

Guidance for Using the AHRQ Quality Indicators for Hospital-level Public Reporting or Payment



**Prevention
Quality Indicators**

**Inpatient
Quality Indicators**

**Patient Safety
Quality Indicators**



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Preface

State data organizations, public payers, employers, health plans, and others seeking to improve health care quality have a growing interest in using public reporting and quality-based payment strategies, and have begun to include AHRQ's Quality Indicators (QIs) as measures in these efforts. The perceived advantage of the QIs is that they measure outcomes that consumers care about; these indicators also use administrative data, which are relatively inexpensive, readily available, and already used for hospital quality improvement. Because AHRQ originally developed and refined these indicators for use in quality improvement and national tracking, there has been some question about how and if to use them in these new ways. The purpose of this document is to provide guidance on this question.

This guide briefly examines the fit between criteria used for developing the Quality Indicators and those used by the National Quality Forum as part of its national consensus process on public reporting. It concludes that the fit is quite close. It then illustrates some typical uses of the QIs and identifies the factors organizations should consider in selecting which specific QIs to include in their particular public reporting or payment efforts. The intent is not to endorse a national approach or provide a one-size-fits-all assessment of which set of measures to use. Local areas and particular users are likely to have different uses (public reporting vs. paying for quality vs. paying for tracking the data), priorities (greater or lesser emphasis on cardiac care, for example), markets (a large or small number of high-volume hospitals) and data situations (variations in data completeness and coding quality). Rather, the goal is to enable organizations considering use of the Quality Indicators to use the best science in making and implementing their decisions. The guide also includes some recommendations on how to use the QIs most productively, for example by involving hospitals early in the measurement efforts, using the QIs as part of a broader dashboard, presenting outcomes with process measures, pairing mortality and volume indicators, using multiple years of data, and evaluating the use of composite measures.

This document will not answer all of the technical questions a potential user might have. It is one of many tools we are producing to support use of the QIs. Other resources include the availability of user support; development of a QI training curriculum with modules specific to providers, purchasers and policymakers; and development of QI software which will incorporate data quality edits and will not require access to statistical software packages.

All QI software and documentation is publicly available at no charge from the AHRQ QI Web site <http://www.qualityindicators.ahrq.gov>. For further information or answers to technical questions, users should feel free to contact our Support for Quality Indicators contract team at support@qualityindicators.ahrq.gov. We would also welcome suggestions of further guidance materials that might be helpful. Thank you for your interest in the AHRQ QIs.

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The Changing Climate of Quality Measurement

The climate for quality tracking, measurement, reporting, and linking payment to quality has changed dramatically in the past few years. Several major landmark studies and reports have identified significant gaps and variations in the quality and safety of health care.^{1,2,3,4,5,6,7}

These reports, in turn, have accelerated efforts by government, accrediting bodies, large purchasers and employer coalitions, and others to track quality at the national, statewide, and provider level; publish comparative quality reports; launch quality improvement efforts; and use public and private purchasing power to reward better quality. Leaders of these quality efforts often consider using administrative data because they are readily available and inexpensive relative to other data sources.

Some leaders involved in efforts focused on hospital quality have expressed a specific interest in the AHRQ Quality Indicators. Although these indicators—specifically the Inpatient Quality Indicators (IQIs) and Patient Safety Indicators (PSIs)—were originally developed for quality improvement purposes, some public and private purchasers and data organizations have begun to use them for hospital-level public reporting and pay-for-performance initiatives;^{8,9,10,11} and many others are considering doing so. Current and potential users have asked AHRQ for guidance in evaluating the QIs and administrative data for these expanded purposes. This document is designed to provide such guidance.ⁱ

Quality Measurement Efforts

Activities focused on quality assessment and implementation of quality measures have exploded in the last few years. Some of these efforts focus on aggregate tracking at the national and regional levels, whereas others focus on provider or hospital-level activities including accreditation, public reporting, purchasing, or payment.

National and Regional Tracking

In 2003, the Agency for Healthcare Research and Quality published the *National Healthcare Quality Report*⁴ (NHQR) and *National Healthcare Disparities Report* (NHDR),⁵ which provide a comprehensive picture of the level and variation of quality within four components of health care quality—effectiveness, safety, timeliness, and patient centeredness—drawn from a conceptual framework identified by the Institute of Medicine.¹² These reports do not include provider level data but rather national and regional baselines to support statewide, community, and provider quality improvement efforts.

Accreditation

For many years, organizations have incorporated quality measures into their accreditation process. The National Committee for Quality Assurance (NCQA) monitors health plan performance using measures in their Health Plan Employer Data and Information Set (HEDIS®),¹³ and the Joint Commission on Accreditation of Healthcare Organizations (JCAHO)

ⁱ This document focuses on public reporting or payment efforts; however, the indicators may be used by a variety of stakeholders in many contexts to encourage provider engagement in quality improvement efforts.

has incorporated measures of hospital quality in their accreditation process.¹⁴ Although these measures initially were used for quality improvement, there has been a trend towards public reporting of some or all of these measures. For example, the JCAHO will be replacing hospital performance reports with quality reports in 2004.¹⁵

Comparative Public Reporting

A major change in the past several years has been an acceleration of public reporting efforts, particularly for hospitals. While several State data organizations including California,¹⁶ New York,¹⁷ and Pennsylvania,¹⁸ have been involved with hospital quality reporting efforts for years, others, such as Texas,⁸ have just recently entered the reporting arena. Thirty-six different hospital quality reporting efforts are summarized in a recent publication by the IPRO.¹⁹ The National Quality Forum (NQF) was established in late 1999 to facilitate widespread health care quality improvement and public accountability.²⁰

An early NQF effort involved creating a comprehensive measurement framework for hospital performance.²¹ The framework included more than 20 specific evaluation criteria organized within the following categories: 1) importance, 2) scientific acceptabilityⁱⁱ, 3) usefulness, and 4) feasibility. The NQF framework and measure evaluation criteria underwent an extensive consensus process involving representatives of the public and NQF membership including Federal and State agencies, providers, purchasers, health plans, and consumers. The efforts of the NQF resulted in endorsement of 39 voluntary consensus standards for hospital care to inform consumer selection, drive improvement of care, facilitate performance-based quality improvement initiatives, and create incentives for value-based purchasing.²² There is a commitment by NQF members to evaluate the endorsed measures for potential inclusion in their reporting programs.

The Centers for Medicare & Medicaid Services (CMS) worked with a variety of provider associations to identify an initial core set of voluntary measures for public reporting; CMS is now continuing to expand these quality measurement efforts by augmenting the initial list of ten measures.²³ The build-out will be accomplished through a partnership with public and private entities to identify candidate measures across the spectrum of care and will involve NQF to identify those measures around which consensus exists.

Payment (Provider Selection and Pay-for-Performance)

Several organizations are already using quality information to guide their provider selection and payments. For example, an increasing number of large employers and coalitions are using a common Request for Information (eValue8²⁴) to solicit information about quality from health plans seeking to do business with them. Through the Leapfrog Initiative,²⁵ alliances of large employers and business coalitions are asking hospitals to provide data on three safety practices: computer physician order entry, evidence-based hospital referral, and physician staffing in the intensive care unit. In addition, both private and public purchasers are establishing programs

ⁱⁱ Elements of scientific soundness include precise specifications, reliability, validity, adaptability, adequacy of risk adjustment, and inclusion of explicit conditions of use. (For more details, see: McGlynn EA. Selecting common measures of quality and system performance. *Med Care* 2003;41(1 Suppl):I39-47.)

basing payment amounts and/or contractual referral relationships on provider quality information. In some cases payment is linked to mere provision of the quality data, such as a component of the Anthem Blue Cross and Blue Shield of Virginia Pay for Performance Initiative,¹¹ whereas in others it is linked to the score itself, such as the CMS Premier Hospital Quality Incentive Demonstration.⁹ CMS has several projects underway that require submission of a core set of hospital quality measures.²⁶ Under the Prescription Drug, Improvement and Modernization Act of 2003, hospitals who do not report quality data will experience a 0.4% reduction of their Medicare payment levels.²⁷

A recent AHRQ Evidence-based Practice Center (EPC) technical review examined the evidence supporting quality-based purchasing strategies.²⁸ The researchers' review of the literature and ongoing research identified considerable variances in the methodologies used to evaluate quality-based purchasing and only one randomized controlled trial. They expanded their evaluation by developing stimulations to determine how often hospitals would be mislabeled in public reports. This work enabled the examination of the role of random variation versus true quality differences in assessing reported hospital outcomes. Based on their modeling work, the researchers concluded that, with appropriate caution such as using multiple years of data, outcome measures can be included among the performance indicators used for quality-based purchasing.ⁱⁱⁱ

Current Challenges

This proliferation of quality measurement activity has led to many challenging questions:

- How do we construct a robust, yet parsimonious measure set?
- How do we ensure that measures span different domains of care, different diseases, and conditions affecting all population groups?
- How do we cover all this ground and still retain a manageable number of measures?
- How do we enable particular stakeholders or localities to choose those measures that most concern them from a broader menu of measures?
- How do we make sure that solid measures are populated with reliable and verifiable data?

National organizations including AHRQ, NCQA, CMS, JCAHO, and NQF are working to resolve these and other pressing questions. This report focuses on one particular issue receiving considerable attention: use of the AHRQ QIs and other administrative data for public reporting and/or pay for performance. The next section describes the genesis, development, major features, and current use of the QIs.

Overview of the AHRQ Quality Indicators

The AHRQ Quality Indicators (QIs) are measures of health care quality that make use of readily available hospital inpatient administrative data. The initial version, developed in the early 1990s,

ⁱⁱⁱ The evidence technical review summary and full report, *Strategies To Support Quality-based Purchasing: A Review of the Evidence*, will be available on the AHRQ Web site in late Summer 2004. See: <http://www.ahrq.gov/clinic/epcix.htm#techreviews>.

came out of a data partnership among the Agency, health care industry, and several States—the Healthcare Cost and Utilization Project or HCUP.²⁹ The original HCUP Quality Indicators represented an effort to enable States and their hospital associations to use their administrative data for quality improvement and tracking, and the indicators were extensively used for these purposes.³⁰

Development Process

In preparation for the *National Healthcare Quality Report*, AHRQ asked its Stanford–University of California, San Francisco (UCSF) EPC to refine, expand, and risk adjust these measures.^{31, 32} The research team followed an extensive multi-step process which included the following:

1. Development of an evaluation framework with six criteria including face validity, precision, minimum-bias, construct validity, fostering real quality improvement, and application experience.
2. Structured literature review, Web searches and contact with quality measurement experts.
3. Evaluation of risk adjustment methods available for use with administrative data.^{iv}
4. Consultation with ICD-9-CM^v coding experts.
5. Structured review of each proposed indicator by clinical panels (for the Patient Safety Indicators), focusing on the usefulness of the proposed indicator as a quality measure, its preventability, and its likelihood of resulting from a medical error.
6. A series of empirical analyses designed to test precision, minimum bias, and construct validity; each indicator was assigned a summary score for empirical performance.
7. Examination and comparison of multiple options for risk adjustment, and selection and incorporation of a risk adjustment methodology.

The AHRQ QIs are the result of this extensive evaluation and development effort and currently include three modules—the Prevention Quality Indicators (PQIs), Inpatient Quality Indicators (IQIs), and Patient Safety Indicators (PSIs).³³ These are briefly described below.

AHRQ QI Modules

The AHRQ Quality Indicators are a tool to assist health care decisionmakers in using administrative data to highlight potential quality concerns, identify areas that need further study and investigation, and track changes over time.

- **Prevention Quality Indicators** focus on ambulatory care sensitive conditions, hospital admissions that evidence suggests could have been avoided, or conditions that could be less severe if treated early and appropriately. These measures reflect quality of health care within a community, primarily outpatient services, and are not measures of hospital quality.

^{iv} Additional information on their evaluation of the available risk adjustment methods is available in *Refinement of the HCUP Quality Indicators* (pp. 56-62 and 171-77).³¹

^v ICD-9-CM refers to the *International Classification of Diseases, 9th Revision, Clinical Modification*, the diagnosis and procedure coding system required for Medicare claims.

- **Inpatient Quality Indicators** reflect quality of care inside hospitals and include inpatient mortality for medical conditions; inpatient mortality for procedures; utilization of procedures for which there are questions of overuse, underuse, or misuse; and volume of procedures for which there is evidence that a higher volume of procedures is associated with lower mortality.
- **Patient Safety Indicators** also reflect quality of care inside hospitals, but these indicators focus on surgical complications and other iatrogenic events.

The QIs can be used with any inpatient claims database in the United States, including not only the HCUP data sets^{34,35} but also data available directly from statewide data collection efforts of State governments and hospital associations or from individual hospitals. For purposes of tracking, hospital self-assessment, or reporting of hospital-specific quality, only the IQIs and PSIs are pertinent. (The prevention module focuses on community care using hospital data.)

The AHRQ QIs were designed with the goal of creating tools for quality tracking and improvement and have been extensively used for these purposes. For example, the recently released NHQR and NHDR provide national and regional data using the PQIs and PSIs. In addition, States, State hospital associations, and individual hospitals have been using them extensively for quality improvement purposes.^{36, 37}

While the focus of the initial QI development work was not on hospital-level comparative reporting or for uses such as health care purchasing or payment, the increased demand for standardized hospital-level comparative data in a time of growing quality concerns has led to their adoption for these new purposes—what might be called an “off-label” use of the indicators. For example, Texas, and New York are now using the IQIs to publicly report quality for all acute care hospitals in their respective States^{8,10} and two pay-for-performance programs mentioned earlier have incorporated the PSIs.^{9,11} Through these and similar efforts, new knowledge has been gained of potential uses and applications of the QIs and the challenges of balancing the need for information with access to data and measures. (See Appendix A for further details on examples of uses of the QIs.)

As a result of the evolution of quality measurement and the changing reporting landscape, potential users of the QIs and other indicators based on administrative data have been asking the following question: How do the criteria used in developing the AHRQ Quality Indicators relate to recently published national frameworks that were intended to increase public accountability for hospital performance? This question is addressed in the next section.

Comparison of Criteria of Existing Indicator Evaluation Frameworks

One very significant outgrowth of the quality measurement and reporting movement in the past few years has been the formulation of evidence-based and consensus-based evaluation frameworks for identifying and prioritizing measures. These frameworks focus on different institutions or units of analysis—hospitals vs. health plans, for example—and were developed for different purposes—accreditation, quality reporting, quality improvement, etc. Some invited all data sources, whereas others (such as the EPC report on the AHRQ QIs) focused just on administrative data.

Table 1 summarizes the characteristics of five frameworks developed by different organizations to guide their respective quality measure selection efforts: the NQF,²¹ the AHRQ QIs,^{31,32} the NHQR,⁴ the JCAHO,³⁸ and the NCQA.³⁹ The five frameworks differ by unit of analysis, intended purpose, and data sources. The differences in the framework characteristics appear to influence the focus and details of individual criteria as well as their implementation and emphasis.

As a first step toward guiding the potential use of the AHRQ QIs for hospital public reporting, AHRQ asked the Support for Quality Indicators (SQI) team at the Stanford–UCSF EPC to align all of the criteria used by the various organizations into a common template as all five frameworks are currently in use (although modifications may occur in the future based on the new work of NQF); each has been referenced in work describing selection of performance measures. This was a somewhat complex undertaking because each of the frameworks use slightly different terminology.

The next task was to compare the frameworks, to identify which criteria appeared in which framework, and to identify key similarities and differences. The QI framework was updated by adding in criteria which were considered in development of the QI software, efforts subsequent to the original EPC report. For example, the QI software offers the ability to generate confidence intervals to support statistical significance testing—a criterion not explicitly stated in the initial framework.³¹ (See Appendix B for a side-by-side comparison of all five frameworks.)

Table 1. Comparison of the characteristics of existing indicator evaluation frameworks

	NQF	AHRQ Quality Indicators	NHQR	JCAHO	NCQA
Unit of analysis	Hospitals	Hospitals	National, State, region	Hospitals	Health plans
Purpose	Public accountability, comparative quality reporting	Quality improvement	Quality reporting – health care quality in America	Accreditation, mandated, moving toward public disclosure	Accreditation, no mandate, voluntary disclosure
Data sources	All feasible	Administrative only	All feasible	All feasible	All feasible
Measure set	Hospital Care Performance Measurement Set	AHRQ Quality Indicators	NHQR measure set	ORYX and ORYX core measures	HEDIS®

The comparison between the NQF measures and the AHRQ QIs is particularly important for several reasons. First, as shown in Table 1, the NQF framework is the only one that focuses solely on public reporting as the goal and hospitals as the unit of analysis. Second, the NQF framework is the most recent of those described above. Finally, the NQF framework was endorsed as a national voluntary consensus standard by NQF membership and Board which included representatives from AHRQ, JCAHO and NCQA as well as providers, purchasers and consumers. For this reason, the following discussion pays particular attention to the comparison between the national voluntary consensus standard framework of NQF, which concentrated on provider public reporting, and the framework applied to the AHRQ QIs.

Table 2 compares the criteria from the NQF and the QI frameworks. As noted earlier, the evaluation framework used for the AHRQ QIs and phrasing of the individual criteria varies slightly from those in the NQF framework; but, in a side-by-side comparison, it is clear there are very few substantive differences. Even the NQF criteria that were not included in the original EPC report for the AHRQ QIs were later addressed through incorporation in subsequent work such as the QI software. So the answer to the question “How do the criteria used to develop and support the QIs compare with those of the NQF?” is that the criteria are almost exactly the same.

Based on this comparison, it appears that the AHRQ QIs were selected through a process that was reasonably aligned with the NQF criteria, and thus are *potentially* appropriate for use in hospital comparative reporting projects. The next section of this report turns to the second question most commonly asked by would-be users of the QIs for reporting, purchasing, or payment: What factors should potential QI users consider when deciding which, if any, AHRQ Quality Indicators to use for public reporting or payment efforts?

**Table 2. Quality indicator evaluation framework criteria:
Comparison of National Quality Forum and AHRQ Quality Indicators**

Quality indicator evaluation framework criteria	NQF	AHRQ QIs
1. Importance		
• Assesses an important leverage point for improving quality; significant to target audiences; impact on health	✓	✓
• Opportunity for improvement, considerable variation in quality of care exists	✓	✓
• Aspect of quality is under provider or health system control	○	✓
• Should not create incentives or rewards to improve without truly improving quality of care		✓
2. Scientific acceptability		
• Relationship to quality is based on scientific evidence	✓	✓
• Well defined and precisely specified	✓	✓
• Valid, measures the intended aspect of quality; accurately represents the concept being evaluated; data sources are comparable	✓	✓
• Adequate proportion of total variation is explained by provider performance and amount of variation in measurement is small after provider performance and patient characteristics are taken into account	✓	✓
• Reliable, producing the same results a high proportion of time in the same population	✓	✗
• Precise, adequately discriminating between real differences in provider performance and reasonable sample size exists to detect actual differences; captures all possible cases and bias related to case exclusion or limited data is minimal.	✓	✓
• Risk adjustment is adequate to address confounding bias	✓	✓
3. Usability		
• Effective (understandable and clear) presentation and dissemination strategies exist	✓	
• Statistical testing can be applied to communicate when differences in performance levels are greater than would be expected by chance	✓	✗
• Has been used effectively in the past and/or have high potential for working well with other indicators currently in use	○	✓
• Compelling content for stakeholder decision making	✓	✓
4. Feasibility		
• Consistent construction and assessment of the measure	✓	✗
• Feasible to calculate; benefits exceed financial and administrative burden of implementation	✓	✗
• Confidentiality concerns are addressed	✓	✗
• Audit strategy can be implemented, quality of data is known	✓	✗
<p>✓ = Indicates the criterion is in the evaluation framework.</p> <p>○ = NQF applied scope and priority thresholds to measures prior to the measure evaluation phase. All NQF hospital care consensus standards meet this criterion as part of the established thresholds.</p> <p>✗ = Indicates the criterion was not in the initial evaluation framework but has been addressed through incorporation in subsequent work such as the QI software.</p>		

Using the AHRQ QIs for Public Reporting or Payment: Factors in Decisionmaking

Organizational and Program Needs

The path from measure evaluation to actual implementation can be difficult to negotiate regardless of data source. There are often significant challenges associated with applying administrative or clinical data, no matter how “good” the measure is (i.e., precisely defined with significant opportunities for improvement and substantial value for stakeholder decisionmaking). Depending on organizational or programmatic needs, different entities will approach implementation questions at different stages in the process, but they need to be addressed at some point. If a program’s goal is to identify a menu of measures meeting certain criteria, implementation issues can be dealt with later as users select from the menu. The NQF consensus process evaluated measures for fit against criteria with the emphasis on defining a measurement set and did not specifically address implementation issues at the outset; an implementation committee was subsequently formed to consider these issues. In contrast, the NHQR/NHDR work followed a one-step, integrated process. The immediate objective was to produce national reports on quality and disparities. This meant implementation issues had to be resolved before a measure was selected for inclusion in the measurement set: No matter how perfect the measure, it could not be used without national data. This is usually the case with reporting or purchasing programs at the State or local level: measures are being assessed for immediate use. Implementation issues, including data availability and data quality, need to be addressed *during the measure selection process* because the immediate goal is to produce comparative data, not just a measure set.

Availability of Data

For hospital-level measurement, the following data sources are typical:

- Clinical data (e.g., medical record abstraction, laboratory data, pharmacy data, electronic medical record)
- Administrative data (refers to UB-92, billing, or claims data)
- Survey data (e.g., patient experience with care, employee satisfaction)
- Operational data (e.g., licensure, ownership, staffing levels, type of staff)

Each of these data sources has strengths and weaknesses. National reports such as the NHQR often draw from several different types of data. The most commonly used sources are clinical data and administrative data. Each of these is discussed in more detail below.

Clinical data. For provider-level reporting purposes, clinicians typically prefer measures of quality derived from clinical data sources, all things being equal. However access to clinical data can be a challenge. Medical record abstraction is usually required and increases the cost of collection. There is often inconsistency in documentation and abstraction across hospitals with complex audit processes required to assure comparability of sources. The primary benefit associated with the use of clinical data is the greater number of data elements that can be abstracted resulting in enhanced measure definition, risk adjustment, and linkage to care

processes. Efforts are underway at the national level to expand access to clinical data and to integrate selected clinical data elements into administrative data systems,^{40,41} but this work is not yet complete.

Administrative data. At this time, administrative data are the most widely available source of information about hospital services, patient care, and patient outcomes; for this reason there is considerable interest in using administrative data for public reporting and payment. All hospitals generate administrative data as part of billing operations and all payers have access to administrative data (Table 3). The data are inexpensive to collect, are easily accessible, and incorporate clinical information through the use of standardized diagnosis and procedure codes. Administrative data have been shown to be useful in quality assessment⁴² and medical research,⁴³ as well as for other measurement tasks including screening for complications,⁴⁴ identifying mortality rates,^{45, 46} and tracking health system utilization.^{47, 48, 49, 50}

Use of administrative data can make quality measurement more accessible, and hospitals and health care systems can use the same data for internal evaluations and improvement. Most State data organizations rely on administrative data for their hospital data programs and often make the data available for public use.^{34,35,51} But administrative data, like clinical data, also have limitations. Because administrative data are collected principally for billing and related administrative purposes, they lack the depth of clinical detail that can be helpful in quality measurement; variations in coding practices may create challenges for quality evaluations; and there can be data validity issues.^{52,53,54,55,56,57}

Table 3. Characteristics and uses of hospital administrative data

<ul style="list-style-type: none"> • Used to bill and pay for hospital services, contains the information from the discharge claim. • Standardized format, available electronically from all hospitals who bill for services (few paper bills). • Used for health care quality research, evaluation of services (including utilization, outcomes, charges/cost), and quality improvement. • Typical data elements include patient gender, age, diagnoses, procedures, length of stay, admission source, discharge status, total charges, primary payer, and hospital identifier. • Data elements that may be available depending on data source include patient race, county or ZIP Code of residence, secondary payer, detailed charges, and identifier of primary physician and surgeon. • Data format and quality may differ across hospitals or data organizations such as the number of diagnosis and procedure codes available (typically 9, but may be as high as 15 or 30 per patient claim) and the sequencing of the codes, the audits or edits applied to the data before and after submission, and the data values accepted.
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Use of either administrative data or clinical data for reporting or purchasing requires clarity about goals and deliberate strategies to maximize strengths and minimize limitations of the data. For example, indicators developed for quality screening tend to emphasize capturing all cases that might reflect a quality concern (i.e., sensitivity) to provide maximal opportunities for quality improvement. In contrast, publicly reported indicators may be more desirable if they are

designed to minimize the false positive rate and therefore the potential for unfair damage to hospitals' reputations.

Area-level Factors

Most important, different stakeholders in different market areas are likely to value various criteria differently, so the leaders of different State- or community-level public reporting, purchasing, or payment initiatives may choose differently from the menu of nationally available measures for programmatic reasons.^{19,58} For example, in their initial screen of potential measures, NQF sought to identify a balanced national measure set that could work for comparing hospitals across the country. In doing so, they established priorities (both condition-specific and cross-cutting) that included identification of the most prevalent conditions and related outcomes/processes within these areas to determine the extent they were relevant to the majority of the Nation's hospitals. In a review of the AHRQ Inpatient Quality Indicators, NQF found, among other issues, that while cerebrovascular diseases represented a highly prevalent condition among inpatients, the majority of hospitals perform relatively few carotid endarterectomies making mortality and volume for this procedure less appealing than other measures.^{vi} But for a variety of reasons, carotid endarterectomy mortality and volume may be of great concern in particular markets; and prevalence of the procedure among hospitals in other markets may be irrelevant to them. As a result, those designing report cards in Texas and New York included this indicator in their State-level reporting initiatives.^{8,10}

Other Factors

Another example of different parameters driving indicator selection relates to the question of risk adjustment. In decisions to date, the NQF has only supported measures whose risk adjustment system is transparent, publicly available, and free of charge. The mortality Inpatient Quality Indicators (IQIs) are risk adjusted using age, gender, and the 3MTM All Payer Refined-Diagnosis Related Group (APR-DRG) system, which is transparent and publicly available, but is not free.^{vii} This was not a concern for others, such as Texas and New York, which incorporated the mortality IQIs in their public reports. These organizations supported use of the APR-DRG system—it was familiar to their stakeholders, had been evaluated in the scientific literature, and had a developer committed to continued enhancement and support of the risk adjustment system.

^{vi} During its deliberation, NQF also considered the strengths and weaknesses of the measures as a set. Particular interest was paid to balancing measures within and across priority areas – as well as ensuring that measures within each priority area sufficiently represented quality in any one area. In one instance, because a single priority area (acute coronary syndrome) had many measures, several were excluded in favor of others in another priority area. In another case, because only a single measure was retained after evaluation (gastrointestinal hemorrhage mortality), NQF concluded that this single measure did not adequately represent quality in the area of gastrointestinal disease and excluded the measure altogether. Application of the NQF-endorsed framework assures that the composition of the measure set as a whole, and how measures within priority areas and across priority areas are balanced, be considered when selecting measures (personal communication, Ellen Kurtzman, Senior Program Director, NQF, March 26, 2004). For a complete summary of deliberations and concerns, see *National Voluntary Consensus Standards for Hospital Care: An Initial Performance Measurement Set*.²²

^{vii} Information on the 3MTM APR-DRG system is available at http://www.3m.com/us/healthcare/his/products/coding/refined_drg.jhtml.

None of the AHRQ Inpatient Quality Indicators has yet been adopted through the NQF process for hospital reporting. The NQF did review selected Patient Safety Indicators as part of the Nursing Care Consensus Standards initiative but concluded the EPC report of evidence on the link between the indicators and the nursing component of care did not coincide with the NQF criteria for identifying such a linkage. The Patient Safety Indicators are risk adjusted using publicly available methods, including the AHRQ comorbidity system, so the risk adjustment issue is not applicable. The NQF also has not reviewed any of the indicators in terms of their use for purchasing and payment strategies. AHRQ will continue to work with NQF to harmonize measures and will be monitoring the impact of current and future use of the QIs for reporting and payment as part of this process. In particular, since the issue of cost for users of the APR-DRGs has been a hurdle in this harmonization process, AHRQ will be exploring the option of developing alternative cost-free risk adjustment approaches for later versions of the mortality indicators.

Selecting AHRQ Quality Indicators for Public Reporting or Payment

The remaining sections of this document focus on selection of particular QIs for public reporting or payment, including provider selection and pay-for-performance. When evaluating indicators, it is helpful to consider how they are currently being used. Table 4 presents an abbreviated summary, using alpha and numeric characters, of the current (known) uses of AHRQ's Inpatient Quality Indicators^{viii} and Patient Safety Indicators as well as the major technical and methodological factors users should examine when evaluating the measures and adapting them for use in hospital-level reporting or purchasing programs. A description of the category represented by the symbol is noted below followed by a brief discussion. (Appendix A presents the same information as contained in Table 4 but in greater detail.)

Current Uses of the AHRQ QIs

The current uses of the AHRQ QIs are summarized into seven categories represented by the alpha characters A through G. The category headings along with a brief description are noted below.

A. State and regional hospital associations' member only reports. A number of State and regional hospital associations across the Nation have integrated the IQIs and PSIs into their quality programs and performance measurement systems.^{ix} Typically the associations generate comparative reports on the indicators that are shared with members only. Some

^{viii} The IQI list presented in Table 4 is based on IQI version 2.1, revision 2 and does not include three new IQIs added to version 2.1, revision 3 released on July 23, 2004. Information on the latest IQI update is available at http://qualityindicators.ahrq.gov/iqi_download.htm.

^{ix} Hospital associations that have publicly acknowledged their use of the AHRQ QIs for quality improvement include the Healthcare Association of New York State; the Missouri Hospital Association; the Illinois Hospital Association CompData subsidiary that also serves hospitals affiliated with the Association of Kentucky Hospitals and Health Systems, the Montana Hospital Association, the Oregon Association of Hospitals and Health Systems, the West Virginia Hospital Association; the Georgia Hospital Association; and the Dallas-Fort Worth Hospital Council.

associations include hospital-specific data while others share only blinded reports, providing comparative data without identifying the individual hospitals.

- B. Internal hospital quality improvement.** Many hospitals have run the QIs on their internal data and incorporated the indicators into their organization's quality improvement programs. The majority of inquiries into the QI User Support System are from representatives of individual providers (34%) while hospital association representatives comprise the second largest group (14%).
- C. National quality reports (not hospital level).** The 2003 *National Healthcare Quality Report* and *National Healthcare Disparities Report* included the PSIs. A subset of the mortality IQIs are under consideration for addition to the measurement set used in the next reports.^{59, 60} The IQIs and PSIs were included in a recent report on the quality of care received by Medicare beneficiaries submitted to Congress by the Medicare Payment Advisory Commission (MedPAC).⁶¹
- D. State agencies' safety monitoring and confidential/internal analyses.** The majority of States have access to hospital discharge data through State data organizations, the State's Department of Health, or other State agencies. Several States have run the PSIs and are using them in internal evaluations. A few States have shared confidential reports with hospitals as part of their safety programs.
- E. Public reporting by hospital.** The IQIs have been publicly reported, with hospitals identified, by two organizations. The first, in Texas, is the Texas Health Care Information Council (THCIC). THCIC's primary purpose is to provide data that will enable Texas consumers and health plan purchasers to make informed health care decisions.⁶² The second organization, in New York, is a collaboration of the Alliance for Quality Health Care (AQHC) and the Niagara Health Quality Coalition, a coalition of businesses, consumer education groups, and health plans created to improve health care quality region-wide while ensuring its cost effectiveness.⁶³
- F. Private pay-for-performance initiative.** An example of a private pay-for-performance initiative is the Anthem Blue Cross and Blue Shield of Virginia Quality-In-Sights[®] Hospital Incentive Program (Q-HIPsm) which began in late 2003.¹¹ The 3-year program is designed to align financial incentives with achievement of specific performance objectives. The patient safety component includes compliance with six JCAHO patient safety goals, adoption of Leapfrog Group recommendations, and selection of two (of nine) PSIs for monitoring and root cause analysis when appropriate.
- G. National (public) pay-for-performance demonstration project.** CMS launched the Hospital Quality Initiative in 2003 which includes the Premier Hospital Quality Incentive Demonstration, a 3-year project to recognize and provide financial rewards to hospitals that demonstrate high quality performance.^{9, 26} CMS seeks significant improvement in the quality of inpatient care by awarding bonus payments to hospitals with high quality as measured by multiple performance measures in the acute care area, including two of the PSIs.

Considerations for Hospital-level Reporting or Purchasing

When evaluating indicators for hospital level public reporting, purchasing, or pay-for-performance projects, there are data and measurement issues that need to be considered and addressed. Problems typically encountered when using administrative data and hospital-level reporting are also summarized in Table 4. These issues are represented by the numeric characters 1 through 7. The seven potential problems are listed below along with a brief discussion of potential solutions or actions that can minimize their impact.

- 1. Very low or low volume (small cell size) could impact patient confidentiality and also limit the ability to reliably identify quality differences.** Small cell size is a frequent problem in performance measurement, especially when using measures of rare events such as mortality or foreign body left after procedure. Small cell size refers to the occasion when there is a small number of cases within any individual unit of analysis. For example, a single hospital (location unit of analysis) may only have one death (small cell size, number of patients who died = 1) in a year (time unit of analysis). It would be difficult to ensure protection of patient confidentiality in this instance. Small cell size also challenges the application of statistical significance tests. The volume of cases or sample size can impact both the sensitivity and specificity of an indicator,^x or true positives and true negatives. Typical solutions to managing low volume or small sample size are suppressing data when the cell size is below a predetermined number (e.g., 5 or 30)⁶⁴ or presenting the raw number without an attempt to risk adjust or present any analysis of differences. Another option is to combine 2 or 3 years of data.⁶⁵ A fourth option may be to combine several measures into a composite index.⁶⁶ This method does offer advantages in dealing with small cell sizes and simplifying data presentation, but there is not yet agreement on the best methodology for creating such an index.⁶⁷ A user may also want to present selected QIs along with other measures—such as those related to process of care—to provide a broader view of quality for a specific patient population (for example, mortality rates associated with CABG and AMI procedures could be combined with the JCAHO or CMS measures^{14,26} specific to those conditions). In addition to the methods already described, the IQI software includes an option for the user to calculate smoothed estimates of hospital performance which reduces “noise” in the measurement or potential differences due to random factors. This is especially helpful when true differences in performance may be obscured due to small sample sizes or relatively rare events.^{xi}

^x Sensitivity refers to the ability to identify a condition that is really present; that is, the proportion positive of those who truly have the condition. Specificity is the ability to identify the absence of a condition when it is really not present; that is, the proportion negative of those who do not have the condition.

^{xi} Additional information on smoothed rates is available in the AHRQ IQI User Guide available for download from the AHRQ Quality Indicators Web site at http://www.qualityindicators.ahrq.gov/iqi_download.htm.

2. **Indicator may not be applicable to the majority of hospitals or applicable only to hospitals with specific services (e.g., cardiac surgery, obstetrics).** The QIs include priority populations and areas such as child health, women's health (pregnancy and childbirth), diabetes, hypertension, ischemic heart disease, stroke, asthma, and patient safety. However not all hospitals provide all the patient care services covered by the QIs. To obtain comparative data for specialty services, a broader geographic region may be selected or the comparison may be limited to hospitals with similar services.
3. **Volume is a proxy measure; volume may be manipulated leading to concerns about appropriate utilization.** Proxy indicators do not directly measure patient outcomes but, rather, an aspect of care that may be associated with the outcome. Volume indicators are not intended as stand-alone measures and are best used in addition to other indicators that measure similar aspects of care or when paired with an outcome measure (e.g., mortality).
4. **Potential confounding bias or the impact may be impaired by skewed distribution not completely eliminated by risk adjustment or carefully constructed operational definitions.** In some situations the indicator may be measuring patient populations that are highly concentrated at a small number of facilities (e.g., pediatric heart surgery). This type of highly skewed volume distribution may have an adverse effect on the precision of this measure. In other situations patient characteristics may substantially affect performance on a measure and may vary systematically across areas. The QI software incorporates risk adjustment to minimize these issues. However, the QIs are limited to those data elements present in administrative data which include patient age, gender, comorbidities,⁶⁸ and the 3M APR-DRG⁶⁹ system. Additionally, the definitions of the QIs were meticulously delineated with the goal being to limit the denominator to comparable patient populations rather than expand to include a broader base of patients with potentially dissimilar characteristics.
5. **Benchmark or the "correct rate" may not be clear.** For some indicators the benchmark rate may not be clear. For other indicators (such as vaginal birth after cesarean section) recent scientific evidence may challenge established benchmarks. Under these circumstances, the national, regional, or peer group averages may be the best benchmark available.
6. **Many, perhaps even the majority, of these procedures are currently done on an outpatient basis or observation status.** The health care setting in which some procedures are performed may change over time (e.g., cholecystectomy), shifting from inpatient admissions to observation status, outpatient basis, or even physician offices. The QIs are based on inpatient discharge data only. Differences in care settings should be considered when evaluating indicators for which the setting of care delivery may be shifting or vary by community in which case only a partial picture of the provision of this service may be provided.

7. **The indicator may require data not present in all administrative data sets, or risk adjustment may be inadequate when based only on data available from ICD-9-CM codes.** The QIs were developed using data from HCUP. Indicator definitions and risk adjustment variables are limited to the readily available data elements but may include data not routinely coded such as external-cause-of-injury codes (E-codes). The HCUP data have been edited for accuracy and validity, both from the originating source (HCUP Partners) and during HCUP processing; and this edited version is returned to each HCUP Partner. However, not all administrative data undergo such an extensive series of audits. State data organizations may have different data requirements; and coding practices may vary across hospitals. QI users should ask about the validation process used for assuring the data quality and integrity of their input data file, be aware of coding practices, and remain cognizant of the potential limitations of risk adjustment. Further suggestions for evaluating data quality will be incorporated into the QI Curriculum currently being developed by RTI International under an Integrated Delivery System Research Network contract with AHRQ. Information on the training sessions associated with the QI curriculum development is posted on the AHRQ QI Web site (<http://www.qualityindicators.ahrq.gov>) and will be distributed to QI Listserv[®] subscribers.^{xii}

^{xii} Instructions on signing up for the QI Listserv[®] are provided on the AHRQ QI Web site at: <http://qualityindicators.ahrq.gov/signup.htm>

Table 4. Current uses of the AHRQ QIs and considerations for hospital-level reporting

AHRQ Quality Indicator	Current Uses		Considerations for hospital level reporting
	Quality improvement and national surveillance	Public reporting and pay for performance	
Esophageal resection volume (IQI 1)	A, B	E	1, 2, 3
Pancreatic resection volume (IQI 2)	A, B	E	1, 2, 3
Pediatric heart surgery volume (IQI 3)	A, B	E	1, 2, 3
Abdominal aortic aneurysm (AAA) repair volume (IQI 4)	A, B	E	1, 2, 3
Coronary artery bypass graft (CABG) volume (IQI 5)	A, B	E	2, 3
Percutaneous transluminal coronary angioplasty (PTCA) volume (IQI 6)	A, B	E	2, 3, 6
Carotid endarterectomy (CEA) volume (IQI 7)	A, B	E	1, 2, 3
Esophageal resection mortality (IQI 8)	A, B	E	1, 2, 4
Pancreatic resection mortality (IQI 9)	A, B	E	1, 2, 4
Pediatric heart surgery mortality (IQI 10)	A, B	E	1, 2, 4
AAA repair mortality (IQI 11)	A, B	E	1, 2, 4
CABG mortality (IQI 12)	A, B	E	1, 2, 4
Craniotomy mortality (IQI 13)	A, B	E	1, 2, 4
Hip replacement mortality (IQI 14)	A, B	E	1, 4
Acute myocardial infarction (AMI) mortality (IQI 15)	A, B	E	1, 4
Congestive heart failure (CHF) mortality (IQI 16)	A, B	E	1, 4
Stroke mortality (IQI 17)	A, B	E	1, 4
Gastrointestinal (GI) hemorrhage mortality (IQI 18)	A, B	E	1, 4
Hip fracture mortality (IQI 19)	A, B	E	1, 4
Pneumonia mortality (IQI 20)	A, B	E	4
Cesarean section (C-section) (IQI 21)	A, B	E	2, 4, 5
Vaginal birth after cesarean section (VBAC) (IQI 22)	A, B	E	2, 4, 5
Laparoscopic cholecystectomy (IQI 23)	A, B	E	4, 5, 6
Incidental appendectomy among elderly (IQI 24)	A, B	E	1, 4
Bi-lateral cardiac catheterization (IQI 25)	A, B	E	1, 2, 5, 6
PTCA mortality (IQI 30)	A, B		1, 2, 3, 6
CEA mortality (IQI 31)	A, B		1, 2, 3
Complications of anesthesia (PSI 1)	A, B, C, D	F	1, 7
Death in low mortality DRGs (PSI 2)	A, B, C, D	F	1, 7
Decubitus ulcer (PSI 3)	A, B, C, D		1, 7
Failure to rescue (PSI 4)	A, B, C, D		1
Foreign body left during procedure (PSI 5)	A, B, C, D		1, 7
Iatrogenic pneumothorax (PSI 6)	A, B, C, D	F	1
Selected infections due to medical care (PSI 7)	A, B, C, D	F	1, 7
Post-operative hip fracture (PSI 8)	A, B, C, D		1, 7
Post-operative hemorrhage or hematoma (PSI 9)	A, B, C, D	F, G	1, 7
Post-operative physiologic and metabolic derangements (PSI 10)	A, B, C, D	G	1, 7
Post-operative respiratory failure (PSI 11)	A, B, C, D		1, 7
Post-operative pulmonary embolism (PE) or deep vein thrombosis (DVT) (PSI 12)	A, B, C, D		7
Post-operative sepsis (PSI 13)	A, B, C, D	F	7
Post-operative wound dehiscence (PSI 14)	A, B, C, D		1, 7
Accidental puncture or laceration (PSI 15)	A, B, C, D		1, 7
Transfusion reaction (PSI 16)	A, B, C, D		1, 7
Birth trauma (PSI 17)	A, B, C, D		2, 7
Obstetric trauma – vaginal with instrument (PSI 18)	A, B, C, D	F	2, 7
Obstetric trauma – vaginal without instrument (PSI 19)	A, B, C, D	F	2, 7
Obstetric trauma – cesarean section (PSI 20)	A, B, C, D	F	2, 7

Note: See text section above, “Selecting AHRQ Quality Indicators for Public Reporting or Payment,” for key to alpha and numeric characters in Table 4.

Post-Selection Suggestions on *How To Use the Indicators*

Although identification of individual QIs is clearly a critical process, decisions about *how* to use them can be equally important to achieving a successful reporting or purchasing effort. Users are referred to a growing body of literature on use of hospital report cards, public accountability, and pay-for-performance.^{65,70,71,72,73,74,75,76,77,78,79} Following are several suggestions that focus on the use of AHRQ QIs with administrative data, drawing from the referenced literature and the experience of early users of the QIs.

- **Clearly delineate the purpose** of the program or measurement project. Is it to drive quality improvement? Public accountability? Inform consumer decisions? Pay for performance? Are there certain patient populations of interest to the program? For example, a project may want to begin by focusing on indicators associated with high cost hospital admissions (e.g., surgical procedures such as coronary artery bypass graft procedures (CABG); craniotomy procedures), admissions representing high volume (e.g., obstetrics), admissions representing high mortality (e.g., acute myocardial infarction (AMI); sepsis), or other criteria. The program purpose will drive all subsequent decisions.
- **Identify stakeholders** involved and their level of responsibilities. Assess expectations and determine to what extent the available data and measures can meet different stakeholder interests.
- **Involve hospitals** early in the measurement program efforts, preferably in the planning stages. Provide them an opportunity to understand the methodology including indicator definitions, any risk adjustment used, and calculation of measures. Provide an opportunity for them to review their own data in order to identify any potential issues with coding or characteristics of their patient population that may present a measurement challenge.
- **Arrange for audits** or similar mechanisms to assure accuracy and completeness of reporting, to make sure that individual hospitals are not penalized for being more accurate in their reporting or providing a larger number of codes than others. This is particularly important if the indicator definition is based on ICD-9 codes not routinely used for payment purposes (such as E-codes). State data organizations vary in their data submission requirements and their capability to accept all ICD-9 codes available in hospitals' health information or billing systems. For example, hospital data program requirements in Texas limit the ICD-9 codes to those available in the electronic billing format (9 diagnoses and 6 procedures) while the data program in California will accept up to 30 ICD-9 diagnosis codes and 30 procedure codes.⁸⁰
- **Evaluate both data quality and content.** Before finalizing indicator selections it is helpful, especially with new measurement programs, to begin with data explorations focusing on overall data quality and content. This may be simple frequency distributions on key variables. Among questions that might be asked are: If the program includes the objective to evaluate access or outcome by patient race, is the data element present for each case? Are data missing in a consistent manner—for example, present in all cases from some hospitals but missing in all cases from other hospitals? Is a selected procedure, e.g., esophageal resection, performed so infrequently in any single year that examining mortality rates would be best accomplished by combining data from several years or by presenting the IQI smoothed rate?

- **Consider incremental implementation** of indicators. For example, an initial stage in a pay-for-performance program may be to reward participation in a measurement effort, e.g., hospital use of the PSIs, rather than individual PSI rates.
- **Utilize comparative benchmarks** (national, regional, and peer group) whenever possible. Examples of sources for comparative data include the NHQR and NHDR, HCUPnet, and other State-level or hospital system reporting efforts.
- **Use AHRQ's SQI program** for help along the way. Detailed information on the AHRQ QIs is available at the AHRQ QI Web site (<http://www.qualityindicators.ahrq.gov>). The QI Support Team is available to assist users with a range of issues including running of the software, clarification of indicator definitions, theoretical questions on the indicators, and interpretation of results. The QI Support Team can be reached via e-mail at support@qualityindicators.ahrq.gov.
- **Link reporting formats** to the program purpose and intended audiences. Pay early attention to how data will be eventually displayed. Different formats may be required for different audiences. Examples of data presentation formats may be obtained from many of the same organizations that make comparative data available.
- **Include an evaluation component** so that other users can benefit from your experience. The SQI program can help with this evaluation component.

Conclusion

As noted earlier, continuous assessment and evaluation by those using the QIs for reporting, purchasing or payment will be essential. AHRQ continues to refine and enhance the QIs and plans to expand the QIs in the near future. In addition, State agencies, hospital associations, and others are engaged in efforts to improve the accuracy and usefulness of administrative data. The Pennsylvania Health Care Cost Containment Council⁸¹ already requires that hospitals collect and submit selected clinical data elements to supplement the administrative data and the UB-02 committee⁴⁰ is considering adding some of these to the minimum data set. AHRQ has funded a project to describe the value of administrative data^{xiii} and is considering future projects on integrating clinical data elements into administrative data.

In addition, use of the QIs in an array of initiatives will provide continuing lessons on how to improve the data sets against which they are applied. The history of the quality measurement and improvement movement shows that new use of an existing data set inevitably reveals opportunities to improve the data and at the same time provides incentives to do so. In the arena of hospital reporting and payment, one often hears that we should not let the perfect be the enemy of the good. If these efforts are carefully crafted, monitored and evaluated—whether they use administrative or clinical data—the good can in fact be the friend and harbinger of the perfect.

^{xiii} Contract No. 233-02-0089 to the National Opinion Research Center.

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