the marketplace that can produce physician performance scores for quality and cost-efficiency using administrative data. While concerns have been raised about the validity of using administrative data sources to produce performance measures, such sources have improved over the past decade and continue to improve in response to explicit efforts to assess performance using these data. In the area of measurement development and standardization, there is significant effort underway by a range of professional organizations, specialty societies, federal agencies, and policy- and standards-setting organizations

(e.g., the National Committee for Quality Assurance (NCQA), the Ambulatory Care Quality Alliance (ACA) and the National Quality Forum (NQF)) to develop and achieve consensus on national standards for measuring physician quality and cost-efficiency performance and to broaden the set of measures that can be used by stakeholders to drive system change. This report provides a snapshot of a rapidly moving field where hundreds of measures are being developed by a range of entities and measures are beginning to be used in a variety of applications.

There are several areas that require our attention and action to move the physician measurement and reporting agenda forward to provide comprehensive measures of the functioning of our health care system, including:

- Continued development of evidence-based quality measures that can be applied to assess individual physician performance on a broader and deeper array of medical conditions and medical specialties;
- Further work to standardize the quality and cost-efficiency measures which the marketplace will use to assess physician performance;
- Research to assess the optimal ways to construct stable performance scores (e.g., levels of aggregation) and which discriminate performance; and,
- Research to assess the optimal ways to provide feedback to physicians and consumers/patients to facilitate their understanding and use of the information.

It is important that all stakeholders understand that they have an important role to play in owning and working to solve the cost and quality problems in our health care system. Efforts to advance our collective ability to measure, hold accountable, and improve the transparency of the performance of physicians is an important step in that direction, and one that will require coordinated and concerted policy action.

Background and Context

An array of studies describe the extent of the deficiencies in the safety and quality of patient care in the United States.^{1, 2} Many Americans have also likely experienced first hand both the benefits of quality care and these deficiencies as consumers of our own health care or that of a family member. Experts have estimated that optimal adherence to evidence-based treatment guidelines and patient safety practices could prevent significant suffering caused by the delivery of inappropriate health care services,² and result in an immediate health status gain of 15 percentage points for Medicare beneficiaries.³

Moreover, large increases in health care costs—that outpace general inflation by five-fold and continue to grow in an unabated fashion—are causing a crisis in the affordability of health care and raise questions moving forward about who will finance these increases. According to a General Accounting Office study, the average health insurance premium is almost now equivalent to more than 50% of the average worker’s earnings.⁴ Employers, in their struggle to be able to continue to offer health insurance to their workers, are shifting a growing share of costs to employees in the form of increased out-of-pocket costs.

A number of studies identify substantial opportunities to improve the cost-efficiency of physician resource use. Health care spending varies substantially across the country⁵⁻⁷ and these variations are neither explained by patient demographics nor by beneficiaries’ need for services.^{5, 6} Research based on analysis of Medicare data found that there is no net improvement in either life expectancy or health outcomes in regions with greater capacity (i.e., physicians and/or hospitals) or higher intensity of service utilization.⁸⁻¹¹ In fact, among those geographic areas with

relatively greater costs, increased capacity and intensity of services delivered appear to be associated with an increased risk of adverse outcomes.^{12, 13} These studies of the experience of Medicare beneficiaries indicate that up to 41% of the variation in Medicare end-of-life spending may be attributed to variations in the local supply of medical specialists and acute care hospital capacity.^{7, 10} These variations in health care capacity and cost, without attendant improvements in quality of care or health outcome are estimated to cost Medicare alone up to 29% of its total system costs.^{7, 14}

Against this backdrop, and recognizing that physicians control more than 80% of the decisions in health care,^{15, 16} public and private purchasers, who pay for the vast majority of all of the health care delivered in the U.S., are seeking more effective ways to promote higher quality and more cost-efficient delivery of care by physicians.¹⁷ Purchasers view market pressure as a key policy lever to drive improvements in quality and reduce costs.¹⁸⁻²³ Research suggests that physician clinical performance transparency (i.e., the public disclosure of physician performance information),^{24, 25} coupled with performance incentives are integral components of any initiative to improve the quality of services delivered and to reduce their attendant costs.²⁶⁻²⁸ The public reporting of hospital and surgeon-specific mortality rates for coronary artery bypass graft surgery in New York was a powerful driver of hospital and physician performance improvement,²⁹ and a recent study of hospitals and the role of performance measurement and public accountability suggests that even the threat of public disclosure of performance information can significantly increase quality improvement activities and improve performance.³⁰

Historically a variety of strategies have been used to improve the quality and value of health care. These strategies have included purchasing efforts, such as health plan audits, performance measurement and public reporting of results, and financial guarantees tied to performance,³¹ consumer-focused efforts, such as consumer report cards, educational materials, benefit redesign,³² and provider-directed quality improvement initiatives, such as physician continuing education programs, reminders, and audits.³³⁻³⁵ More recently, the focus to improve quality has expanded to include public accountability and performance measurement at all levels of the health system, and the redesign of payment policies to incent improvements in performance.

While we see the good work of thousands of health professionals, the performance failures of our health care system are largely invisible and will remain invisible as long as we do not have systems that allow us to track the cost-efficiency and quality performance of the providers and organizations that are the central suppliers of our health care. Currently, our payment systems reward (i.e., pay) providers for care irrespective of the level of quality that is provided or the efficiency with which care is delivered. In order to address the cost and quality problems in American health care, we need to develop new systems which will include performance measurement and feedback, transparency and public accountability, and rewards to incent optimal performance.

A key strategy on the health care policy agenda is advancing performance measurement at all levels of the health care system, and in particular, at the physician level where there is substantial unexplained variation in practice that leads to poor quality, inefficient delivery, and wasteful spending on care. Physician performance measurement, including both quality and cost-efficiency, is an important vehicle to support value-based purchasing, which will in turn stimulate improvements in quality and costs of delivering care. Provider-based measurement of performance is critical to efforts to reform existing payment policies to incent quality

improvement investments by providers. Mark McClellan, Administrator of the Centers for Medicare & Medicaid Services (CMS), notes that “linking a portion of Medicare payments to valid measures of quality and effective use of resources would give providers more direct incentives and financial support to implement the innovative ideas and approaches that actually result in improvements in the value of care that our beneficiaries receive.”³⁶

Efforts are underway nationally, by CMS, as well as regionally by many private payors to develop reporting and payment systems that support and reward quality and the efficient delivery of care. In the public arena, CMS is actively advancing a range of quality measurement and improvement demonstration projects and policies, including the development and endorsement of quality indicators at the hospital level (i.e., Hospital Quality Alliance performance measures), physician level (i.e., the Ambulatory Care Quality Alliance (AQA) measures and the CMS-AMA-NCQA collaboration on ambulatory care measures), and pay-for-performance demonstrations with hospitals (e.g., Premier Hospital Quality Incentive Demonstration) and physicians (e.g., Physician Group Practice Demonstration and the Medicare Care Management Performance Demonstration). The Agency for Healthcare Research and Quality (AHRQ) is also leading efforts to develop physician-level measures (e.g., Ambulatory Care Quality Alliance measures) and review what is known about efficiency measurement.

Stakeholders in the private sector – such as the Pacific Business Group on Health (PBGH), Bridges to Excellence, and the Massachusetts Health Quality Partnership – are also working to advance measurement, accountability, and rewards for performance. These efforts seek to produce comparative physician performance information so that:

- 1) **Physicians** will have the opportunity to improve based on benchmarking their cost-efficiency and

quality performance against that of their peers using objective and reliable indicators;

- 2) **Consumers** will have access to previously unavailable information about physician quality and efficiency, empowering them to make informed health care choices; and
- 3) **Private and public sector purchasers and health plans** will have new information with which they can encourage physicians to improve health care quality and control health care costs by rewarding physicians for their performance and improvement.

To this end, the Consumer-Purchaser Disclosure Group, a consortium of purchaser, consumer, and labor organizations, has set forth an ambitious challenge to have physician-specific performance information available to consumers by 2007 to enable them "to select physicians based on reporting of nationally standardized measures for clinical quality, patient experience, equity and efficiency."³⁷ Critical to advancing both public and private sector efforts to reform the health care system through enhanced accountability and value-based purchasing is understanding and advancing the current state of our ability to measure physician performance.

Several policy- and standards-setting organizations (including the National Committee for Quality Assurance (NCQA), the Ambulatory Quality Alliance (AQA) and the National Quality Forum (NQF)), are engaged in a long-term process of developing consensus on national standards for measuring physician quality and cost-efficiency performance. While in 2005 agreement has been reached on a "starter set" of ambulatory care measures, results that encompass the range of care provided by most physician specialties are not expected to reach the market until 2006-2007. Also, to date, the consensus process has largely left unanswered the issue of implementing the collection of the data, as many of the measures in the starter set require access to electronic health records and/or medical

charts – yet there is no organized system for financing and collecting such data directly from physicians' offices.

While measure development and standardization continues to evolve, health plans, provider organizations, and purchaser groups have already begun to embark on a variety of initiatives that produce physician performance information using available tools and methods. Such initiatives are under way across the country, such as those sponsored by business coalitions in Massachusetts, Missouri, Florida, and California, and in health plans including UnitedHealthcare, Aetna, PacifiCare Health Systems, Blue Cross of California, and Regence Blue Shield, where performance information is used for physician quality improvement activities, benefit design, and public reporting. In late 2004, Bridges to Excellence and The Leapfrog Group released a White Paper summarizing the available knowledge about hospital and physician-level efficiency, and set forth principles and recommendations for stakeholders regarding the use of efficiency measures.³⁸

On October 5 and 6, 2004, PBGH and Lumetra, the California Quality Improvement Organization (QIO), through the financial support of The Commonwealth Fund (CMWF) and the Quality Improvement Fund from PBGH Members, hosted a working meeting of major stakeholders, measurement experts, and potential funders to review the current state of the art of individual physician performance measurement, with an explicit focus on what could be accomplished using administrative data sources. The goals of the meeting were to:

- summarize the state of current practice in physician quality and cost-efficiency performance measurement using administrative data;
- identify gaps to be addressed with research; and
- outline a roadmap to achieve full transparency of physician performance.

Participants at the meeting included representatives from CMS, private health plans, the California Medical Association (CMA), consumer organizations, large national employers and employer coalitions, unions and organized labor, the Medicare Payment Advisory Commission (MedPAC), AHRQ, the research community and major private foundations (see Meeting Participants).

This report is a product of the October meeting and its follow-up, and was prepared under a grant from the Robert Wood Johnson Foundation (RWJF). Portions of the report served to frame the discussion at the October meeting by summarizing background information on various methodological issues associated with measuring performance of individual physicians using administrative data and the current practice in physician performance measurement. As updated, the report is intended as a resource for use by stakeholders and policymakers to understand the background and prevailing issues in physician performance measurement, and to frame a policy agenda for advancing physician quality and cost-efficiency performance measurement. While measurement software tools and their measurement methods are identified, the report makes no recommendation as to preferred methods.

Goals of Physician Performance Measurement

The Institute of Medicine (IOM) provides the following definitions for quality of care and an efficient health system.³⁹

Quality of care: “[t]he degree to which healthcare services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge.”

Efficient Health System: “...resources are used to get the best value for the money spent. The opposite of efficiency is waste” [or], “the use of resources without benefit to the patients a system is intended to help.”

In the U.S., there is strong evidence that the care received by many patients neither meets their needs nor is based on the best scientific information available.^{1, 26} Further, significant variations that have been observed in cost are not related to differences inpatient demographics or illness burden.^{7, 10} These quality and cost variations may be one consequence of the absence of information on physician performance. Such information would enable us to understand the extent of differences, to examine the causes for the differences, and to identify strategies to reduce variations in practice patterns.

The development of broad-based physician performance transparency is expected to provide key information about how the system overall is performing, how individuals are performing, and where efforts to improve should be focused.^{40, 41} Making the performance results transparent to end users can provide information that will allow physicians to improve both the quality and the efficiency of the care that they deliver, enable consumers to make choices about where to receive the care they need, and allow public and private

purchasers (and their health plan agents) to reward physicians for providing care consistent with evidence-based standards and improving the care they provide. Additional research confirms that consumers want information on provider performance and that they are likely to use information to choose hospitals, health plans, and physicians if the information is meaningful and provided in an easy to understand format.⁴²⁻⁴⁶

Physician performance measurement and transparency may potentially trigger significant consequences for both consumers and physicians. For example, physicians might receive bonuses or be excluded from networks and consumers might be directed to or away from physicians based on measurement results. For these reasons, performance measurement must be valid and reliable, provide useful information, and be easily understood by physicians, health plan and physician group administrators, purchasers, and consumers.

Organizations or entities that embark on physician performance measurement and transparency must clearly articulate the goals of the initiative in order to define the performance measures, capture the relevant data and determine which measurement tools to use. This goal-setting should consider:

- How will the measurement information be used (physician feedback, physician quality improvement activities, consumer use, benefit design, network design, etc.)?
- Which physicians will be measured (primary care or other specialists), and why?
- Will physicians be measured individually or through a mechanism that aggregates the care of a practice site or medical group?

- What fraction of contracted physicians in each specialty will be sufficient to implement the planned strategy?
- What benefits or incentives, if any, will be provided to high performing physicians?
- What consequences, if any, will be imposed on lower performing physicians?
- What opportunities will exist for lower performing physicians to improve or change their performance?
- Will physicians be measured on quality, cost-efficiency or a combined measure of quality and cost-efficiency?
- How often will the measurements be repeated?

In addition to goal-setting, there are an assortment of methodological and implementation issues that must be considered when engaging in physician performance measurement. The following sections of this report address these issues.

Data Issues in Physician Performance Measurement

The technical issues inherent in producing valid and reliable information on physician performance are complex and require careful consideration of a variety of factors that will determine whether goals are met as well as have a significant effect on the analytic results. Data availability and sufficiency are essential starting points.

Data Availability

Information relating to patient care may be captured from a variety of sources, including medical records, patient surveys, testing results, provider self-report, and administrative data. Historically, administrative data were used for the purposes of tracking enrollment, encounters, and paying claims; however, increasingly systems are evolving to capture other elements that extend beyond the scope of billing and tracking enrollment. In this report, we use the term “administrative data” to refer to all electronically available records on physician/professional services, facility services/encounters (both inpatient and outpatient), ancillary services, and pharmacy, laboratory, and diagnostic test information.

In the area of quality measurement, the medical record has been regarded as the gold standard of complete information,⁴⁷ notwithstanding documented deficiencies that limit the accuracy of data extraction and affect their use for quality performance assessment as well as the high cost of abstracting information from medical records. Among these deficiencies are poor coding (inaccurate or incomplete diagnostic coding or recording of tests), absence of coding or documentation of care provided (e.g., counseling), poor handwriting, and multiple patient records residing with a variety of providers for whom information is not integrated.

Non-standard charting practices further confound these problems.^{48, 49}

The electronic health record (EHR) is viewed as a tool that will facilitate more detailed capture of clinical information, and in turn, provide a more cost-effective way to track clinical performance. However this technology is still relatively new and non-standardized, and is viewed by many physicians as either too expensive or disruptive to their practice to implement and maintain. To date EHRs within physician offices have not been widely adopted in the U.S. and it is projected that it may take a decade or more to achieve widescale implementation of health information technology in physician offices; however, a range of national efforts, such as those sponsored by CMS, AHRQ, and the Office of the National Coordinator of Health Information Technology (ONCHIT) are underway to advance the diffusion and adoption of EHR and other information technologies into physician practice. Absent broad use of an EHR that consistently collects information in ways that facilitate standardized reporting, and given the high cost of accurate medical record abstraction, there is near term interest in using currently available data from administrative data sources to measure the system’s performance, including the performance of individual physicians. Using administrative data to measure performance is also seen as a mechanism to promote improvements in data capture and data quality, as the data will be tied to a business model.

At present, administrative data are one of the most readily available and cost-effective sources of information to measure physician performance. Questions have been raised, however, about the reliability of administrative data in providing accurate

details of a patient encounter with the health care system and thus the underlying accuracy of the measurement. Studies conducted in the 1980s comparing inpatient medical records to administrative data sources revealed disparities between the two sources of information and suggested that administrative data were not a reliable record of delivered services. However, more recent comparisons, performed on ambulatory care administrative data, indicate a far higher degree of agreement overall between the information contained in each source.^{47, 50, 51}

Recent studies have found that medical records are not consistently better than administrative data sources in measuring performance rates⁵² and that physician reminder systems based on administrative data can improve quality of care and reduce costs.⁵³ Data collection and reporting initiatives sponsored and promoted by health plans and employers, such as the NCQA Health Plan Employer Data Information Set (HEDIS[®]), and the Integrated Healthcare Association's (IHA) Pay-for-Performance program (P4P), which rely on administrative data for producing performance measures, have demonstrated the potential for improved capture of information in administrative data.⁵⁴ Performance measurement efforts that "require" the use of administrative data as the basis for measurement provide a stimulus to increase the capture of information. Enhanced data capture improves the reliability of using administrative data for measuring performance. As might be expected, administrative data are most complete when they capture information identified as a "billable event," as there is a financial incentive for the provider to submit the data in order to secure reimbursement for care provided. Pay-for-performance programs that base measurement on administrative data are providing a financial incentive to physicians, practice sites, and physician organizations to improve the data they collect and submit in encounter data files.

An oft-cited criticism of administrative data is that these data do not provide sufficient information on the clinical encounter, and therefore should not be

used to "profile" physicians.⁵⁵ However, medical and health services research has made extensive use of these data to identify patients at risk, and to accurately assess access, utilization, and underutilization problems.^{7, 50, 56-60}

Optimally, data capture should be uniform across members and physicians to provide fair comparisons when developing comparative measures of physician performance. If there are variations in the data capture across health plans (e.g., lab or pharmacy charges are not included because of a carve-out benefit or co-insurance), this can create an uneven playing field as not all services/encounters will be captured for the purposes of computing performance measures. In any measurement of physician performance using administrative data or other sources of data, it is critical to understand data completeness and where gaps in the information capture exist that may hinder accurate measurement.

Data Sufficiency

Data Sufficiency for Quality Performance Measurement.

Most commercial quality measurement tools use a performance ratio to describe an individual physician's performance, based on the number of opportunities the physician has to meet the performance expectation (i.e., the number of patients with the diagnosis of interest). There is substantial debate about how many patients with the diagnosis of interest must be included to obtain a valid quality performance score for an individual physician. Hofer et al. caution that for a single quality measure with a high level of unreliability (vs. aggregated measures), as many as 100 patients with a particular condition might be necessary to measure an individual physician's performance at the individual indicator level.⁵⁵

Another way to measure physician performance is to use an aggregated measure or composite score, which combines performance results across multiple single indicators of performance, either for a single medical condition or across types of care (e.g.,

preventive, acute, chronic). Kaplan and Greenfield suggest that an aggregated measure will reduce the “noise” (unreliability) in the measurement and thus reduce the number of patients with a particular medical condition needed to measure and discern differences in physician performance.⁶¹ Using the model of diabetes (NCQA-American Diabetes Association Diabetes Physician Recognition Program), they estimated that as few as 25 patients per doctor may be sufficient to compute performance measures that are stable and that accurately discriminate performance among providers. Additional research is needed to clarify the number of patients needed for valid measurement of a physician’s quality performance at the level of a single indicator and composite, and to provide guidance on how best to create composite scores by aggregating results across multiple indicators of performance.

Independent of the question of sufficient data to produce an individual measure, there is not consensus as to how to aggregate several measures of performance across several medical conditions, into a single score for a physician. The performance ratio for a number of medical conditions or quality measures could be reported as a composite, either weighting each indicator equally or applying differential weight to indicators based on their importance (e.g., clinical relevance).

Data Sufficiency for Efficiency Measurement.

A key challenge to the valid measurement of individual physician cost-efficiency performance is assuring sufficient data are available on each physician, which often can be a problem when using data from a single health plan or employer. Physicians who treat the largest number of patients may produce sufficient data for risk adjustment, attribution of costs, and cost-efficiency ranking, but measurement based on a small number of episodes will be particularly vulnerable to statistical error and produce unstable estimates of performance. Physicians and physician groups typically manage patients covered by many different health insurance plans, and may not have a large proportion of their

patients covered by any single payor. As a result, a single insurer or employer is not likely to have a sufficiently large volume of administrative data for individual physicians to produce cost-efficiency measures on more than a small number of physicians. Pooling of data across multiple entities (e.g., private payors or private and public payors) would create a larger number of measurable events for a given physician, which would address the problems of stability of estimates as well as being able to generate measures for a large number of providers.

Measures and Measurement Methods

Quality Performance Measures and Measurement

The methods for measurement and evaluation of quality of care are based on the conceptual framework for quality developed by Donabedian in the late 1960s.⁶² This framework has three measurement domains: 1) **structural measures**, which describe the characteristics of individual clinicians, the organization and structure of the care system, and the demographics of patients; 2) **process measures**, or the ways in which clinicians interact with patients, including the assessments, treatments, and procedures they provide; and 3) **outcome measures**, which describe changes in the patient's health status, including quality of life.⁶³

Currently, measurement of quality performance is heavily focused on process measures – due to the relative ease of measuring processes of care as compared to outcomes – that have a demonstrated relationship to a specific health outcome. While there is great interest in tracking health outcomes, they are more complex to capture because the outcome frequently occurs far in the future or is not captured in the administrative record (e.g., lab testing results), or is a rare event which requires a large number of patients to observe (e.g., death). Because process of care measures specify the criteria for inclusion of patients for receipt of recommended care (e.g., by age, sex, medical condition) and the process indicator is recommended for all patients who meet the inclusion criteria, process of care measures do not require risk adjustment to control for differences across physicians in the pre-existing health statuses of their patient panels.⁵²

The first step in measuring a process of care is to establish the eligibility of an individual patient for a

particular aspect of care (i.e., does the patient have the diagnosis of interest), which defines the “denominator event.” The second step is to determine whether the necessary service was provided to that patient within a specified time period, which defines the “numerator event.” The score or result is the performance rate or the rate at which the process of interest occurs in the eligible population.⁵² In order to measure physician performance using administrative data it is necessary to define the necessary service (i.e., the evidence-based process of care) and the eligible patient (the patient with the diagnosis of interest).

While quality of care process measures exist and continue to be expanded to cover more conditions and types of providers (e.g., specialists and subspecialists), a critical challenge related to the application of these measures is a need for standardization of the measures and adoption of the standardized measures by all stakeholders. Standardization is necessary to ensure comparability of measurement across providers within a market and to facilitate the development of data systems (e.g., EHRs) to support construction of the performance measures. NCQA's HEDIS has been a primary source of process of care measures.

There are a number of commercial vendors or researchers that have developed quality measurement software programs (e.g., Resolution Health, Inc.; HealthBenchmarks, Inc., HealthDialog; and RAND). These products are based on identification of evidence-based process of care measures and use computer algorithms to identify the patients who meet the required diagnostic categories, and whether a needed service or procedure was delivered within the required time frame. Some of these commercial products provide

reports that include reminders to physicians and patients about missed opportunities for evidence-based care. Increasingly they are being used to measure physician performance in the aggregate, by medical condition, or by specialty.

PBGH has been gathering information from leading commercial vendors of physician quality performance measurement systems as to the depth and breadth of the performance measures addressed by their systems. Review of these tools finds that the number of measures that can be produced from administrative data sources varies substantially based on the type of specialty and the type of data that are captured administratively which can be used to produce a clinical indicator (**see Table 1**).

Generally, the quality measurement tools can produce the largest number of measures for primary care specialties (e.g., family practice, pediatrics, and internal medicine), a smaller number of measures for selected specialties that deal with common medical conditions such as heart disease, diabetes, asthma, and pregnancy (e.g., allergy, cardiology, obstetrics and gynecology, and endocrinology), and few or no measures for other specialties, such as surgeons and procedural specialists (e.g., orthopedics, dermatology, and urology). Generally, product vendors have rapidly converted quality measures where possible to be derived from administrative data, but are

Table 1: Number of Embedded Physician Quality Measures in Administrative Data-Based Tools

Vendor	Vendor 1	Vendor 2	Vendor 3
Allergy/Immunology	14	5	
Cardiology	43	20	25
Endocrinology	20	8	10
Family/General Practice	101	49	150
Gastroenterology		3	20
Infectious Disease			40
Internal Medicine	101	49	150
Nephrology	1		
Neurology	6		15
Obstetrics & Gynecology	17	4	10
Ophthalmology	3	2	8
Orthopedics	7	1	20
Pediatric Allergy		5	
Pediatrics	40	21	70
Psychiatry	5	3	5
Pulmonology	14	5	25
Rheumatology	5		5

constrained in increasing the number of measures due to a limited scientific evidence base and the lack of important clinical information in the administrative data (e.g., lab values, blood pressure readings).

For many physician specialties, there is work in process to develop more robust measures of quality care. CMS is collaborating with numerous specialty societies to develop quality measures that address care provided by specialists and subspecialists.³⁶ Measures have been developed or are under development for a number of specialties as shown in **Table 2**.

Table 2: Examples of Physician Quality Measures

Family or General Practice	Percentage of patients who received an influenza immunization; percentage of patients who received a pneumococcal immunization; percentage of patients with diabetes with one or more A1C test(s) conducted during the measurement year, hypertension).
Preventive Medicine	Percentage of patients who received an influenza immunization; percentage of patients who received a pneumococcal immunization; rate of mammography screening; rate of cervical cancer screening.
Internal Medicine	Heart disease: coronary artery disease- percentage of patients who were prescribed a lipid-lowering therapy based on current ATP III guidelines), hypertension (percentage of patient visits during which either systolic blood pressure >140 mm Hg or diastolic blood pressure >90 mmHg with documented plan of care for hypertension).
Endocrinology/ Diabetes/Metabolism	Percentage of patients with diabetes with one or more A1C test(s) conducted during the measurement year.
Gastroenterology	Appropriate attention to patient monitoring before, during and after the procedure when using conscious sedation measures; the percentage of patients who had appropriate screening for colorectal screening.
Geriatric Medicine	Percentage of patients who received an influenza immunization; percentage of patients who received a pneumococcal immunization.
Hema-Oncology	Percentage of patients reporting pain; percentage of patients reporting nausea/vomiting; percentage of patients reporting fatigue.
Nephrology	Regular measurement of the delivered dose of hemodialysis.
Neurology	Appropriate treatment of ischemic stroke; stroke rehabilitation; diagnosis of dementia.
Pulmonology	Percentage of patients with COPD who had a spirometry evaluation documented; percentage of patients with systemic corticosteroids for acute exacerbation).
Rheumatology	Osteoarthritis: functional assessment - percentage of patients diagnosed with symptomatic osteoarthritis that were assessed for function and pain annually.
Surgery – General	The percentage of patients who have an autogenous arteriovenous fistula for dialysis vascular access, prophylactic antibiotic received within one hour prior to surgical incision; surgical patients with recommended thromboembolism prophylaxis.
Colorectal	Prophylactic antibiotic received within one hour prior to surgical incision; surgical patients with recommended thromboembolism prophylaxis.
Neurological	Prophylactic antibiotic received within one hour prior to surgical incision; surgical patients with recommended thromboembolism prophylaxis.
Ophthalmology	Appropriate management of primary angle open glaucoma; appropriate post-op care for filtering surgery patients; complete post-op examination post cataract surgery, glaucoma screening).
Orthopedic	Prophylactic antibiotic received within one hour prior to surgical incision; surgical patients with recommended thromboembolism prophylaxis, appropriate diagnosis and treatment of back pain.
Plastic & Reconstructive	Prophylactic antibiotic received within one hour prior to surgical incision; surgical patients with recommended thromboembolism prophylaxis.
Thoracic/Cardiac	Percentage of patients undergoing isolated coronary artery bypass graft (CABG) who received an internal mammary artery graft, prophylactic antibiotic received within one hour prior to surgical incision; surgical patients with recommended thromboembolism prophylaxis.
Vascular	Percentage of patients who have an autogenous arteriovenous fistula for dialysis vascular access, prophylactic antibiotic received within one hour prior to surgical incision; surgical patients with recommended thromboembolism prophylaxis.
Anesthesiology	Prophylactic antibiotic received within one hour prior to surgical incision; surgical patients with recommended thromboembolism prophylaxis, appropriate evaluation of the patient – pre, during, and post procedure.
Cardiology	Coronary Artery Disease (CAD) and Heart Failure (HF) measures (see Internal Medicine).
Critical Care	Prevention of intra-vascular catheter-related infections; treatment of intra-vascular catheter-related infections; appropriate weaning from mechanical ventilatory support.
Emergency Medicine	Aspirin and beta blocker treatment at arrival for acute myocardial infarction).
Nuclear Medicine	Appropriate use of cardiac radionuclide imaging; appropriate protocols; appropriate patient preparation.
Gerontology	Appropriate Assessing Care of Vulnerable Elders (ACOVE) measures for vulnerable elderly – Detecting and treating conditions such as dementia, depression, and functional impairments that are underdetected in the elderly.
Obstetrics/Gynecology	Rate of mammography screening; rate of cervical cancer screening.
Pathology	Appropriateness of tests and appropriate communication of results.
Physical Medicine and Rehabilitation	Stroke rehabilitation and the prevention of complications.
Psychiatry	Effective acute phase treatment: percentage of patients who were diagnosed with a new episode of depression and treated with antidepressant medication and remained on an antidepressant for at least 180 days.
Radiology	Appropriateness criteria for various diagnosis procedures such as chest x-ray, computed tomography (CT) for detection of pulmonary embolism in adults) and appropriate communication of results.

Cost-Efficiency Measures and Measurement

There are various definitions of economic efficiency (e.g., technical efficiency, allocative efficiency, productive efficiency), and all examine the ratio of outputs to inputs.⁶⁴ Applied to health care, efficiency measures “whether health care resources are being used to get the best value for the money.”⁶⁵ With respect to the discussion in this report on physician measurement of efficiency, the focus is on cost-efficiency, which reflects a combination of the price and quantity of services (i.e., total resources used) to generate the output (i.e., an episode of care).

Physicians are confronted in each instance of patient care with a wide array of diagnostic and treatment options. Unlike quality measurement, however, there is no evidence-based or absolute standard of what level of resource use is optimal for each of the medical conditions a physician might treat. Consequently, physician efficiency measurement in its current state of development focuses on relative performance comparisons, comparing one physician’s use of resources in the care of a population of patients to that of his or her peers, as opposed to an absolute standard.

Existing physician cost-efficiency measurement tools use an episode of care to create comparable units of “output” which to assess the level of resource utilization. The concept of an episode of care as a unit of analysis has been in use since the 1960’s. Its most widespread use has been for establishing DRG-based hospital reimbursement policy where payments are based on the inpatient episode of care.^{66, 67} These health care episodes have been defined as:

“The period of time during which a specific disease process, illness, health care problem, or treatment process is present. It is characterized by an onset, or beginning, and a resolution, or ending, between which the health problem state applies...the health care episode is a higher-order concept that deals with all reasons for contact with the health care system.”⁶⁷

Episodes of care provide a more meaningful unit of analysis than more traditional utilization comparisons (e.g., hospital admissions per 1000 beneficiaries or emergency room visits per 1000 beneficiaries) because they provide a more cohesive and more provider-specific unit of comparison.⁶⁶

Currently available efficiency measurement tools that construct episodes from administrative data are built on methods used to group episodes that were originally developed by Schneeweis, Garnick and Cave.^{66, 68-72} An episode grouper methodology constructs episodes of care that are based on definitions of a case by diagnosis, procedures, and time periods for services delivered. The algorithms recognize the breadth of the illness (the progression of a disease from simple to complex), the severity of the illness, the conclusion of one illness or injury event based on time periods between visits or other services, and the exclusion of concurrent but unrelated illnesses and injuries. The case descriptors attempt to bundle patient and clinical care characteristics into discrete, homogeneous medical condition categories.

Commercial episode groupers that are used in different efficiency measurement tools differ in the variables that contribute to case categories and resource use, and the number of episode categories into which diagnoses and procedures are assigned. They differ in the algorithms to identify increasingly complex cases, as well as severity of illness (e.g., whether the presence of a procedure in an episode is used to define illness severity). They also differ in the length of the “clean periods” that signal the end of one episode and the beginning of another. Commonly, these tools aggregate all costs of care associated with an episode, including inpatient, outpatient, professional, lab, diagnostic testing, pharmacy, and facility charges or costs. Currently available commercial episode groupers, including Symmetry’s ETG™ product, the Cave Grouper™ and MEDSTAT’s MEGs® are in widespread use in the market. At this point in time, these groupers have not all been tested either for validity or agreement with each other.

Performance Measurement Standardization

In part fueled by demand from employers, payers, providers, and consumers, numerous government agencies, and not-for-profit organizations are sponsoring or working on initiatives to develop, standardize, find consensus, and implement performance measures. Working independently, and in collaboratives and consortia, organizations including the NCQA, NQF, CMS, the American Medical Association (AMA), and the American Board of Medical Specialties (ABMS) are actively engaged in physician-level performance measure development, endorsement, or deployment. This discussion provides an overview of the underlying conceptual framework of transparency and standardization in measurement, and highlights the major ongoing national standardization activities. Underlying this discussion is the belief that any measures adopted must have implementation rules, policies, and systems that are detailed and standardized to ensure that comparison of performance results across physicians and health care organizations are valid and reliable.

Transparency in Measurement

Increased transparency helps establish measurable provider accountability, documents quality gaps and opportunities for improvements in health care, allows for valid benchmarking and identification of best practices, facilitates performance-sensitive health care purchasing selections, and provides a basis for differential incentives based on achieved results.^{1, 73}

McGlynn and others have articulated desirable attributes of compelling health care performance measures.⁷⁴ Well-articulated measures help minimize the very real risk of “misclassification” of providers or organizations, and help to mediate the significant risks associated with implementing these programs in “real time” settings (e.g., inadequate data collection, analysis, and reporting procedures), irrespective of how well performance measures

perform in their development and testing process. The urgent need for detailed guidelines in implementing performance measurement efforts targeting physicians is further illustrated by the increasing spread of pay for performance (P4P) initiatives, the integration of physician performance results in health plans’ provider directories, and the “tiering” of provider networks based on provider performance.⁷⁵

National Initiatives in Measurement Activities

A wide variety of partnerships and collaborations have been developed that draw on the strengths of each partner to design research tools, implement pilot projects, and provide processes and forums for consensus building aimed at creating gold standards for performance measurement.

National Quality Forum (NQF): The NQF is a not-for-profit membership organization whose mission is to improve American health care through endorsement of consensus-based national standards for measurement and public reporting of health care performance data. The Consensus Development Process (CDP) that the NQF employs is designed according to the 1995 National Technology Transfer and Advancement Act (NTTAA) and Office of Management and Budget Circular A119. The NQF does not develop standards; rather, it evaluates and endorses measures or standards developed by other organizations. To date the NQF has endorsed performance measures in the area of hospital and nursing home performance measures. However, NQF has begun a multi-year process through which a set of ambulatory care performance measures will be endorsed. In April of 2004, NQF announced that a set of approximately 90 performance measures, identified by a collaboration including the AMA, CMS, and NCQA would be considered for endorsement under an expedited review process, and 36 of these measures were endorsed in July 2005. This set will be deployed by CMS in its Doctors’ Office Quality Demonstration Project.

Ambulatory Care Quality Alliance (AQA): In September 2004, the American Academy of Family Physicians (AAFP), the American College of Physicians (ACP), America's Health Insurance Plans (AHIP), and AHRQ, joined together to lead a collaborative effort for determining, under the most expedient timeframe, how to most effectively and efficiently improve performance measurement, data aggregation and reporting in the ambulatory care setting. This effort, named the Ambulatory Care Quality Alliance (AQA), seeks to improve health care quality and patient safety through a collaborative process in which key stakeholders agree on a strategy for measuring performance at the physician level; collecting and aggregating data in the least burdensome way; and reporting meaningful information to consumers, physicians and other stakeholders to inform choices and improve outcomes. The Alliance consists of a large body of stakeholders that represents clinicians, consumers, purchasers, health plans and others. The group seeks to reach consensus on: 1) a starter set of measures for ambulatory care that stakeholders can use in January 2006 contracts; 2) a multi-year strategy to roll-out additional measurement sets and implement measures into the marketplace; 3) a model (including framework and governing structure) for aggregating, sharing and stewarding data; and 4) critical steps needed for reporting useful information to providers, consumers and purchasers.

CMS/Doctors' Office Quality: The Physician Focused Quality Initiative at CMS builds upon ongoing strategies and programs in other health care settings in order to: 1) assess the quality of care for key illnesses and clinical conditions that affect many people covered by Medicare, 2) support clinicians in providing appropriate treatment of the conditions identified, 3) prevent health problems that are avoidable, and 4) investigate the concept of payment for performance. The Physician Focused Quality Initiative includes the Doctors' Office Quality (DOQ) Project, the Doctors' Office Quality Information Technology (DOQ-IT) Project, and several demonstration projects and evaluation

reports. CMS has contracted with NCQA to develop physician office performance measures that can be calculated exclusively through accessing electronically available administrative data. CMS, in partnership with the AMA and NCQA, has submitted these measures for endorsement by NQF.

Physician Consortium for Performance Improvement/American Medical Association (AMA): The Physician Consortium for Performance Improvement (Consortium) is a group of clinical and methodological experts convened by the AMA. The Consortium includes representatives from more than 60 national medical specialty and state medical societies, AHRQ and CMS. The AMA has developed measurement modules for a variety of conditions and practice areas including asthma, coronary artery disease, diabetes, congestive heart failure, hypertension, depression, osteoarthritis, prenatal care, and preventive services. The AMA has endorsed the use of its identified performance measures for quality improvement purposes but not for purposes of public reporting or pay-for-performance.

American Board of Medical Specialties (ABMS)/American Board of Internal Medicine (ABIM): As part of its plan for recertification of specialist physicians, the ABMS is planning to make performance-based assessments of physician practices mandatory by 2010. In addition to demonstrating their professional standing (credentialing), their commitment to life-long learning and assessment (assessment of medical knowledge and clinical skills), and cognitive expertise (examination) for a positive re-certification decision, physicians will be evaluated on their performance in practice by completing select practice-based improvement modules. Current performance measurement-based assessment modules have been developed for preventive services, preventive cardiology, diabetes, asthma, hypertension, acute myocardial infarction, congestive heart failure, osteoarthritis, hospitalized elderly care, end-of-life care, oncology, and gastroenterology.

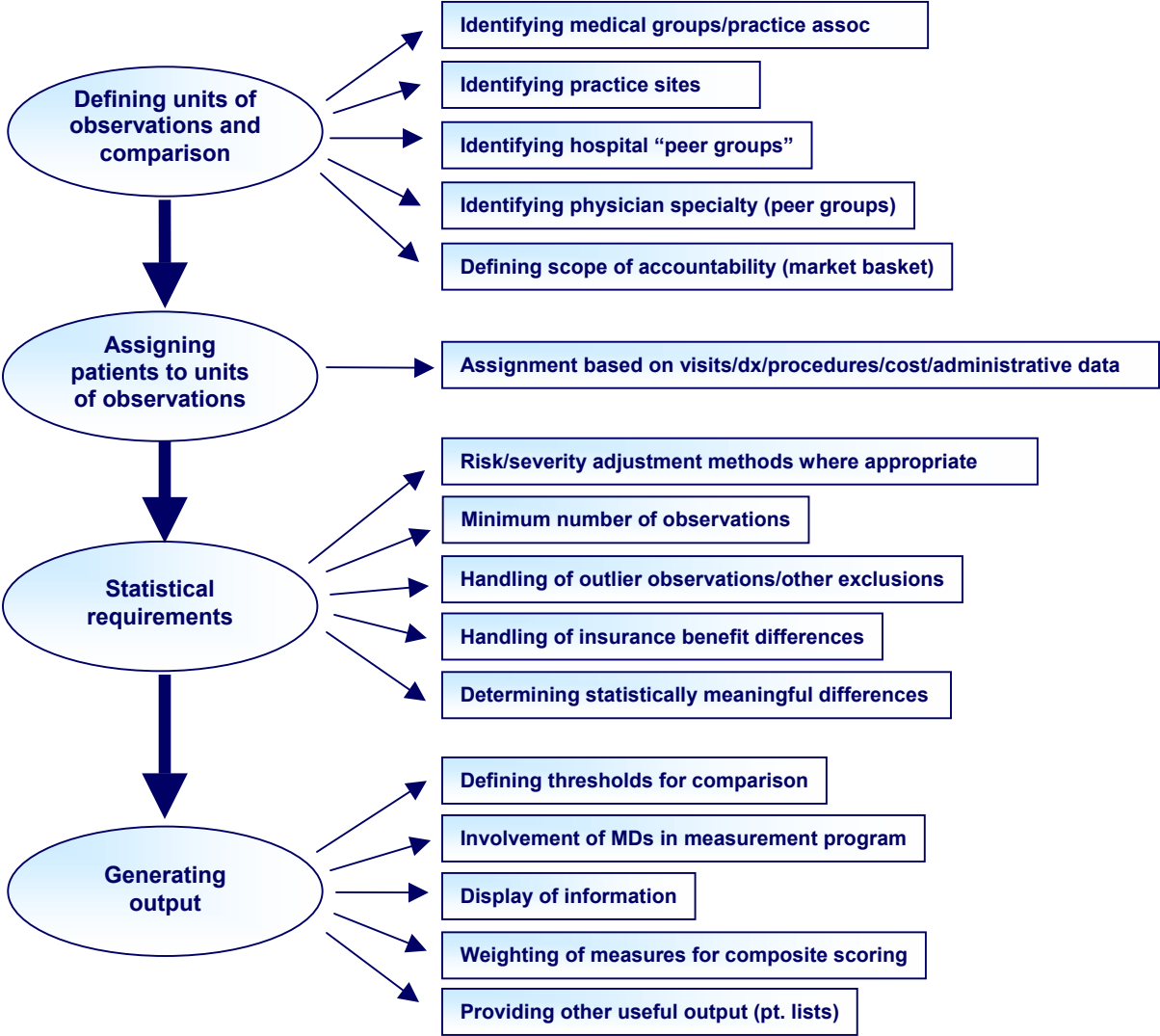
National Committee for Quality Assurance (NCQA): With grant support from the Commonwealth Fund and others, NCQA is specifying measures and associated implementation guidelines, and suitable performance result database architecture to advance the availability of physician performance benchmarks regionally and nationally. To that end NCQA has engaged the active participation of representatives of 11 large-scale physician measurement projects from around the country. These initiatives currently use different measures, methods, and reporting mechanisms to inform physicians, consumers, and other stakeholders about the performance of physicians. With the aid of that group, NCQA has begun to standardize an initial subset of implementation methods that will enable cross-organization benchmarking of physician performance. Because information from electronic medical records is not currently available on a large scale, the calculation of valid and reliable physician-level performance results is centered on developing metrics and implementation rules that rely on administrative records, including enrollment records, medical claims, pharmacy claims, laboratory claims, and laboratory values.

Figure 1 represents a schematic of an implementation rule set for development of physician performance benchmarking, including the consistent identification of units of observation, patient attribution, statistical adjustments, and output generation. Using the rigor displayed in the development and implementation of the HEDIS[®] performance measures set used to compare health plans performance, this comprehensive rule set seeks to become a model that will enable meaningful benchmarking and public reporting of health care performance information. One immediate user group of such standards might be health plans, which are dramatically expanding their efforts to measure the performance of physicians in their networks. To some extent the expansion of their physician performance measurement portfolios has come in response to the plans' employer-customers,

who are seeking performance-sensitive benefit design and network construction.

NCQA has also begun to make performance-based quality information available about physicians around the country through recognition programs developed in collaboration with the American Diabetes Association, the American Heart/American Stroke Association, and Bridges to Excellence. Such programs are voluntary and currently available for physicians to demonstrate their competence in diabetes care, heart/stroke care, as well as the deployment of office systems ensuring systematic and planned care.

Figure 1: Data components standardized by the National Forum on Performance Benchmarking of Physician Offices and Organizations (NFBPO) members



Implementation Issues in Physician Performance Measurement

Risk Adjustment

Risk adjustment for quality measures: For every individual there is risk or uncertainty about their need for health care services, which is a function of many variables including their age, gender, past medical history, current health care practices, their physical environment, and genetics. This variation in health status can lead to wide variations in the need for and use of health care services. In measuring physician quality performance using process of care measures, adjusting for variation in a patient's underlying health status/medical condition is primarily accomplished by the identification of the denominator event (i.e., does the patient have the diagnosis of interest, at the severity of illness that requires the process of care). For outcome measures, risk adjustment for demographic and clinical characteristics of the patient population is critical when producing comparative performance measures.

Risk adjustment in efficiency measurement:

In measuring physician efficiency performance, a key statistical challenge is to minimize the influence of patient health status variation, and the health status of a panel of patients, on an individual physician's score. Separating the practice pattern of the physician from the health status variation of his or her patients is a key element of each of the cost-efficiency measurement models. Several factors, when left uncontrolled, could significantly influence the results of cost-efficiency performance measurement. These factors include:

- variation in patient health status;
- variation in severity of illness within the condition affecting the patient;

- variation in the case mix in each physician's panel of patients; and
- variability in the number of episodes assigned to each physician and associated susceptibility to high outlier influences.

A variety of commercial risk-adjustment tools (e.g., DCGs, ACGs, ERGs) have been applied to control for the influence of patient health status and patient mix on an individual physician's cost-efficiency performance score. These risk adjustment tools estimate expected costs for individual patients, based on demographic and health care history information and assign a risk score to that patient's information, for use in risk adjustment in physician measurement. These tools vary markedly in the data fields required for the algorithms that define patient risk categories and their output. For example, risk adjustment tools may or may not include age, sex, and one or more primary or secondary procedures and diagnoses. Some packages include pharmacy and laboratory information in the risk analysis and some do not.

Table 3 compares three leading commercial efficiency measurement tools and how they approach risk adjustment to control for the factors listed above.

In a comparison of several risk-adjustment tools, Thomas, Grazier, and Ward, identified significant variation in data requirements, the number of risk categories available for assignment, as well as the proportion of members in a standard data set who could be assigned a risk category or score.⁷⁶ Their results indicate that most software programs accurately predict approximately 50% of the costs for a simulated panel of patients, although some were more accurate than others. In addition, they

Table 3: Comparison of Physician Cost-Efficiency Risk Adjustment Approaches

Analytic methods need to recognize:	Symmetry ETG™ and various users	Cave Consulting Group's Marketbasket System™	MEDSTAT'S MEGS®
Variation in patient health status	Uses Episode Risk Groups (ERGs) to control for variation in patient health status, adjusting for age, co-morbidities, complications, and significant use of surgery	Uses physician specialty-specific Marketbasket of medical conditions to control for variation in patient health status	Uses DCG's to risk adjust, adjusting for patient demographics and all diagnosis information. Assigns a set of risk scores to the patient that measures current and future risk.
Variation in severity of illness	as above	Uses only medical conditions with severity of illness categories 1 and 2 (of 3) in physician comparisons. Does not use presence of procedures to define severity-of-illness.	Uses proprietary disease staging classification system
Variation in case-mix in each physician's panel of patients	Risk adjustment and outlier analysis controls for variation in panels of patients.	Uses Marketbasket System™ and limited severity of illness classifications to control for case-mix variation	Combination of disease staging and DCGs creates risk-adjusted episodes
Variability in the number of episodes assigned to each physician and associated susceptibility to high outlier influences	ETG software includes both low and high outlier charge trim points for episodes.	Marketbasket System™ uses indirect standardization to control for differences in coefficient of variation between physicians.	Episode mix adjustment is done with an external spreadsheet application

note that there has not yet been an assessment of the validity of any one risk adjustment method, when compared with other independent sources of information. These results suggest that risk adjustment tools need further comparison and review to understand the implications various methods for adjusting have on performance ratings.

Attribution of Patients, Procedures, and Episodes of Care to Physicians

A critical decision in any physician measurement effort is how to attribute patients, procedures, and episodes of care to individuals or groups of physicians. Attribution of care for quality measurement will depend, for example, on whether both primary care and procedural specialists are being measured, and whether individuals, practice sites or larger groups of physicians are the unit of analysis. At present, there is a lack of consensus on which aspects of care delivery should be attributed to which level of the health care system and where shared accountabilities and measurement reside. More work should be done to specify and make

explicit who is accountable for what, which will serve to improve ownership of quality defects and quality improvement.

In efficiency measurement, similar decisions about attribution must be made. Attribution decisions include the portion of professional or overall care that would be required in order for a physician to be assigned responsibility for a particular episode. Attributing responsibility for an episode of care is usually based on a set of decision rules, which may differ based on the goals of the analysis and the proportion of total resources required to assign an episode to an individual physician. **Table 4** provides an illustration of how the choice of attribution rules can affect the type and number of physicians included in an efficiency analysis and whether, for example, referral patterns can be examined. For example, if the attribution rule is that episodes will be assigned only to an individual physician if that physician is responsible for 50% or more of total costs of the episode, then all episodes that do not have a physician with 50% or more of costs attributed to one physician will be omitted from

Table 4: Potential Effects of Various Attribution Rules on Physician Measurement

Required for episode assignment	Effect on episodes available for analysis	Physician type measured	Effect on number of physicians measured	Ability to examine referral patterns
Responsibility for 50% or more of professional charges	All episodes that do not have a single provider with 50% or more of the professional charges are deleted from the analysis; effectively reduces the number of episodes included in analysis	Likely mostly specialists (surgeons) No episode will be assigned to more than one physician	Limiting the number of episodes reduces the number of physicians measured	No
Highest cost physician or highest cost procedure or service	More episodes retained than with 50% rule, but still excludes many episodes from analysis	Likely mostly specialists (surgeons) No episode will be assigned to more than one physician	More physicians measured than with 50% rule	No
First (or last) provider to provide services within the episode period	No defined episodes lost to analysis	Provider of record, either PCP or specialist, assigned episodes	Episodes not attributed to other associated physicians, leaving many unmeasured	Yes
Responsibility for 20-30% of either professional charges or total charges	Minimal loss of episodes to analysis	Both PCPs and specialists will be measured; potential for an episode to be assigned to more than one physician	Minimal loss of episodes; maximizes the number of physicians included in the measurement	Yes

analysis. Because most commercial health plans, in contrast to Medicare, are likely to have a small number of episodes for the majority of physicians they contract with, losing a large number of episodes could significantly impact the number and proportion of physicians that can be evaluated. Attribution rules have to balance the potential for data loss against other factors such as stability of estimates.

Peer Group Comparison of Physicians for Scoring

Measurement of physician quality performance is usually reported in performance rates for specific process of care or outcome measures, sometimes aggregated across multiple measures to create a composite index. Scoring can be based on relative comparisons (e.g., regional, specialty group) or based on comparison to an absolute threshold performance rate.

As noted earlier in this report there is a lack of a gold standard for what constitutes “efficient resource

use” for any medical condition; as a result, performance measurement in the area of cost-efficiency assigns physicians scores based on relative comparisons. The standard comparison of physician efficiency is the ratio of an individual physician’s average episode cost, to the expected or peer group average episode cost. Methodologies used in commercial products differ as to:

- medical conditions included in the measurement (the physician’s own combination of medical conditions treated or a standard set of medical conditions for all physicians in a specialty);
- how the peer group average episode cost is estimated; and
- how the individual physician’s average episode cost is estimated.

The output from cost-efficiency measurement for physicians is commonly the ratio of the observed costs to the expected costs, as defined by peers in the same specialty.⁷⁷ The average score assigned to the peer comparison group is 1.0. Physicians who

use fewer total resources for a similar episode of care as compared with their peer group receive an efficiency score of <1.0 and are labeled “more efficient.” Physicians who use more total resources for a similar episode of care as compared to their peer group receive an efficiency score of >1.0 and are labeled “less efficient.” **Table 5** provides an illustration of practice variation among physicians. In this example of cardiology services, an efficiency score is developed based on resource use across the core types of episodes for prevalent conditions treated by the specialty.⁷⁸

Use of the ratio of the observed cost to expected cost is prevalent, but is susceptible to significant error if physicians with small panels of patients are measured. Alternative methods, such as using the difference between the standardized expected costs and the standardized observed costs for a patient or panel, can be used to dampen this small-sample bias.⁷⁷

Table 5. Variation in Resource Use

	Average score	Physician visits	Diagnostic tests	Medical/surgical procedures	Inpatient facility	Outpatient facility	Inpatient admissions
Peer group	1.00	2.75	3.32	1.22	3.18	0.13	0.20
Decile 2 physicians	0.81	2.69	2.21	0.49	2.79	0.13	0.17
Decile 6 physicians	1.00	2.75	3.93	1.35	2.73	0.13	0.18
Decile 10 physicians	1.48	2.64	4.01	2.29	4.00	0.16	0.22
Ratio of highest to lowest	–	1.09	1.99	4.67	1.43	1.60	1.29

Note: Data based on resource use among cardiologists for Medicare enrollees in a single geographic practice cost index payment area (based on 2001 Medicare Part B claims data). As noted in the March 2005 MedPAC report on Medicare Payment Policy, this analysis done by Cave Consulting Group presents a ratio that compares the resources defined as a function of unit price, volume and intensity of a physician treating a set of episodes with the resources used by a peer group of the same specialty.

Utility of Output to Enable Physician Performance Improvement

One purpose of quality and cost-efficiency measurement tools is to identify variation in physician performance and to provide information to physicians and their organizations in order to minimize non-evidence-based differences in practice and to improve care delivery. Quality performance rates on individual measures typically are easily understood by physicians and integrated into quality improvement initiatives. Performance measures that aggregate results on multiple measures are more difficult to understand and target to quality improvement efforts, unless detail is provided at the individual measure level.

In efficiency measurement, the labeling of inputs to the calculation and aggregation of costs by the

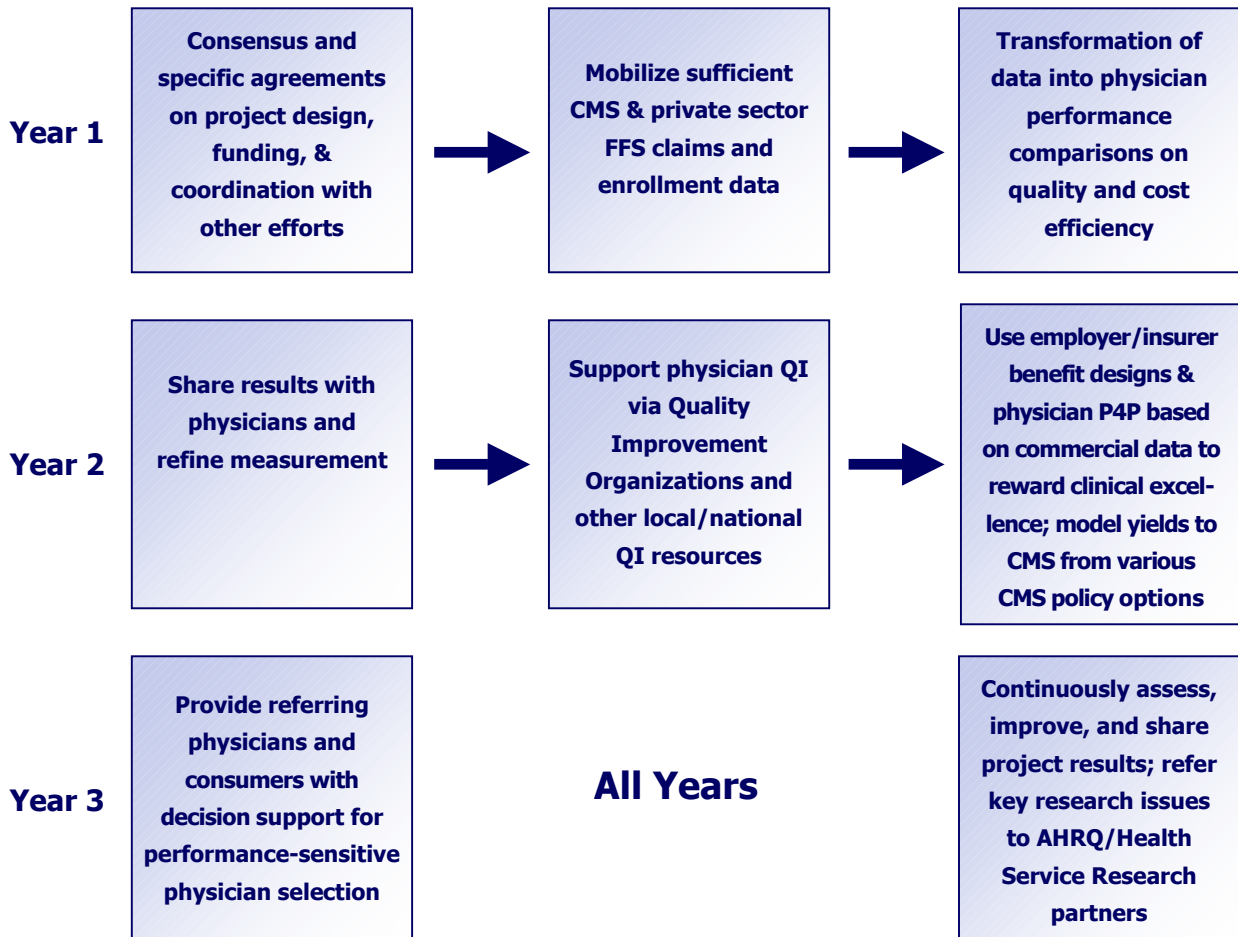
episoding algorithms, and the presentation of results in the outputs, are critical to the tool’s application to physician performance improvement. For example, if a tool aggregates costs into three categories – inpatient facility, outpatient facility, and other, and the physician is identified as cost-inefficient compared with his or her peers because of over- or under-use of “other” services, the physician will not be able to identify a practice pattern to improve. If, however, costs are presented in a larger number of categories (e.g., inpatient facility, outpatient facility, professional visits, lab, pharmacy), physicians and the organizations in which they practice will be better able to target practice patterns for attention and improvement.

Summary and Next Steps

Significant work to enable physician performance measurement – such as the development of performance measures and measurement methodologies – already exists today and much work is occurring to enhance our efforts to measure more broadly (i.e., more physicians), deeply (i.e., more conditions), and in a standardized way. Nationally, it is imperative that stakeholders collaborate in efforts to define and implement a standard set of performance measures, and this section of the report attempts to foster a dialogue on how to develop a road map to move us toward that goal.

Many measurement tools already exist and can be used with administrative data to validly assess physician performance. Moreover, administrative data are evolving and expanding to capture more detail on the clinical encounter to facilitate quality and cost-efficiency measurement work at all levels of the system. These are significant steps that allow for the advancement of individual physician performance measurement on quality and cost-efficiency to assess the overall value of care being delivered and to make the results transparent to drive improvements in the quality and cost of care.

Figure 2. A Potential Roadmap for Physician Efficiency Measurement



There are several areas that require attention and action to move the physician measurement agenda forward, including:

1. Continued development of evidence-based quality measures that can be applied to assess individual physician performance on a broader and deeper array of medical conditions and medical specialties, so as to be able to develop comprehensive measures of the functioning of our health care system;
2. Pooling of data across multiple payors to facilitate measurement of a large number of physicians and to produce more stable estimates of performance (note: this will require standardization of physician identifiers across all payors);
3. Further work to standardize the quality and cost-efficiency measures which the marketplace will use to assess physician performance;
4. Research to assess the optimal ways to construct stable performance scores (e.g., levels of aggregation) and measures that discriminate performance; and
5. Research to assess the optimal ways to provide feedback to physicians and consumers/patients to facilitate their understanding and use of the information.

One action that would significantly move the physician performance measurement agenda forward is a collaborative project such as that described in **Figure 2**. This proposed "roadmap" involves the formation of a partnership of key stakeholders who would design a project where administrative data would be pooled, quality and cost-efficiency tools applied, and the information shared with physicians to drive quality improvement efforts. Advancing the science of physician performance measurement requires application of existing tools to understand how they perform and how to improve the existing methodologies.

It is important that all stakeholders understand that they have an important role to play in owning and working to solve the cost and quality problems in our health care system. Efforts to advance our collective ability to measure, hold accountable, and improve the transparency of the performance of physicians is an important step in that direction, and one that will require coordinated and concerted policy action.

Meeting Participants

Below is a list of participants who attended the **"State of the Art and Road Map for Public/Private Collaboration for Performance Excellence"** meeting hosted by PBGH and Lumetra with grant funding from The Commonwealth Fund. The contents of this report and views represented herein should not be considered that of either specific participants or the organizations they represent.

Clay Ackerley

Special Assistant to the Administrator
Centers for Medicare & Medicaid Services

Anne-Marie Audet, M.D.

Vice President
The Commonwealth Fund

Ronald Bangasser, M.D.

Director of External Affairs
Beaver Medical Group

Larry Becker

Director of Corporate Benefits
Xerox

John Bertko, FSA, MAAA

Vice President & Chief Actuary
Humana, Inc.

Gifford Boyce-Smith, M.D.

Senior Medical Director of Quality
Management
Blue Shield of California

Sophia Chang, M.D., MPH

Director of Chronic Disease Care
The California HealthCare Foundation

Carolyn Clancy, M.D.

Director
Agency for Healthcare Research and Quality

Barbara Cooper

Director, Program on Medicare's Future
The Commonwealth Fund

Cheryl Damberg, Ph.D.

Director of Research
Pacific Business Group on Health

Karen Davis, Ph.D.

President
The Commonwealth Fund

Joyce Dubow

Associate Director
AARP Public Policy Institute

Jeff Flick

Regional Administrator, Region IX
Centers for Medicare & Medicaid Services

Irene Fraser, Ph.D.

Director, Center for Delivery, Organization
and Markets
Agency for Healthcare Research and Quality

Elizabeth Gilbertson

Director of Strategic Planning
H.E.R.E.I.U. Welfare Fund

Kyle Grazier, Dr.P.H.

Professor, Health Management and Policy
The University of Michigan School of Public
Health

Sheldon Greenfield, M.D.

Co-Director, Center for Health Policy Research
University of California at Irvine

Jarvio Grevious

Deputy Executive Officer
Benefits Administration, CalPERS

Stu Guterman

Director, Office of Research, Development
and Information
Centers for Medicare & Medicaid Services

Kevin Hayes

Research Director
MedPAC

Trent Haywood, M.D., J.D.

Acting Deputy Director & Chief Medical Officer
Office of Clinical Standards and Quality
Centers for Medicare & Medicaid Services

Sam Ho, M.D.

Executive VP & Chief Medical Officer
PacifiCare Health Systems

E.J. Holland, Jr.

Vice President, Compensation, Benefits, Labor
& Employee Relations
Sprint Corporation

David Hopkins, Ph.D.

Director, Quality Measurement &
Improvement
Pacific Business Group on Health

Steve Jencks, M.D.

Director, Quality Improvement Coordination
Office of Clinical Standards and Quality
Centers for Medicare & Medicaid Services

Ashish Jha, M.D.

Assistant Professor of Health Policy
Harvard School of Public Health

Robert Krugoff

President
Center for the Study of Services

Peter V. Lee, J.D.

President and CEO
Pacific Business Group on Health

Jack Lewin, M.D.

Executive Vice President and CEO
California Medical Association

Lori Melichar, Ph.D.

Program Officer
The Robert Wood Johnson Foundation

Arnie Milstein, M.D., MPH

Medical Director
Pacific Business Group on Health

Anne Mutti

Senior Analyst
MedPAC

Barbara Rabson

Executive Director
Massachusetts Health Quality Partners

William Rollow, M.D.

Quality Improvement Group
Centers for Medicare & Medicaid Services

Joachim Roski, Ph.D.

Vice President, Performance Measurement
National Committee for Quality Assurance

Jo Ellen Ross, MNA

President and CEO
Lumetra

Steve Schoenbaum, M.D.

Senior Vice President
The Commonwealth Fund

Patsi Sinnott, Ph.D.

Senior Manager, Quality Measurement &
Improvement
Pacific Business Group on Health

Barry Straube, M.D.

Chief Medical Officer, Region IX
Centers for Medicare & Medicaid Services

Sean Tunis, M.D., MSc

Chief Medical Officer
Centers for Medicare & Medicaid Services

Ernie Valente, Ph.D.

Director of Scientific Affairs
Lumetra

Anne Weiss

Program Officer
The Robert Wood Johnson Foundation

Nancy Wilson, M.D.

Joint Senior Adviser for Quality Initiatives
Agency for Healthcare Research and Quality
and Centers for Medicare & Medicaid Services

Charlotte Yeh, M.D.

Regional Administrator
Centers for Medicare & Medicaid Services

References

1. McGlynn EA, Asch SM, Adams J, et al., *The Quality of Health Care Delivered to Adults in the United States*. N Engl J Med, 2003. **348**(26): p. 2635-45.
2. Leape LL, *Error in Medicine*. JAMA, 1994. **272**(23): p. 1851-7.
3. Brook RH, Kamberg CJ, Lohr KN, et al., *Quality of Ambulatory Care. Epidemiology and Comparison by Insurance Status and Income*. Med Care, 1990. **28**(5): p. 392-433.
4. Walker D. *Growing Challenges Point to Need for Fundamental Reform*. in *Government Accounting Office (GAO) Health Care Forum*. 2004. Washington DC.
5. Gatsonis CA, Epstein AM, Newhouse JP, et al., *Variations in the Utilization of Coronary Angiography for Elderly Patients with an Acute Myocardial Infarction. An Analysis Using Hierarchical Logistic Regression*. Med Care, 1995. **33**(6): p. 625-42.
6. Fisher ES, Wennberg JE, Stukel TA, et al., *Hospital Readmission Rates for Cohorts of Medicare Beneficiaries in Boston and New Haven*. N Engl J Med, 1994. **331**(15): p. 989-95.
7. Wennberg JE, Fisher ES, and Skinner JS, *Geography and the Debate over Medicare Reform*. Health Affairs, 2002. **Supp Web Exclusives**: p. W96-114.
8. Fisher ES, Wennberg JE, Stukel TA, et al., *Associations among Hospital Capacity, Utilization, and Mortality of U S Medicare Beneficiaries, Controlling for Sociodemographic Factors*. Health Serv Res, 2000. **34**(6): p. 1351-62.
9. Krakauer H, Jacoby I, Millman M, et al., *Physician Impact on Hospital Admission and on Mortality Rates in the Medicare Population*. Health Serv Res, 1996. **31**(2): p. 191-211.
10. Skinner JS, Fisher E, and Wennberg JE, *The Efficiency of Medicare, NBER Working Paper No. W8395*. 2001, National Bureau of Economic Research: New York.
11. Kessler D and McClellan M, *Is Hospital Competition Socially Wasteful?* Quarterly Journal of Economics, 2000. **115**(2): p. 577-616.
12. Chassin MR, *Is Health Care Ready for Six Sigma Quality?* Milbank Q, 1998. **76**(4): p. 565-91, 510.
13. Fisher ES and Welch HG, *Avoiding the Unintended Consequences of Growth in Medical Care: How Might More Be Worse?* JAMA, 1999. **281**(5): p. 446-53.
14. Consumer Purchaser Disclosure Project, *More Efficient Physicians - a Path to Significant Savings in Health Care*. 2003.
15. Eisenberg J, *Physician Utilization: The State of Research About Physicians' Practice Patterns*. Med Care, 2002. **40**(11): p. 1016-1035.
16. Chilingirian JA and Sherman HD, *Managing Physician Efficiency and Effectiveness in Providing Hospital Services*. Health Serv Manage Res, 1990. **3**(1): p. 3-15.
17. Landon BE, Normand SL, Blumenthal D, et al., *Physician Clinical Performance Assessment: Prospects and Barriers*. JAMA, 2003. **290**(9): p. 1183-9.
18. Miller RH and Bovbjerg RR, *Efforts to Improve Patient Safety in Large, Capitated Medical Groups: Description and Conceptual Model*. J Health Polit Policy Law, 2002. **27**(3): p. 401-40.

19. Coye MJ, *No Toyotas in Health Care: Why Medical Care Has Not Evolved to Meet Patients' Needs*. Health Affairs, 2001. **20**(6): p. 44-56.
20. Armour BS, Pitts MM, Maclean R, et al., *The Effect of Explicit Financial Incentives on Physician Behavior*. Arch Intern Med, 2001. **161**(10): p. 1261-6.
21. Hopkins JR, *Financial Incentives for Ambulatory Care Performance Improvement*. Jt Comm J Qual Improv, 1999. **25**(5): p. 223-38.
22. Sturm R and Wells KB, *Physician Knowledge, Financial Incentives and Treatment Decisions for Depression*. J Ment Health Policy Econ, 1998. **1**(2): p. 89-100.
23. Cave DG and Geehr EC, *Analyzing Patterns-of-Treatment Data to Provide Feedback to Physicians*. Med Interface, 1994. **7**(7): p. 117-26, 128.
24. Milstein A and Adler NE, *Out of Sight, out of Mind: Why Doesn't Widespread Clinical Quality Failure Command Our Attention?* Health Affairs, 2003. **22**(2): p. 119-27.
25. Berwick DM, *Invisible Injuries; We Need a Better System for Tracking and Preventing Medical Errors*, in *The Washington Post*. 2003: Washington, DC. p. A. 17.
26. Institute of Medicine, *Crossing the Quality Chasm, a New Health System for the 21st Century*, Committee on Quality of Health Care in America. 2001, Washington, DC: National Academy Press.
27. *The State of Healthcare Quality 2003: Industry Trends and Analysis*. 2003, National Committee for Quality Assurance: Washington, DC.
28. Jencks SF, Huff ED, and Cuerdon T, *Change in the Quality of Care Delivered to Medicare Beneficiaries, 1998-1999 to 2000-2001*. JAMA, 2003. **289**(3): p. 305-12.
29. Hannan EL, Sarrazin MS, Doran DR, et al., *Provider Profiling and Quality Improvement Efforts in Coronary Artery Bypass Graft Surgery: The Effect on Short-Term Mortality among Medicare Beneficiaries*. Med Care, 2003. **41**(10): p. 1164-72.
30. Hibbard JH, Stockard J, and Tusler M, *Does Publicizing Hospital Performance Stimulate Quality Improvement Efforts?* Health Affairs, 2003. **22**(2): p. 84-94.
31. Schauflier HH, Brown C, and Milstein A, *Raising the Bar: The Use of Performance Guarantees by the Pacific Business Group on Health*. Health Affairs, 1999. **18**(2): p. 134-42.
32. Hibbard JH, *Engaging Health Care Consumers to Improve the Quality of Care*. Med Care, 2003. **41**(1 Suppl): p. I61-70.
33. Davis DA, Thomson MA, Oxman AD, et al., *Changing Physician Performance. A Systematic Review of the Effect of Continuing Medical Education Strategies*. JAMA, 1995. **274**(9): p. 700-5.
34. Davis D, *Does CME Work? An Analysis of the Effect of Educational Activities on Physician Performance or Health Care Outcomes*. Int J Psychiatry Med, 1998. **28**(1): p. 21-39.
35. Eccles M, Steen N, Grimshaw J, et al., *Effect of Audit and Feedback, and Reminder Messages on Primary-Care Radiology Referrals: A Randomised Trial*. Lancet, 2001. **357**(9266): p. 1406-9.
36. McClellan M, *Letter to the Chairman, Committee on House Ways and Means*. 2005.
37. *Mission Statement*. Consumer Purchaser Disclosure Group, 2004.
38. *Measuring Provider Efficiency Version 1.0*. 2004, The Leapfrog Group and Bridges to Excellence: Washington DC.
39. Institute of Medicine, *Medicare: A Strategy for Quality Assurance*, ed. Lohr K. Vol. 2. 1990, Washington, DC: National Academy Press.
40. Berwick DM, *Continuous Improvement as an Ideal in Health Care*. N Engl J Med, 1989. **320**(1): p. 53-6.

41. Blumenthal D and Kilo CM, *A Report Card on Continuous Quality Improvement*. Milbank Q, 1998. **76**(4): p. 625-48, 511.
42. Beaulieu ND, *Quality Information and Consumer Health Plan Choices*. J Health Econ, 2002. **21**(1): p. 43-63.
43. Chernew M and Scanlon DP, *Health Plan Report Cards and Insurance Choice*. Inquiry, 1998. **35**(1): p. 9-22.
44. Fowles JB, Kind EA, Braun BL, et al., *Consumer Responses to Health Plan Report Cards in Two Markets*. Med Care, 2000. **38**(5): p. 469-81.
45. Hibbard JH, Slovic P, Peters E, et al., *Strategies for Reporting Health Plan Performance Information to Consumers: Evidence from Controlled Studies*. Health Serv Res, 2002. **37**(2): p. 291-313.
46. Hibbard JH and Peters E, *Supporting Informed Consumer Health Care Decisions: Data Presentation Approaches That Facilitate the Use of Information in Choice*. Annu Rev Public Health, 2003. **24**: p. 413-33.
47. Fowles JB, Fowler E, Craft C, et al., *Comparing Claims Data and Self-Reported Data with the Medical Record for Pap Smear Rates*. Eval Health Prof, 1997. **20**(3): p. 324-42.
48. Romm FJ and Putnam SM, *The Validity of the Medical Record*. Med Care, 1981. **19**(3): p. 310-5.
49. Demlo LK, Campbell PM, and Brown SS, *Reliability of Information Abstracted from Patients' Medical Records*. Med Care, 1978. **16**(12): p. 995-1005.
50. Quam L, Ellis LB, Venus P, et al., *Using Claims Data for Epidemiologic Research. The Concordance of Claims-Based Criteria with the Medical Record and Patient Survey for Identifying a Hypertensive Population*. Med Care, 1993. **31**(6): p. 498-507.
51. Dresser MV, Feingold L, Rosenkranz SL, et al., *Clinical Quality Measurement. Comparing Chart Review and Automated Methodologies*. Med Care, 1997. **35**(6): p. 539-52.
52. Hicks J, *The Potential of Claims Data to Support the Measurement of Health Care Quality*, in *Policy Analysis*. 2003, RAND: Santa Monica. p. 251.
53. Javitt JC, Steinberg G, Locke T, et al., *Using a Claims Data-Based Sentinel System to Improve Compliance with Clinical Guidelines: Results of a Randomized Prospective Study*. Am J Manag Care, 2005. **11**(2): p. 93-102.
54. Damberg CL, Raube K, Williams T, et al., *Paying for Performance: Implementing a Statewide Project in California*. Quality Management in Health Care, 2005. **14**:2(Spring).
55. Hofer TP, Hayward RA, Greenfield S, et al., *The Unreliability of Individual Physician "Report Cards" for Assessing the Costs and Quality of Care of a Chronic Disease*. JAMA, 1999. **281**(22): p. 2098-105.
56. Lozano P, Connell FA, and Koepsell TD, *Use of Health Services by African-American Children with Asthma on Medicaid*. JAMA, 1995. **274**(6): p. 469-73.
57. Lo Sasso AT and Freund DA, *A Longitudinal Evaluation of the Effect of Medi-Cal Managed Care on Supplemental Security Income and Aid to Families with Dependent Children Enrollees in Two California Counties*. Med Care, 2000. **38**(9): p. 937-47.
58. Fortney JC, Borowsky SJ, Hedeon AN, et al., *Va Community-Based Outpatient Clinics: Access and Utilization Performance Measures*. Med Care, 2002. **40**(7): p. 561-9.
59. Asch SM, Sloss EM, Hogan C, et al., *Measuring Underuse of Necessary Care among Elderly Medicare Beneficiaries Using Inpatient and Outpatient Claims*. JAMA, 2000. **284**(18): p. 2325-33.
60. Weingart SN, Iezzoni LI, Davis RB, et al., *Use of Administrative Data to Find Substandard Care: Validation of the Complications Screening Program*. Med Care, 2000. **38**(8): p. 796-806.
61. Kaplan S, Griffith JL, Price LL, et al., *Reliably Assessing Physician Performance: The Critical First Step in Pay for Performance*. under review, 2005.

62. Donabedian A, *Evaluating the Quality of Medical Care*. Milbank Mem Fund Q, 1966. **44**(3): p. Suppl:166-206.
63. Lohr KN, *Use of Insurance Claims Data in Measuring Quality of Care*. Int J Technol Assess Health Care, 1990. **6**(2): p. 263-71.
64. Palmer S and Torgerson DJ, *Economic Notes: Definitions of Efficiency*. BMJ, 1999. **318**(7191): p. 1136.
65. Williams A, *Priority Setting in Public and Private Health Care: A Guide through the Ideological Jungle*. J Health Econ, 1988: p. 173-183.
66. Rosen AK and Mayer-Oakes A, *Episodes of Care: Theoretical Frameworks Versus Current Operational Realities*. Jt Comm J Qual Improv, 1999. **25**(3): p. 111-28.
67. Hornbrook MC, Hurtado AV, and Johnson RE, *Health Care Episodes: Definition, Measurement and Use*. Med Care Rev, 1985. **42**(2): p. 163-218.
68. Schneeweiss R, *Diagnosis Clusters: A New Approach for Reporting the Diagnostic Content of Family Practice Residents' Ambulatory Experiences*. J Fam Pract, 1985. **20**(5): p. 487-92.
69. Garnick DW, Luft HS, Gardner LB, et al., *Services and Charges by PPO Physicians for PPO and Indemnity Patients. An Episode of Care Comparison*. Med Care, 1990. **28**(10): p. 894-906.
70. Cave DG, *Pattern-of-Treatment Differences among Primary Care Physicians in Alternative Systems of Care*. Benefits Q, 1994. **10**(3): p. 6-19.
71. Cave DG, *Analyzing the Content of Physicians' Medical Practices*. J Ambul Care Manage, 1994. **17**(3): p. 15-36.
72. Cave DG, *Profiling Physician Practice Patterns Using Diagnostic Episode Clusters*. Med Care, 1995. **33**(5): p. 463-86.
73. Galvin R and Milstein A, *Large Employers' New Strategies in Health Care*. N Engl J Med, 2002. **347**(12): p. 939-42.
74. McGlynn EA, *Selecting Common Measures of Quality and System Performance*. Med Care, 2003. **41**(1 Suppl): p. I39-47.
75. Lee TH, Meyer GS, and Brennan TA, *A Middle Ground on Public Accountability*. N Engl J Med, 2004. **350**(23): p. 2409-12.
76. Thomas JW, Grazier KL, and Ward K, *Comparing Accuracy of Risk-Adjustment Methodologies Used in Economic Profiling of Physicians*. Inquiry, 2004. **41**(2): p. 218-31.
77. Thomas JW, Grazier KL, and Ward K, *Economic Profiling of Primary Care Physicians: Consistency among Risk-Adjusted Measures*. Health Serv Res, 2004. **39**(4 Pt 1): p. 985-1003.
78. *Issues in Physician Payment Policy, Ch. 3, in Report to the Congress: Medicare Payment Policy*. 2005, Medicare Payment Advisory Commission: Washington DC. p. 143-180.



PBGH

**Pacific Business
Group on Health**

221 Main Street, Suite 1500
San Francisco, California 94105
415.281.8660 ph
415.281.0960 fax
www.pbgh.org



Lumetra

Brighter insights. Better healthcare

One Sansome Street
San Francisco, California 94104
415.677.2000 ph
415.677.2195 fax
www.lumetra.com