WHA Information Center LLC

# Wisconsin Inpatient Hospital Quality Indicators Report

• 2003 •

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*WHA Information Center*

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# 2003

**January 2005**

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*WHA Information Center*

## Executive Summary

In January 2004 the Bureau of Health Information (BHI) in the Wisconsin Department of Health and Family Services published the first *Wisconsin Hospital Quality Indicators Report*.[1] The quality measures for the report were derived from hospital data submitted to BHI by 127 general medical and surgical hospitals in the state for 2001 inpatient stays. The quality indicators included in that report were developed by the Agency for Healthcare Research and Quality (AHRQ). AHRQ divides the indicators into four areas: volume, utilization, mortality for procedures, and mortality for conditions.[2] AHRQ is the health services research arm of the U.S. Department of Health and Human Services, complementing the biomedical research mission of its sister agency, the National Institutes of Health.[3]

BHI did not produce a report for 2002 data. In 2003, hospital data collection and dissemination was privatized and WHA Information Center assumed responsibility for producing the report. The first report produced by WHA Information Center is based on 2003 inpatient hospital data for 134 general and medical and surgical hospitals. WHA Information Center used the same AHRQ indicators and methods used by BHI except for the addition of two new AHRQ indicators (Acute Myocardial Infarction Without Transfer, and Primary Cesarean Delivery) and some changes in the selection criteria as noted on pages iv and v of this summary.

AHRQ has not yet published national data on AHRQ inpatient quality indicators. The first such publication is scheduled for late January 2005, using 2001 data.

The following tables provide side-by-side information on the 2001 and 2003 Wisconsin Inpatient Quality Indicators. In 2003 fewer Wisconsin hospitals were at or above AHRQ's volume thresholds and mortality rates decreased for most indicators.

[1] Wisconsin Department of Health and Family Services, Division of Health Care Financing, Bureau of Health Information. Wisconsin Inpatient Hospital Quality Indicators Report, 2001 (PHC 5381). January 2004.
[2] AHRQ Quality Indicators-Guide to Inpatient Quality Indicators, Quality of Care in Hospitals-Volume, Mortality, and Utilization. Rockville, MD: Agency for Healthcare Research and Quality, 2002. Revision 3 (July 21, 2004). AHRQ Pub. No. 02-R0204.
[3] US Department of Health and Human Services. Agency for Healthcare Research and Quality. www.ahrq.gov/about/whatis.htm. Accessed December 2004.

## Wisconsin Inpatient Hospital Quality Indicators
2001 and 2003

| | 2001 | 2003 |
|---|---|---|
| Number of Hospitals | 127 | 134 |

## Volume Indicators
## Number of hospitals below and at/above volume thresholds

| Esophageal Resection (IQI 1) | 2001 19 hospitals | | | 2003 21 hospitals | | |
|---|---|---|---|---|---|---|
| Volume Threshold | 1-5 | ≥6 | ≥7 | 1-5 | ≥6 | ≥7 |
| Number of hospitals | 16 | 3 | 3 | 21 | 0 | 0 |

| Pancreatic Resection (IQI 2) | 2001 28 hospitals | | | 2003 29 hospitals | | |
|---|---|---|---|---|---|---|
| Volume Threshold | 1-9 | ≥10 | ≥11 | 1-9 | ≥10 | ≥11 |
| Number of hospitals | 25 | 3 | 2 | 28 | 1 | 1 |

| Abdominal Aortic Aneurysm (AAA) Repair (IQI 4) | 2001 48 hospitals | | | 2003 52 hospitals | | |
|---|---|---|---|---|---|---|
| Volume Threshold | 1-9 | ≥10 | ≥32 | 1-9 | ≥10 | ≥32 |
| Number of hospitals | 24 | 24 | 6 | 35 | 17 | 3 |

| Coronary Artery Bypass Graft (CABG) (IQI 5) | 2001 24 hospitals | | | 2003 27 hospitals | | |
|---|---|---|---|---|---|---|
| Volume Threshold | 1-99 | ≥100 | ≥200 | 1-99 | ≥100 | ≥200 |
| Number of hospitals | 1 | 23 | 13 | 7 | 20 | 11 |

| Percutaneous Transluminal Coronary Angioplasty (PTCA) (IQI 6) | 2001 29 hospitals | | | 2003 36 hospitals | | |
|---|---|---|---|---|---|---|
| Volume Threshold | 1-199 | ≥200 | ≥400 | 1-199 | ≥200 | ≥400 |
| Number of hospitals | 11 | 18 | 11 | 14 | 22 | 14 |

| Carotid Endarterectomy (CEA) (IQI 7) | 2001 54 hospitals | | | 2003 57 hospitals | | |
|---|---|---|---|---|---|---|
| Threshold | 1-49 | ≥50 | ≥101 | 1-49 | ≥50 | ≥101 |
| Number of hospitals | 34 | 20 | 9 | 36 | 21 | 6 |

## Mortality Indicators for Inpatients Procedures
## Risk-Adjusted Mortality Rates

| | 2001 | | 2003 | |
|---|---|---|---|---|
| | Overall | ≥ 50 procedures | Overall | ≥ 50 procedures |
| CABG Mortality Rate (IQI 12) | 3.8 | 4.0 | 2.7 | 2.9 |
| Craniotomy Mortality Rate (IQI 13)* | 7.0 | 7.2 | 6.4 | 7.7 |
| Hip Replacement Mortality Rate (IQI 14)** | 0.15 | 0.21 | 0.23 | 0.25 |
| PTCA Mortality Rate (IQI 30) | 1.4 | 1.5 | 1.3 | 1.3 |
| CEA Mortality Rate (IQI 31) | 0.9 | 1.2 | 0.6 | 0.6 |

***2001 – DRGs 001, 002, 528, 529, and 530; 2003 – DRG 001 (craniotomy, except for trauma)**
****2001 – Included code 716.69; 2003 – Deleted code 716.69**

## Mortality Indicators for Inpatient Conditions
## Risk-Adjusted Mortality Rates

| | 2001 | | 2003 | |
|---|---|---|---|---|
| | Overall | ≥ 50 discharges | Overall | ≥ 50 discharges |
| Acute Myocardial Infarction (AMI) Mortality Rate (IQI 15)* | 10.4 | 10.8 | 9.4 | 8.9 |
| AMI mortality rate, Without Transfer Cases (IQI 32) | Not reported | Not reported | 10.4 | 9.8 |
| Congestive Heart Failure (CHF) Mortality Rate (IQI 16)** | 4.9 | 5.2 | 3.9 | 4.4 |
| Acute Stroke Mortality Rate (IQI 17) | 13.6 | 13.5 | 11.5 | 11.3 |
| Gastrointestinal (GI) Hemorrhage Mortality Rate (IQI 18) | 3.0 | 3.1 | 2.3 | 2.4 |
| Hip Fracture Mortality Rate (IQI 19) | 3.5 | 3.6 | 3.0 | 3.0 |
| Pneumonia Mortality Rate (IQI 20) | 8.4 | 8.1 | 7.0 | 7.1 |

***2001 – diagnosis code of AMI in any field, MDCs 14 and 15 in exclusion criteria; 2003 – principal diagnosis only, eliminated MDCs 14 and 15 from exclusion criteria**

****2001 – the denominator excluded patients undergoing a cardiac procedure; 2003 – the denominator included patients undergoing a cardiac procedure**

## Utilization Indicators – Provider (Hospital) Level
## Risk-Adjusted Utilization Rates

| | 2001 | | 2003 | |
|---|---|---|---|---|
| | Overall | ≥ 50 procedures | Overall | ≥ 50 procedures |
| Cesarean Delivery Rate (IQI 21)* | 19.0 | 20.6 | 18.3 | 20.1 |
| Primary Cesarean Delivery Rate (IQI 33) | Not reported | Not reported | 11.1 | 12.3 |
| Incidental Appendectomy Among the Elderly Rate (IQI 24) | 1.7 | 1.4 | 1.5 | 1.7 |

***2001 – included patients with abnormal presentation, preterm delivery, fetal death, or multiple gestation; 2003 – excluded patients with abnormal presentation, preterm delivery, fetal death, or multiple gestation.**

## FOREWORD

In 2003 there were more than 663,000 hospitalizations in Wisconsin, accounting for nearly $9.5 billion in hospital charges[4]. In addition to information about health care costs, consumers, payers, providers and policy makers want more information about quality. Recent national publications have drawn attention to the quality of care in hospitals in particular. This Wisconsin Inpatient Hospital Quality Indicators Report is intended to provide information about the quality of care in Wisconsin hospitals. Publication of this report is mandated by Chapter 153 of the Wisconsin Statutes.

Hospitals use information to make administrative and system changes that will improve patient outcomes. Generally, hospitals have information about their own performance but lack comparative information or benchmarks. The Wisconsin Inpatient Quality Indicators Report permits hospitals to view their performance in comparison to their peers. In addition, information about care quality allows consumers and payers to make informed health care choices.

This report has many potential audiences and uses. For example, it:

- Allows Wisconsin hospitals to compare their performance against their peers.
- Provides information about performance variation among Wisconsin hospitals.
- May help guide quality improvement efforts.
- Provides health care consumers, payers, providers and policy makers with useful information about the overall quality of care in Wisconsin hospitals.
- Provides a resource to consumers interested in learning about the expected outcomes of hospital care associated with specific diagnostic categories and procedures.

The quality indicators included in this report were developed by the Agency for Healthcare Research and Quality (AHRQ). AHRQ is the U.S. Department of Health and Human Services agency designated by the U.S. Congress to publish the first national report on health care quality. That report was released in late 2003.

The quality measures for this report were derived from hospital data submitted to the Bureau of Health Information in the Wisconsin Department of Health and Family Services and WHA Information Center by 134 general medical and surgical hospitals in the state for inpatient stays in 2003. Chapter 153, Wisconsin Statutes, requires hospitals to submit administrative and claims (billing) information that includes patient demographic information, patient discharge diagnoses, procedures conducted during the hospital stay, length of the hospital stay, discharge disposition and hospital charges. This report was prepared in the WHA Information Center by Joe Kachelski, Vice President, Debbie Rickelman, RHIT, Manager, and Susan Wiegmann, PhD, Consultant.

[4] *Wisconsin Health Care Data Report,* 2003. WHA Information Center

An external workgroup representing hospitals, health systems, and other stakeholders (see page 3) provided guidance for the construction of this report. The WHA Information Center Advisory Board reviewed a draft of the report and provided comments.

This report is available online from the WHA Information Center Web site at the following Web address: www.whainfocenter.com.

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# INTRODUCTION

More than one-third of personal health care expenditures in the United States are for hospital care. In Wisconsin in 2003, there were nearly 663,000 inpatient hospital stays generating almost $9.5 billion in health care charges. Consumers, payers, providers and policy makers are interested in knowing more about the quality of the care delivered by hospitals. Informed consumers can make better health care choices. There are many formal and informal sources of information about quality. Recommendations from physicians and other providers, experiences of friends and family, and quality reports that provide information about the process and outcomes of care are all important in making health care decisions.

Despite widespread interest in information about quality in a health care setting, determining methods to best assess quality of hospital care is a challenge. Definitions of quality differ; human beings are physically, emotionally and psychologically complex; data are imperfect and there is disagreement regarding the best way to measure quality.

This Wisconsin Hospital Inpatient Quality Indicators Report presents useful information about the quality of inpatient care delivered in Wisconsin hospitals in 2003. Twenty-one hospital quality indicators are included in this report. These indicators were constructed using administrative and billing (claims) data from hospital discharges in Wisconsin. Administrative and claims data from the first three quarters of 2003 were collected by the Bureau of Health Information in the Department of Health and Family Services, and data from the last quarter of 2003 by the WHA Information Center pursuant to Chapter 153, Wisconsin Statutes. The contract for professional services between the State of Wisconsin, represented by the Department of Administration, and the Wisconsin Hospital Association (WHA) charges WHA with the production of an inpatient hospital quality indicators report that:

- Is consistent with nationally recognized indicators of quality;
- Displays quality indicator variation across Wisconsin hospitals;
- Does not identify individual hospitals;
- Provides hospitals with useful information for internal quality improvement.

Hospital administrative and claims data include information about patient demographics, diagnoses that are known and reported at the time of discharge, procedures performed during the hospitalization, length of the hospital stay, discharge disposition and hospital charges.

### Indicators of Quality, Not Definitive Determinations of Quality

Even though these inpatient hospital quality indicators represent the state of the art in measuring the quality of hospital care through analysis of administrative and claims data, it is important to recognize that these are **indicators** of quality and **not definitive determinations** of quality. For example, different mortality rates among hospitals may reflect differences in coding, or differences in patient risk factors not included in

administrative and claims data. These indicators are meant to serve as a starting point for further investigation that employs more in-depth analyses. It is important to keep in mind that administrative and claims data do not contain the more detailed patient information typically available from clinical medical records.

AHRQ describes the indicators presented in this report as "a tool to assist health care decision makers in using administrative data to highlight potential quality concerns, identify areas that need further study and investigation, and track changes over time."[5] In particular, the information contained in this report should be useful for hospital administrators, hospital physicians, hospital quality managers and anyone actively engaged in hospital quality improvement initiatives. Variations in results among the hospitals included in this report may stimulate further analysis of the reasons for these differences and contribute to the quality efforts already underway in Wisconsin hospitals.

The information in this report provides a foundation for further analysis of care quality. In some cases, variation in quality indicator results represents true differences in quality. In other cases differences in results may reflect coding differences or the limitations of risk adjustment based on the information available in claims data. Variation in hospital performance may actually reflect the practice patterns of individual providers and not the hospital as a whole. For example, high numbers of Cesarean deliveries at one hospital may be attributed to a single doctor. Variation may also reflect inadequate risk adjustment (especially risks not captured by claims data) or a series of systemic differences between hospitals. In sum, the information presented in this report provides a "snapshot" of comparative data to direct the continuous inquiry that is the foundation of hospital quality improvement efforts.

[5]AHRQ Quality Indicators-Guide to Inpatient Quality Indicators: Quality of Care in Hospitals-Volume, Mortality, and Utilization. Rockville, MD: Agency for Healthcare Research and Quality, 2002. Revision 3 (July 21, 2004). AHRQ Pub. No. 02-R0204.

# THE WISCONSIN INPATIENT HOSPITAL QUALITY INDICATORS REPORT

The Wisconsin Inpatient Hospital Quality Indicators Report provides information about procedure volume, utilization and in-hospital mortality for common conditions and procedures in 134 general medical and surgical hospitals in Wisconsin. Federal hospitals are not included in this report. Data used to construct the 21 quality indicators in this document are derived from administrative and claims (billing) data submitted to the Bureau of Health Information in the Department of Health and Family Services and WHA Information Center under Chapter 153, Wisconsin Statutes. These 21 indicators are a subset of the 34 Inpatient Quality Indicators developed by AHRQ with the assistance of the University of California San Francisco-Stanford Evidence-Based Practice Center (UCSF-Stanford EPC). The AHRQ indicators are supported by research and technical review performed by the UCSF-Stanford EPC.

## QUALITY INDICATORS WORKGROUP METHODOLOGY

Overview

To provide guidance for this report, the WHA Information Center convened a Quality Indicators Workgroup. Eight individuals, representing payers, hospitals, health systems, physicians, and consumers, provided guidance for the construction of this report (See Appendix A). The workgroup met from September 2004 until December 2004. The Workgroup discussed hospital coding variation, strengths and limitations of indicators, suggestions for inclusion or exclusion of specific indicators, options for graphic presentation of indicators, guidance for public interpretation and the usefulness of the report.

Selection Criteria

In addition, the Quality Indicators Workgroup proposed a set of criteria, shown below, for the inclusion of indicators in this report. As a result of the application of these criteria, 13 of the 34 AHRQ indicators were not used in the 2003 report. The same 13 indicators were not used in the 2001 report prepared by the Department of Health and Family Services. The criteria for inclusion or exclusion of indicators included:

- **The indicators should be hospital-specific.** Area-level utilization indicators (see Appendix G for a complete list of the AHRQ indicators) were excluded from this report because its focus is at the hospital level rather than the state as a whole or some other geographical area. Indicators defined as area-level by AHRQ are calculated only at levels of aggregation larger than individual hospitals, such as metropolitan statistical areas and states. An example of an area-level utilization indicator is the hysterectomy rate in Wisconsin for all women 18 years of age and older.

- **Indicators related to procedures frequently performed in an outpatient setting should be excluded.** Much of the data needed to construct meaningful quality indicator scores are not included in the hospital inpatient database for procedures that are frequently performed in an outpatient setting. For example, the "utilization" indicator for laparoscopic cholecystectomy is constructed using laparoscopic cholecystectomies and abdominal cholecystectomies. Since most laparoscopic procedures are performed in outpatient settings, they would not be captured by the AHRQ quality indicator specifications.

- **Indicators affected by changes in guidelines, or lack of consensus for guidelines, should be excluded.** If there is recent clinical evidence that suggests the indicator may no longer be clinically appropriate as a quality indicator, that indicator was eliminated. For example, there is recent medical literature suggesting that Vaginal Birth After Cesarean (VBAC) may be associated with more complications than previously recognized. Therefore, judgments about better or worse hospital performance on this indicator may be confusing and controversial. The rate of VBAC was consequently excluded from the 2001 and 2003 reports.

- **Indicators for procedures where the denominator, or total number of procedures, is extremely small should be excluded.** The denominator size needed to calculate a reliable mortality rate was not present at any Wisconsin hospitals for some procedures. A minimum of 50 cases was used to calculate a mortality rate for a specific procedure or condition. Esophageal resection, for example, is a relatively rare procedure, and no Wisconsin hospitals performed enough of these procedures to calculate a reliable mortality rate. Consequently, mortality rates for esophageal resection were excluded from the 2001 and 2003 reports. Even though a minimum of 50 cases is used as a criterion in this report, the minimum caseload needed to reliably identify quality problems may be higher.[6]

- **Indicators for procedures performed at few hospitals in Wisconsin should be excluded.** For example, the indicators for pediatric heart surgery are excluded because so few hospitals perform the procedure that it was not possible to comply with the law that prohibits the identification of hospitals.

The workgroup also discussed several options for addressing at least some of the 13 eliminated indicators in future reports. For example, mortality rates for rare procedures, such as esophageal resection, might be calculated if several years of data were combined. It is fully anticipated that the content of this report will change in subsequent years as refinements continue to be made to these indicators and as clinical evidence regarding these indicators evolves.

[6] Dimick JB, Welch HG, Birkmeyer JD. Surgical mortality as an indicator of hospital quality. JAMA 2004;292(7):847-851.

## AUDIENCE AND USES FOR THIS REPORT

### Audience(s)

The Wisconsin Inpatient Hospital Quality Indicators Report is intended for payers, providers, consumers and policymakers. It offers a window into the quality of care delivered in Wisconsin hospitals.

### Potential Uses

Examples of potential uses for the Wisconsin Inpatient Hospital Quality Indicators Report include:

- To provide an indication of hospital quality at the state level.
- To indicate the degree of variation in utilization, procedure volume and in-hospital mortality among hospitals in Wisconsin.
- To allow hospitals to assess their performance against their peers.
- To provide hospitals with information that will allow them to perform more in-depth internal quality investigations and complement their ongoing quality improvement efforts.
- To provide a resource to consumers interested in learning about the expected outcomes of hospital care associated with specific diagnostic categories and procedures.
- To compare Wisconsin hospital quality indicators with national indicators that employ the same methodology, as those results become available.
- For cross-state comparisons of quality as data become available from other states using this methodology.
- To monitor changes in quality indicator scores over time.
- To guide further analyses of quality by providers, payers and policymakers.

### Caveats

The Wisconsin Inpatient Hospital Quality Indicators Report provides **indicators** of hospital quality, **not definitive determinations** of quality. More definitive determinations of quality depend on further, more in-depth, analyses.

It is *not* appropriate to compare the indicator results in this report with any other similar indicators, absent assurance that the methods of constructing indicators exactly replicate those of the AHRQ inpatient indicators. For example, a report referring to mortality rates following coronary artery bypass surgery (CABG) may refer to 30-day mortality and would thus not be comparable to the inpatient mortality for CABG reported here.

Another report may use different CPT or ICD-9-CM codes to identify procedures or conditions, or a different risk-adjustment methodology, making comparisons misleading and inappropriate.

## DATA AND REPORTING ISSUES

### Why Hospitals Are Not Identified In This Report

Wisconsin law prohibits the identification of individual hospitals while encouraging the presentation of data in a way that provides insight into variation in quality scores among facilities. This report indicates the variation among hospitals, but does not identify hospitals.

### Considerations When Interpreting the Data

While the AHRQ hospital quality indicators represent the state of the art in quality assessment using administrative and claims data, AHRQ recommends that readers use and interpret the indicators in the context of the underlying data from which they were constructed. Indicator results are imperfect, at best, and should be used as a screening tool rather than as definitive measures of hospital quality.

Administrative data are primarily use for billing purposes. However, such data also contain valuable information about patient diagnoses, procedures performed during the hospitalization, length of stay, charges, disposition of the patient and demographic information about the patient. Further, administrative data are generally much easier to obtain than information from the inpatient medical record, and many hospitals regularly report them to local and national organizations. Consequently, they are widely accessible.

When evaluating indicators based on administrative and claims data there are data and measurement issues that need to be considered.[7] Awareness of these limitations is critical to accurate interpretation of the quality indicators presented in this report. These limitations include:

- Systematic variation and errors in the coding of diagnoses and procedures.
- Inability to determine whether a condition reported on the hospital discharge database occurred during the hospital stay or preceded hospital admission.
- Lack of specificity in ICD-9-CM coding.
- Limitations of data content. Administrative data do not contain the detailed patient information found in clinical medical records.

[7] Remus D, Fraser I. Guidance for Using the AHRQ Quality Indicators for Hospital-level Public Reporting or Payment. Rockville, MD: Agency for Healthcare Research and Quality, 2004. August 2004. AHRQ Pub. No. 04-0086-EF.

## AHRQ INPATIENT QUALITY INDICATORS

### Overview of AHRQ Indicators

The collection of AHRQ Quality Indicators represents the state of the art in assessing quality of care using hospital administrative data.[8] AHRQ divides the indicators into four areas: **volume, utilization, mortality for procedures, and mortality for conditions.** Indicators for all four areas make use of readily available hospital inpatient administrative data. In addition, the indicators related to mortality incorporate risk adjustment, which uses administrative data to address biases that may arise from differences in patient mix severity across providers. Risk-adjusted mortality rates are superior to unadjusted rates and more fair to providers with severe and complex patient mixes; however, unmeasured differences in patient mix may still influence mortality rates.

### Methods Used in Indicator Selection and Refinement

As described in Appendix B, the AHRQ hospital quality indicators were selected and refined by the staff of the UCSF-Stanford EPC. Potential indicators were identified through strategic literature searches and evaluated on the basis of reliability and validity, precision, minimization of bias, relationship to real quality improvement and prior effective use as quality indicators. Selection criteria for all indicators included:

- Indicators are compatible with the use of Healthcare Cost and Utilization Project (HCUP) data.
- Conditions addressed affect at least one percent of hospitalized patients or 20 percent of providers.
- Conditions are the subject of public reporting, previous use as indicators, or large dollar volume.
- Indicators show a clear relationship to quality as evaluated by clinical judgment of health services researchers and medical doctors (AHRQ Guide to Inpatient Quality Indicators, 2004).

### Volume (Hospital-Level) Indicators

The volume indicators are simple counts of admissions in which specific procedures were performed during the hospital stay. Two additional evaluation criteria were applied to the selection of volume indicators:

1. A widely documented volume-outcome relationship.
2. Recent evidence regarding a volume-outcome relationship.

The AHRQ Quality Indicators documentation cites studies suggesting a relationship between procedure volume and outcome, specifically, that higher volume is associated

[8] AHRQ Quality Indicators–Guide to Inpatient Quality Indicators, Quality of Care in Hospitals-Volume, Mortality, and Utilization. Rockville, MD: Agency for Healthcare Research and Quality, 2002. Revision 3 (July 21, 2004). AHRQ Pub. No. 02-R0204.

with better outcomes. Results from the "The California Report on Coronary Artery Bypass Graft Surgery," for example, shows that as volume increases, risk-adjusted mortality decreases for that particular procedure. Wide variation in performance among low-volume hospitals as compared with higher-volume hospitals for the procedure was also found.[9] However, the link between volume and outcome remains controversial, and no consensus exists on the exact thresholds that define high volumes.

The volume thresholds shown in Table 1 are the lowest and highest found in the volume-outcome literature reviewed by AHRQ in developing the indicators (see Appendix D for literature citations associated with thresholds). Following AHRQ's suggestion, hospitals exceeding these thresholds are defined as high-volume hospitals in this report. It should be kept in mind, however, that evidence regarding the volume-outcome relationship is inconsistent.

**Table 1. Volume Indicators and Thresholds**

| Indicator | Thresholds | Comment |
|---|---|---|
| Abdominal Aortic Aneurysm (AAA) Repair | 10 procedures<br>32 procedures | Relatively rare procedure. |
| Carotid Endarterectomy (CEA) | 50 procedures<br>101 procedures | |
| Coronary Artery Bypass Graft (CABG) | 100 procedures<br>200 procedures | 40 years and older. |
| Esophageal Resection | 6 procedures<br>7 procedures | Relatively rare procedure. |
| Pancreatic Resection | 10 procedures<br>11 procedures | Relatively rare procedure. |
| Percutaneous Transluminal Coronary Angioplasty (PTCA) | 200 procedures<br>400 procedures | Increasingly an outpatient procedure.<br>40 years and older. |

### Utilization (Hospital-Level) Indicators

Utilization indicators represent procedures "whose use varies significantly across hospitals, and for which high or low rates of use are likely to represent inappropriate or inefficient delivery of care, leading to worse outcomes, higher costs or both."[10]

[9] Damberg CL, Danielson B, Parker JP, castles AG, and Steimle AE. The California Report on Coronary Artery Bypass Graft Surgery 1999 Hospital Data: Summary Report. San Francisco, CA: Pacific Business Group on Health and the California Office of Statewide Health Planning and Development, August 2003.
[10] Technical Review No. 4. Refinement of the HCUP Quality Indicators, 2001. AHRQ Pub. No. 01-0035.

Utilization indicators were required to have an alternative surgical or medical therapy with lower/higher morbidity or mortality - in addition to meeting the other criteria noted above - in order to be selected for evaluation.

**Table 2. Utilization Indicators**

| Indicator | Definition | Comment |
|---|---|---|
| Cesarean Delivery Rate | Number of Cesarean deliveries per 100 deliveries. | |
| Primary Cesarean Delivery Rate | Number of Cesarean deliveries per 100 deliveries in women with no history of previous Cesarean delivery. | |
| Incidental Appendectomy Among the Elderly Rate | Number of incidental appendectomies per 100 elderly discharges with intra-abdominal procedure. | Incidental appendectomy is not indicated for elderly patients (age 65 years and older). Lower rates suggest better quality of care. |

### Mortality Indictors for Surgical Procedures and Medical Conditions

The AHRQ mortality rates reflect the inpatient death rate for several complex procedures and conditions. The mortality indicators presented here are risk-adjusted, using software recommended by AHRQ, to account for some of the differences in patient mix across providers. Risk adjustment uses statistical procedures to account for the effects of patient-specific factors such as age, sex, and secondary diagnoses. Such factors are considered to lie outside the control of hospitals and providers while still influencing medical and surgical outcomes.

Twelve mortality indicators are included in this report. We exclude procedure-related indicators where: a) the number of procedures is too small across a majority of hospitals to compute reliable rates of mortality; or b) the number of hospitals performing a procedure is very small, thereby making it impossible to comply with the law prohibiting identification of hospitals.

| Table 3. Mortality Indicators for Procedures | |
|---|---|
| **Indicator** | **Definition** |
| Coronary Artery Bypass Graft (CABG) Mortality Rate | Number of in-hospital deaths per 100 discharges for CABG, age 40 years and older. |
| Hip Replacement Mortality Rate | Number of in-hospital deaths per 100 discharges for partial or full hip replacement. |
| Percutaneous Transluminal Coronary Angioplasty (PTCA) Mortality Rate | Number of in-hospital deaths per 100 discharges for PTCA, age 40 years and older. |
| Carotid Endarterectomy (CEA) Mortality Rate | Number of in-hospital deaths per 100 discharges for CEA. |
| Craniotomy Mortality Rate | Number of in-hospital deaths per 100 discharges for craniotomy, age 18 years and older. |

| Table 4. Mortality Indicators for Conditions (age 18 years and older) | |
|---|---|
| **Indicator** | **Definition** |
| Acute Myocardial Infarction (AMI) Mortality Rate | Number of in-hospital deaths per 100 discharges with principal diagnosis of AMI. |
| Acute Myocardial Infarction (AMI) Without Transfer Mortality Rate | Number of in-hospital deaths per 100 discharges with principal diagnosis of AMI |
| Congestive Heart Failure (CHF) Mortality Rate | Number of in-hospital deaths per 100 discharges with principal diagnosis of CHF. |
| Acute Stroke Mortality Rate | Number of in-hospital deaths per 100 discharges with principal diagnosis of stroke. |
| Gastrointestinal (GI) Hemorrhage Mortality Rate | Number of in-hospital deaths per 100 discharges with principal diagnosis of GI hemorrhage. |
| Hip Fracture Mortality Rate | Number of in-hospital deaths per 100 discharges with principal diagnosis of hip fracture. |
| Pneumonia Mortality Rate | Number of in-hospital deaths per 100 discharges with principal diagnosis of pneumonia. |

## QUALITY INDICATOR MEASURES - WISCONSIN HOSPITALS, 2003

This report presents results using 2003 data on 21 hospital inpatient quality indicators for 134 general medical and surgical hospitals in Wisconsin. The 21 indicators are a subset of 34 inpatient quality indicators developed by the Agency for Health Research and Quality (AHRQ). For a complete list of the 34 AHRQ inpatient indicators, see Appendix G.

AHRQ identified four types of inpatient indicators:

- Volume
- Utilization
- Mortality associated with procedures
- Mortality associated with conditions

The indicators included here were constructed from administrative and claims data submitted to the WHA Information Center. Production of these measures is consistent with specifications provided by AHRQ (see previous section and Appendix F, Methodology).

### Presentation of Indicators

Volume, utilization and mortality indicators presented in this section are organized by organ system, disease and type of admission. Table 5 (page 13) illustrates the order in which quality indicators appear in this report and the types of indicators associated with each procedure or condition.

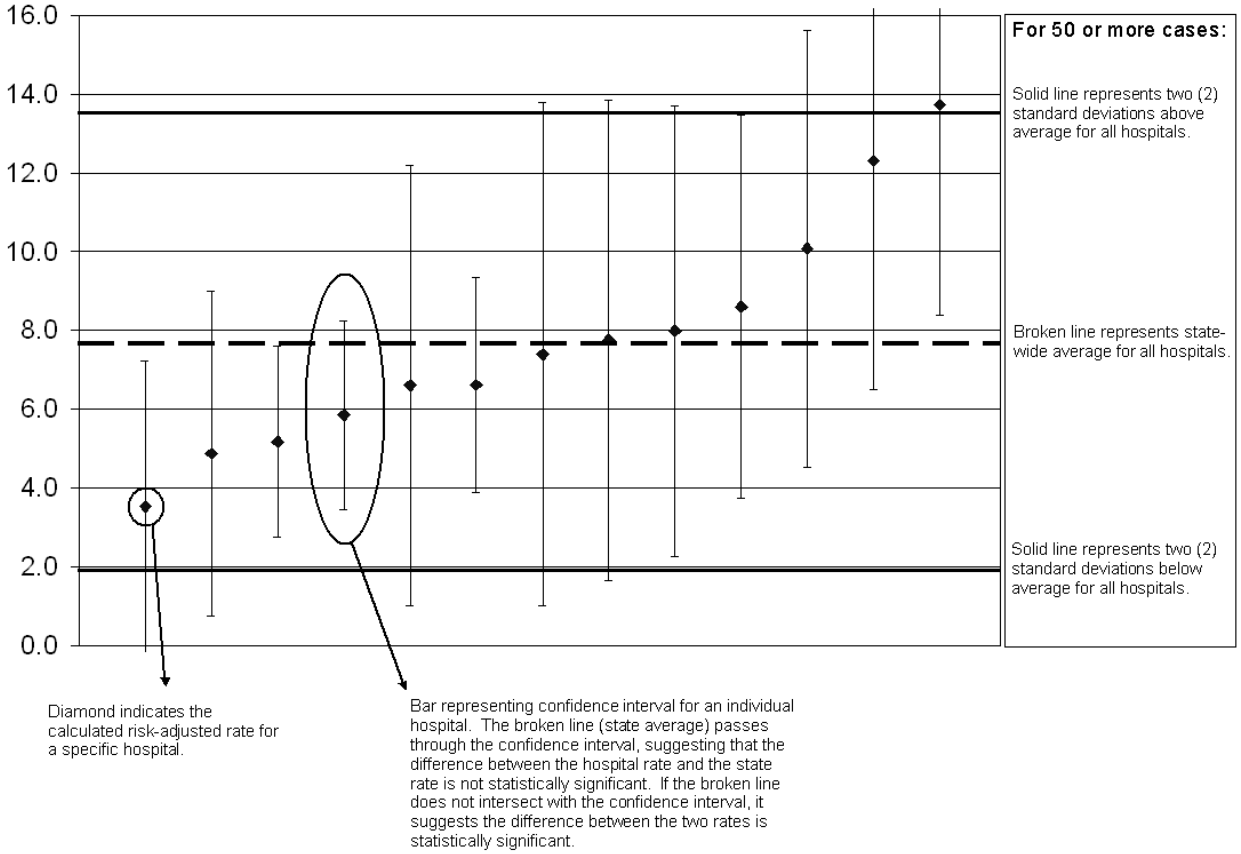
### Interpreting the Indicator Results

As discussed earlier in this report, it is important to note that these are **indicators** of quality and **not definitive determinations** of quality. They are intended for use as a starting point in quality investigations.

For example, there are many reasons a hospital might have a higher inpatient mortality rate for a given procedure in comparison to other hospitals. Some reasons might be related to quality of care, while others may not. Coding differences, the ability to discharge dying patients to hospice or skilled nursing facilities, or the limitations of information available for risk adjustment could contribute to, or account for, the variation in in-hospital mortality rates.

WHA Information Center will provide individual hospitals with their own indicator results for 2003 upon written request. Hospitals may use their results to examine variation and determine whether true quality-of-care concerns exist. Follow-up investigation of variation might involve evaluation of population differences, profiling of providers associated with the hospital, examination of coding practices and medical record review.

## How to Read Graphs, Illustrations and Confidence Intervals



| Table 5. Hospital Inpatient Quality Indicators by Type | | | | |
|---|---|---|---|---|
| **Procedure or Diagnosis** | **Volume** | **Utilization** | **Mortality with Procedure** | **Mortality with Condition** |
| **Circulatory System: Heart Disease, Stroke and Blood Vessel Disease** | | | | |
| Acute Myocardial Infarction (AMI) | | | | X |
| Acute Myocardial Infarction (AMI) Without Transfer | | | | X |
| Coronary Artery Bypass Graft (CABG) | X | | X | |
| Percutaneous Transluminal Coronary Angioplasty (PTCA) | X | | X | |
| Congestive Heart Failure (CHF) | | | | X |
| Stroke | | | | X |
| Carotid Endarterectomy (CEA) | X | | X | |
| Abdominal Aortic Aneurysm (AAA) Repair | X | | | |
| **Orthopedics** | | | | |
| Hip Fracture | | | | X |
| Hip Replacement | | | X | |
| **Cancer Surgery** | | | | |
| Esophageal Resection | X | | | |
| Pancreatic Resection | X | | | |
| **Obstetrics** | | | | |
| Cesarean Delivery | | X | | |
| Primary Cesarean Delivery | | X | | |
| **Common Acute Conditions Causing Inpatient Hospitalization** | | | | |
| Pneumonia | | | | X |
| Gastrointestinal (GI) Hemorrhage | | | | X |
| **Other** | | | | |
| Craniotomy | | | X | |
| Incidental Appendectomy Among the Elderly | | X | | |

## Volume Indicators/Volume-Outcome Relationship

- The literature supporting an association between volume and outcome is inconsistent. Hospitals performing greater numbers of procedures do not necessarily have better outcomes related to those procedures. Volume indicators may be helpful when there are no other indicators of quality.

- Even when volume-outcome relationships are observed, they may not persist over time. New technology associated with procedures and less steep "learning curves" may affect previously observed volume-outcome relationships.

Potential reasons for the lack of a volume-outcome relationship for these indicators include:

- No volume-outcome relationship exists.
- Inpatient mortality is not the best outcome to look at because some hospitals may discharge patients to hospice or a skilled nursing facility before death.
- Mortality rates at hospitals performing small numbers of procedures have wide confidence intervals. Therefore, it is more difficult to draw conclusions about mortality rates for hospitals performing fewer procedures.
- Many of the research studies used to determine volume thresholds rely on relatively old data. Because medical technology is changing so rapidly and because the "learning curve" for performing complex procedures may diminish with collective experience and new technology, volume-outcome relationships may decrease over time.

## Utilization Indicators

Variation in utilization rates is sometimes used as an indicator of quality. Over-utilization, under-utilization and/or inappropriate utilization may reflect a problem with quality. Utilization of health care services is influenced by many factors, including access to care, provider practice patterns, patient preferences and reimbursement. It is generally unwise to draw conclusions about the quality of care based on utilization alone. However, in the absence of obvious differences in patient populations, variation in utilization rates may stimulate a more in-depth assessment of the causes of that variation.

## Mortality Indicators

Users of this report should realize that many factors not related to quality of care may influence the inpatient mortality rates of individual hospitals. These include:

- Differences in the accuracy and completeness of coding, affecting the information from administrative data available for risk adjustment.

- Inherent constraints of administrative data for use in risk adjustment. For example, administrative data may indicate that a patient has congestive heart failure, but relevant clinical details (e.g., left ventricular ejection fraction) may not be included in the billing record.
- The fact that seriously ill or dying patients may be transferred to a hospice or another institutional setting.
- Varying levels of procedure acuity, which is not always apparent from claims data, and may affect outcome. For example, PTCA is increasingly performed in emergent situations.
- The extent to which patients or patient representatives directed the hospital to withhold certain types of care.

The reader is cautioned that risk-adjusted mortality rates for hospitals with small numbers of cases of the relevant procedures and conditions should be interpreted with caution. Rates calculated on small numbers of cases have wide confidence intervals, indicating they are relatively imprecise and unreliable (See Appendix H).

# *Heart Disease, Stroke and Blood Vessel Disease*

## ACUTE MYOCARDIAL INFARCTION (AMI) - MORTALITY

Each year, more than one million people in the United States experience a heart attack. Forty-two percent of all heart attacks are fatal, and many victims never reach a hospital.[11] Heart attacks happen when a blockage occurs in a coronary artery, which supplies oxygen-rich blood to the heart muscle. Coronary artery disease occurs when fatty material forms a plaque in a coronary artery resulting in decreased blood flow. Blood clots are more likely to form in narrowed coronary arteries. If a clot or blockage occurs, the oxygen-rich blood cannot reach the heart muscle (myocardium) and it dies or becomes infarcted. This is an **acute myocardial infarction (AMI).**

### State-Level AMI Mortality

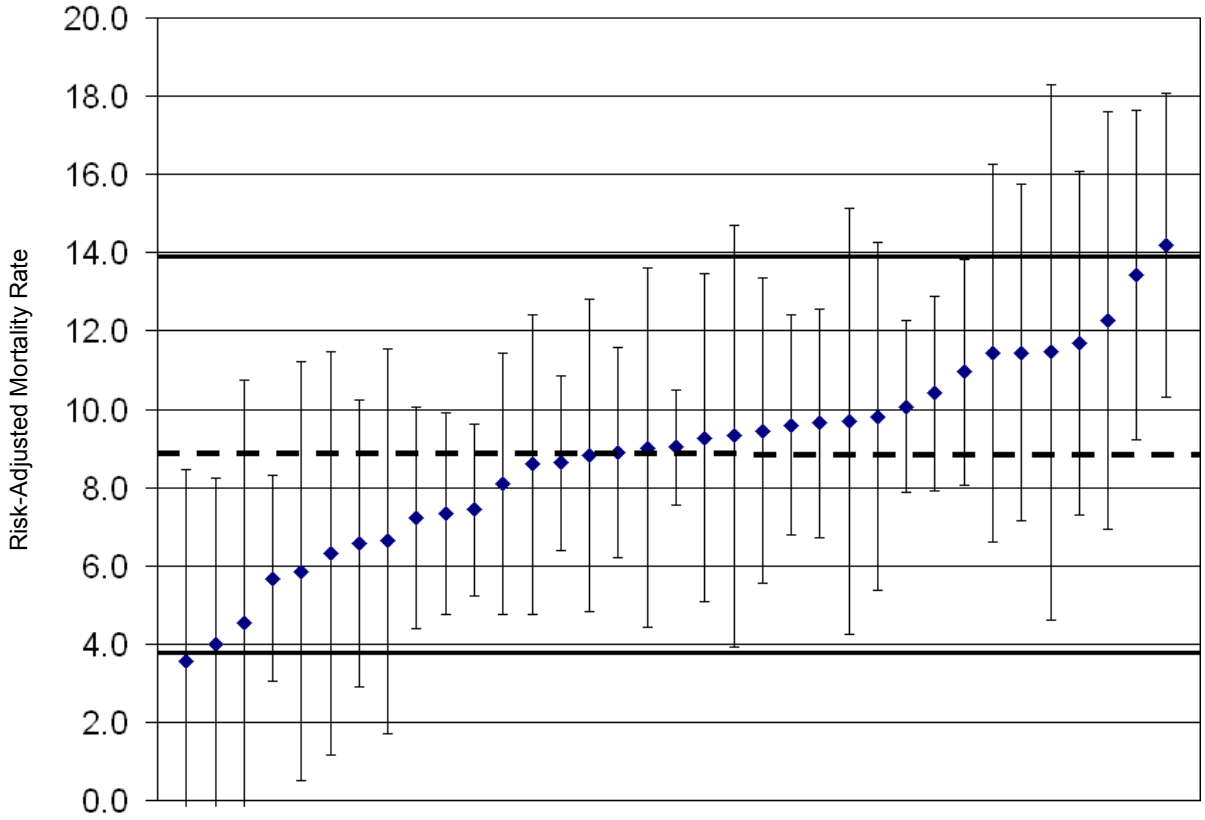
In 2003, the statewide risk-adjusted inpatient mortality rate for persons hospitalized with AMI (including transfers) was 9.4 per 100, or approximately 9 percent.

### Hospital-Level AMI Mortality (Figure 1)

- Risk-adjusted inpatient mortality rates for AMI ranged from 3.6 to 14.2 per 100 cases among Wisconsin hospitals represented in this report. (Rates for hospitals with fewer than 50 AMI discharges in 2003 were excluded.)
- The average risk-adjusted inpatient mortality rate for the 35 included hospitals was 8.9 per 100 cases.
- One hospital rate was greater than 2 standard deviations above the hospital average, and one hospital rate was greater than 2 standard deviations below the hospital average.
- Two hospitals had risk-adjusted mortality rates significantly higher than the hospital average, and three hospitals had rates significantly lower than the average, based on 95% confidence intervals. Confidence-interval width should be considered when interpreting this rate.

[11] American Heart Association. Heart Attack and Angina Statistics. www.americanheart.org/presenter.jhtml?identifier=4591. Accessed December 2004.

**Figure 1. Acute Myocardial Infarction:**
**Risk-Adjusted Mortality Rates with 95% Confidence Intervals**
**(Number of deaths per 100 discharges with principal diagnosis code of AMI)**




**Each data point represents the rate of a single hospital.**
**Solid lines represent two standard deviations above and below dashed line, which represents a hospital average of 8.9 for this indicator.**

Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

Note: Values for hospitals with fewer than 50 cases are excluded.

## ACUTE MYOCARDIAL INFARCTION (AMI), WITHOUT TRANSFER CASES - MORTALITY

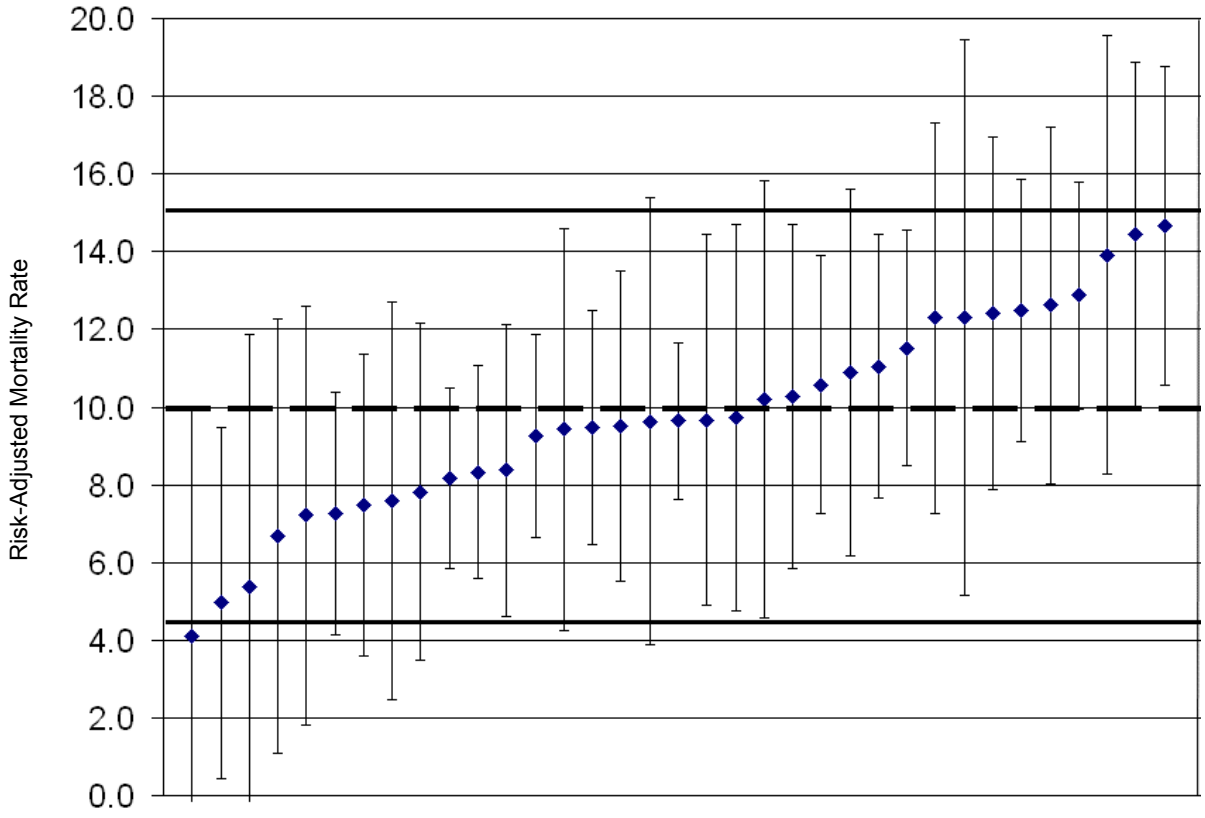
### State-Level AMI Mortality

In 2003, the statewide risk-adjusted inpatient mortality rate for persons hospitalized with AMI (excluding transfers) was 10.4 per 100, or approximately 10 percent.

### Hospital-Level AMI Mortality (Figure 2)

- Risk-adjusted inpatient mortality rates for AMI ranged from 4.1 to 14.7 per 100 cases among Wisconsin hospitals represented in this report. (Rates for hospitals with fewer than 50 AMI discharges in 2003 were excluded.)
- The average risk-adjusted inpatient mortality rate for the 35 included hospitals was 9.8 per 100 cases.
- One hospital rate was greater than 2 standard deviations below the hospital average.
- Three hospitals had risk-adjusted mortality rates significantly higher than the hospital average, and one hospital had a rate significantly lower than the average, based on 95% confidence intervals. Confidence-interval width should be considered when interpreting this rate.

**Figure 2. Acute Myocardial Infarction, Without Transfer Cases: Risk-Adjusted Mortality Rates with 95% Confidence Intervals**
**(Number of deaths per 100 discharges with principal diagnosis code of AMI)**




**Each data point represents the rate of a single hospital.**
**Solid lines represent two standard deviations above and below dashed line, which represents a hospital average of 9.8 for this indicator.**

Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

Note: Values for hospitals with fewer than 50 cases are excluded.

## CORONARY ARTERY BYPASS GRAFT (CABG) - VOLUME AND MORTALITY

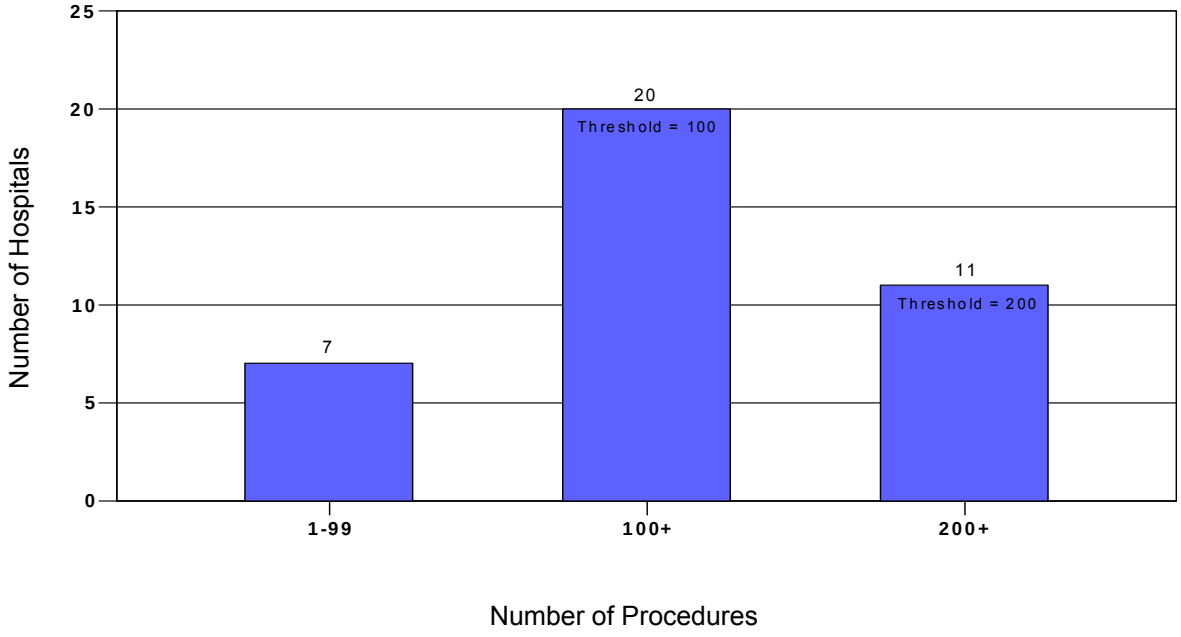
Coronary artery disease may be treated by medical and/or surgical procedures. Left untreated, persons with significant coronary artery disease have an increased risk of heart attack (acute myocardial infarction) or death. One treatment for coronary artery disease is **coronary artery bypass graft surgery (CABG).** In this procedure veins from the legs or arteries going to the chest wall are attached to diseased coronary arteries to bypass the blocked or narrowed area. More than 500,000 CABG procedures are performed in the U.S annually.[12]

AHRQ identified two high-volume thresholds for CABG —100 and 200 procedures annually. The medical literature citations supporting these volume thresholds are shown in Appendix D. Ninety-four percent of CABG surgeries in Wisconsin were performed at hospitals meeting the high-volume threshold of 100 procedures. Seventy-four percent were performed at hospitals meeting the high-volume threshold of 200 procedures.

### CABG Volume (Figure 3)

- Twenty-seven Wisconsin hospitals performed at least one CABG in 2003.
- Twenty of the 27 hospitals met the AHRQ high-volume threshold of 100 procedures.
- Eleven hospitals also met the AHRQ high-volume threshold of 200 procedures.

**Figure 3. Coronary Artery Bypass Graft: High-Volume Thresholds**
**Number of hospitals below and at/above high-volume thresholds identified by AHRQ**




Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

[12] American Heart Association. Angioplasty and Cardiac Revascularization Statistics. www.americanheart.org/presenter.jhtml?identifier=4439. Accessed December 2004.

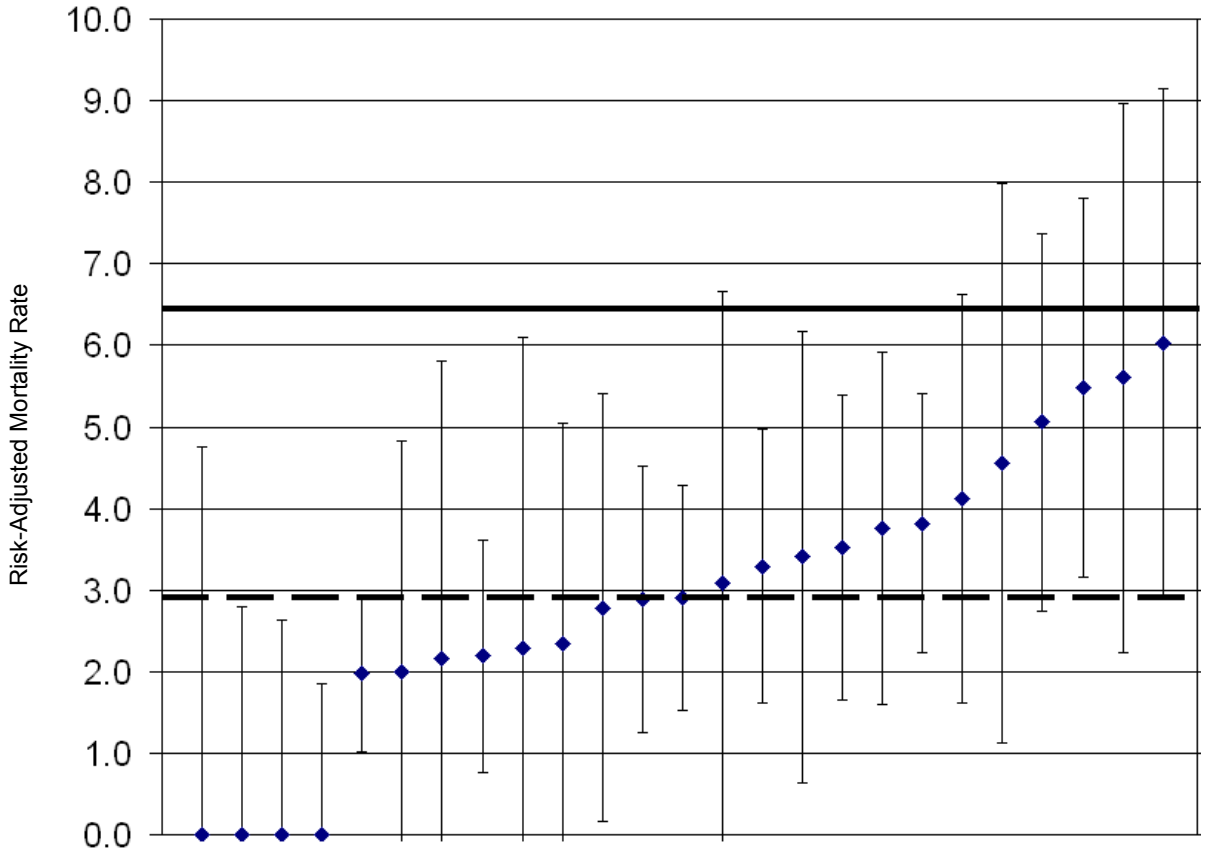
### State-Level CABG Mortality

The Wisconsin statewide, risk-adjusted inpatient mortality rate for CABG surgery was 2.7 per 100 procedures, or approximately 3 percent.

### Hospital-Level CABG Mortality (Figure 4)

- Risk-adjusted inpatient CABG mortality rates ranged from 0 to 6.0 per 100 procedures in 2003. (Rates for hospitals with fewer than 50 procedures in 2003 were excluded.)
- The average risk-adjusted inpatient CABG mortality rate for the 25 included hospitals was 2.9 per 100 procedures, or approximately 3 percent.
- Rates for all included hospitals were within 2 standard deviations of the hospital average.
- One hospital had a risk-adjusted mortality rate significantly higher than the hospital average, and three hospitals had rates significantly lower than the average, based on 95% confidence intervals. Confidence-interval widths should be considered when interpreting these rates.

**Figure 4. Coronary Artery Bypass Graft:**
**Risk-Adjusted Mortality Rates with 95% Confidence Intervals**
**(Number of deaths per 100 discharges with procedure code of CABG in any field, age 40 years and older)**




**Each data point represents the rate of a single hospital.**
**Solid line represents two standard deviations above dashed line, which represents a hospital average of 2.9 for this indicator.**

Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

Note: Values for hospitals with fewer than 50 cases are excluded.

## PERCUTANEOUS TRANSLUMINAL CORONARY ANGIOPLASTY (PTCA) - VOLUME AND MORTALITY

Another treatment for coronary artery disease is **percutaneous transluminal coronary angioplasty (PTCA).** During coronary angioplasty, a catheter with a small, deflated balloon is inserted in a large artery (femoral artery) in the groin area. The catheter is guided through the body's major arteries until it reaches the coronary arteries. After the doctor identifies the blocked area with the help of a special x-ray and x-ray dye, the small balloon is inflated to open the blocked area. A small stent is usually placed in the area where the coronary artery has been widened to keep the blocked or narrowed area open. More than 570,000 PTCAs are performed in the U.S each year.[13].

### PTCA Volume

Nearly 15,000 PTCAs were performed in inpatient settings in Wisconsin in 2003. It is important to note that another 800 PTCAs were performed in ambulatory care settings. **Procedures performed in ambulatory settings are not represented in this report.**

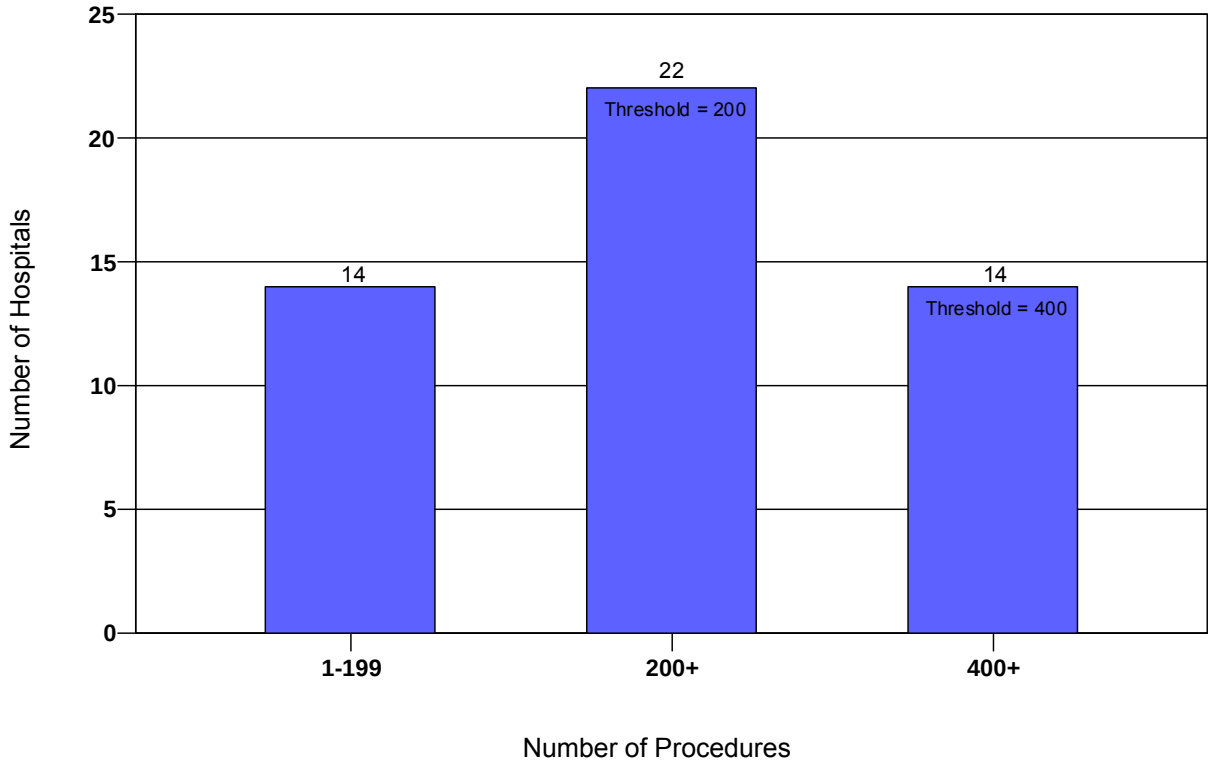
AHRQ identified two high-volume thresholds for PTCA—200 and 400 procedures annually. The medical literature citations supporting these volume thresholds are shown in Appendix D. Ninety-one percent of inpatient PTCAs in Wisconsin were performed at hospitals meeting the high-volume threshold of 200 procedures; 77 percent were performed at hospitals meeting the higher threshold of 400 procedures.

### PTCA High-Volume Thresholds (Figure 5)

- Thirty-six Wisconsin hospitals performed at least one inpatient PTCA in 2003.
- Twenty-two of the 36 hospitals met the AHRQ high-volume threshold of 200 procedures.
- Fourteen of the 36 hospitals met the AHRQ high-volume threshold of 400 procedures.

[13] American Heart Association. Angioplasty and Cardiac Revascularization Statistics. www.americanheart.org/presenter.jhtml?identifier=4439. Accessed December 2004.

**Figure 5. Percutaneous Transluminal Coronary Angioplasty: High-Volume Thresholds**
**Number of hospitals below and at/above high-volume thresholds identified by AHRQ**




Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

## State-Level PTCA Mortality

The Wisconsin statewide risk-adjusted inpatient mortality rate for PTCA was 1.3 per 100 procedures, or approximately 1 percent.[14]

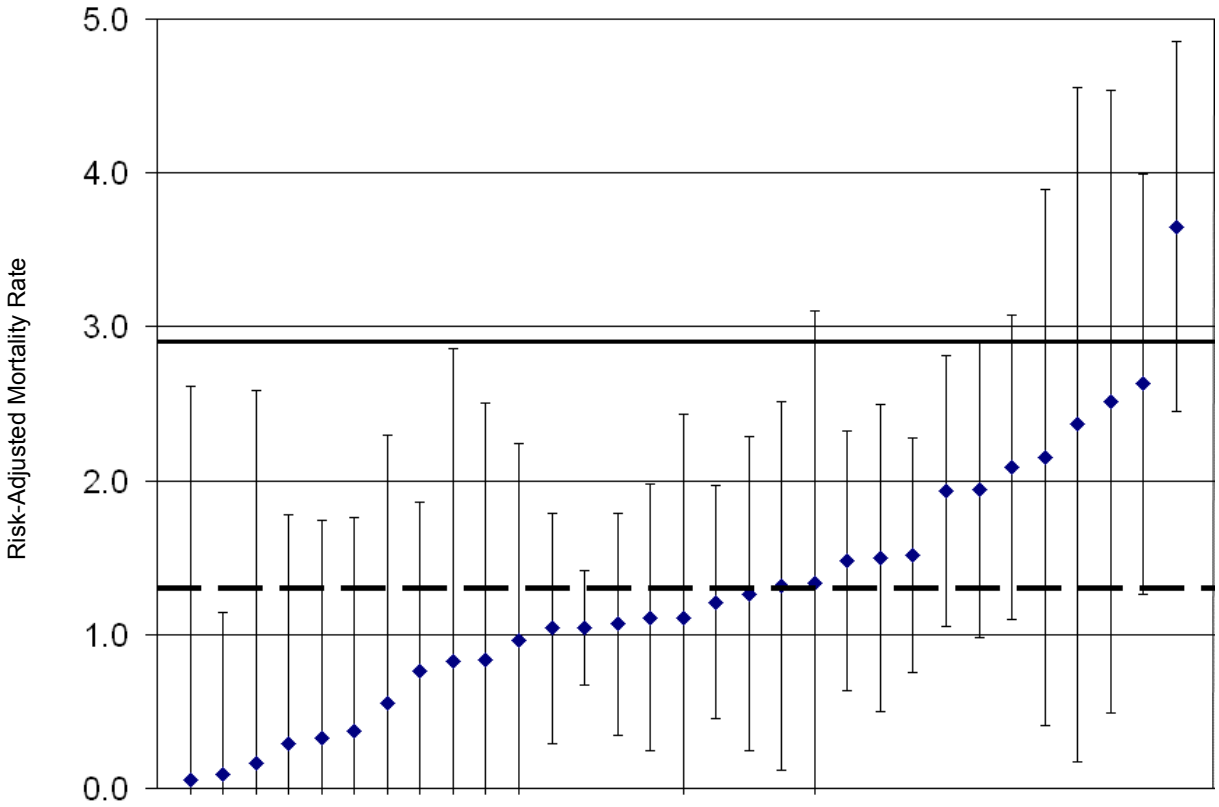
## Hospital-Level PTCA Mortality (Figure 6)

- Risk-adjusted inpatient mortality rates among the Wisconsin hospitals included in this report ranged from 0.1 to 3.7 per 100 procedures. (Hospitals with fewer than 50 procedures were excluded.)
- The average risk-adjusted inpatient PTCA mortality rate for the 31 hospitals represented in this report was 1.3 per 100 procedures.

[14] It should be noted that a selection bias may exist at hospitals that perform outpatient PTCA or that refer a significant number of low-risk patients to outpatient surgery settings, which could affect inpatient PTCA mortality rates.

- One hospital rate was greater than two standard deviations above the hospital average.
- The same hospital had a risk-adjusted mortality rate significantly higher than the hospital average, and one hospital had a rate significantly lower than the average, based on 95% confidence intervals. Confidence-interval width should be considered when interpreting this rate.

**Figure 6. Percutaneous Transluminal Coronary Angioplasty: Risk-Adjusted Mortality Rates with 95% Confidence Intervals**
**(Number of deaths per 100 discharges with procedure code of PTCA in any field, age 40 years and older)**




**Each data point represents the rate of a single hospital.**
**Solid line represents two standard deviations above dashed line, which represents a hospital average of 1.3 for this indicator.**

Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

Note: Values for hospitals with fewer than 50 cases are excluded.

## CONGESTIVE HEART FAILURE (CHF) - MORTALITY

Congestive heart failure affects approximately five million people in the U.S.[15] It is a common cause of hospitalization, especially in persons older than 65 years of age. Congestive heart failure is caused by uncontrolled high blood pressure, heart valve disease, and coronary artery disease leading to heart muscle damage, infection and other diseases of the heart muscle. Depending on the cause of the heart failure, there are a number of medical and surgical treatments for CHF, contributing to declining mortality rates for CHF. This condition directly or indirectly contributes to the death of approximately 250,000 individuals per year.

### State-Level CHF Mortality

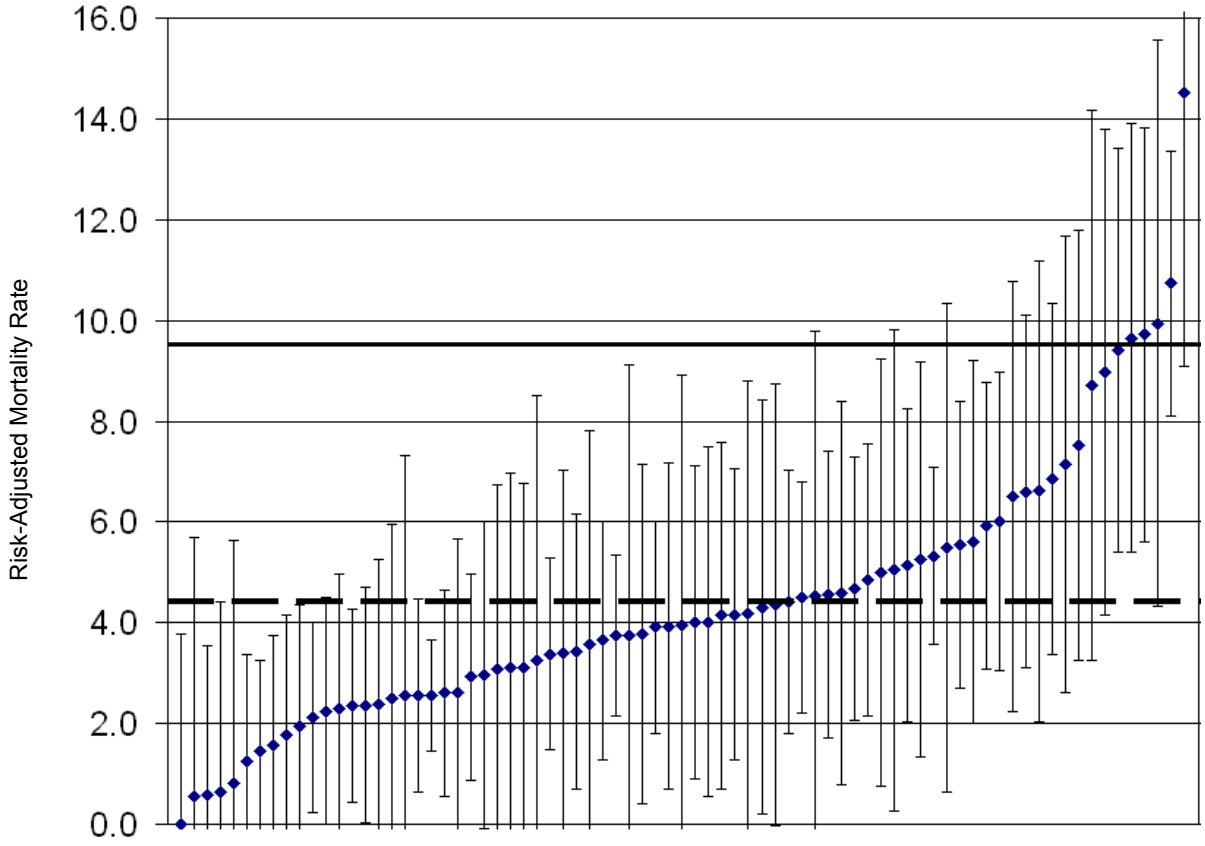
The Wisconsin statewide risk-adjusted inpatient mortality rate for persons hospitalized with CHF in 2003 was 3.9 per 100 cases, or approximately 4 percent.

### Hospital-Level CHF Mortality (Figure 7)

- Risk-adjusted inpatient mortality rates for CHF ranged from 0 to 14.5 per 100 cases among the Wisconsin hospitals included in this report. (Rates for hospitals with fewer than 50 discharges associated with CHF were excluded).
- The average risk-adjusted inpatient mortality rate for the 77 hospitals represented in Figure 7 was 4.4 per 100 cases, or approximately 4 percent.
- Five hospitals had rates greater than two standard deviations above the hospital average.
- Five hospitals had risk-adjusted mortality rates significantly higher than the hospital average, and ten had rates significantly lower than the average, based on 95% confidence intervals. Confidence-interval widths should be considered when interpreting these rates.

[15] Heart Failure Society of America Practice Guidelines. Journal of Cardiac Failure 1999;5:357-382.

**Figure 7. Congestive Heart Failure:**
**Risk-Adjusted Mortality Rates with 95% Confidence Intervals**
**(Number of deaths per 100 discharges with principal diagnosis code of congestive heart failure)**




**Each data point represents the rate of a single hospital.**
**Solid line represents two standard deviations above dashed line, which represents a hospital average of 4.4 for this indicator.**

Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

Note: Values for hospitals with fewer than 50 cases are excluded.

## ACUTE STROKE - MORTALITY

Stroke is the third leading cause of death in the U.S.[16] Each year more than 900,000 people are discharged from hospitals with a primary diagnosis of stroke. Many others experience permanent and serious disability. Incidence rates for stroke have decreased in recent decades due to better control of blood pressure and blood lipid levels, and to smoking cessation. Early treatment with clot-dissolving drugs and better management of stroke patients have also helped decrease stroke disability and mortality rates.

### State-Level Inpatient Stroke Mortality

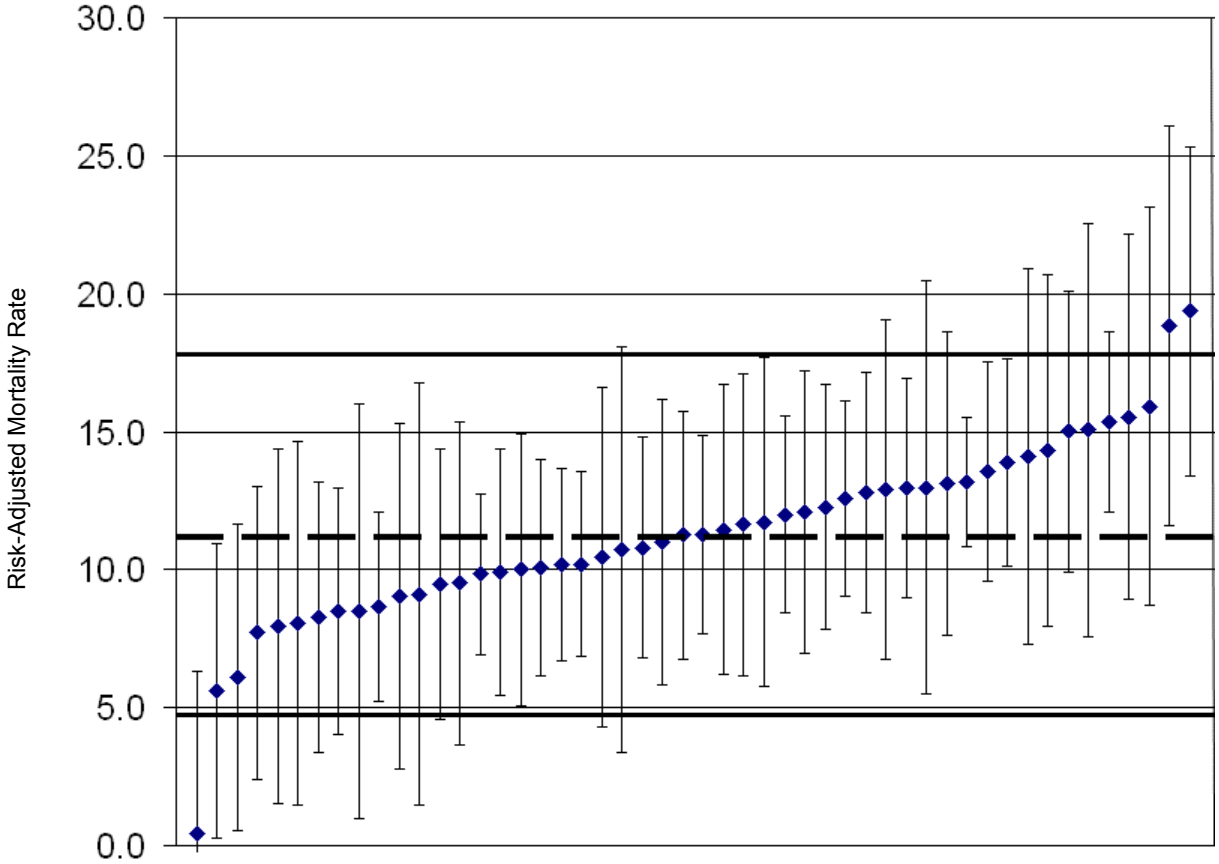
The statewide risk-adjusted inpatient mortality rate for persons hospitalized with stroke in 2003 was 11.5 per 100 cases.

### Hospital-Level Inpatient Stroke Mortality (Figure 8)

- Risk-adjusted inpatient mortality rates for stroke ranged from 0.5 to 19.4 among the Wisconsin hospitals included in this report. (Rates for hospitals with fewer than 50 discharges associated with stroke in 2003 were excluded.)
- The average risk-adjusted, inpatient mortality rate for the 50 included hospitals was 11.3 per 100 cases.
- Two hospitals had rates greater than two standard deviations above the hospital average and one hospital had a rate greater than two standard deviations below average.
- Three hospitals had risk-adjusted mortality rates significantly higher than the hospital average, and two had rates significantly lower than the average, based on 95% confidence intervals. Confidence interval widths should be considered when interpreting these rates.

[16] Center for Disease Control and Prevention. National Center for Health Statistics-FASTATS-Stroke and Cerebrovascular Disease. www.cdc.gov/nchs/fastats/stroke.htm. Accessed December 2004.

**Figure 8. Acute Stroke:**
**Risk-Adjusted Mortality Rates with 95% Confidence Intervals**
**(Number of deaths per 100 discharges with principal diagnosis code of stroke)**




**Each data point represents the rate of a single hospital.**
**Solid lines represent two standard deviations above and below dashed line, which represents a hospital average of 11.3 for this indicator.**

Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

Note: Values for hospitals with fewer than 50 cases are excluded.

## CAROTID ENDARTERECTOMY (CEA) - VOLUME AND MORTALITY

People with moderate to severe narrowing in their carotid arteries are at risk for experiencing a stroke. Carotid arteries are blood vessels located in the neck that supply oxygen-rich blood from the heart to the brain. Carotid endarterectomy is a surgical procedure to remove fatty plaques from the carotid artery. More than 130,000 carotid endarterectomies are performed in the U.S. yearly.[17] This operation is performed through an incision in the neck to expose the carotid artery. An incision is then made in the vessel wall and the fatty plaque is removed from the walls of the artery.

### CEA Volume

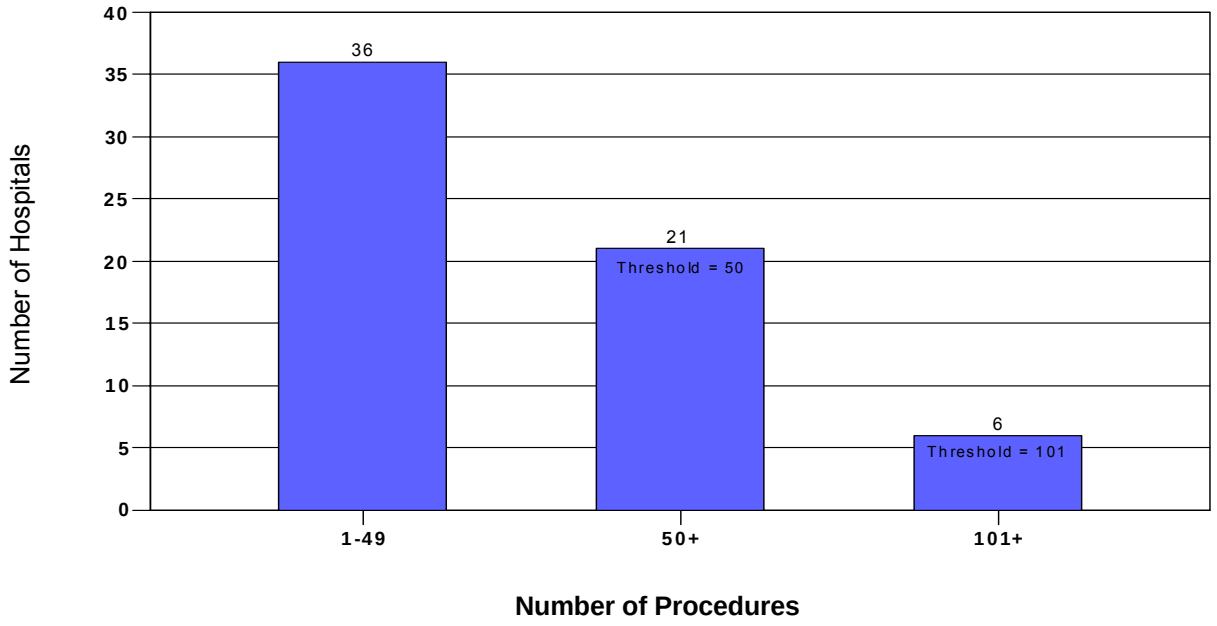
AHRQ identified two high-volume thresholds for CEA surgery—50 and 101 procedures annually. The medical literature citations supporting these volume thresholds are shown in Appendix D. Seventy-five percent of the CEA surgeries done in Wisconsin in 2003 were performed at hospitals that met the high-volume threshold of 50 procedures. Thirty-eight percent of surgeries were performed at hospitals that met the higher threshold of 101 procedures.

### CEA High-Volume Thresholds (Figure 9)

- Fifty-seven Wisconsin hospitals performed at least one CEA surgery in 2003.
- Twenty-one of the 57 hospitals met the AHRQ volume threshold of 50 procedures.
- Six of the 57 hospitals met the AHRQ volume threshold of 101 procedures.

[17] National Institute of Neurological Disorders and Stroke. Questions and Answers About Carotid Endarterectomy. www.ninds.nih.gov/disorders/stroke/carotid_endarterectomy_backgrounder.htm. Accessed December 2004.

**Figure 9. Carotid Endarterectomy:**
**High-Volume Thresholds**
**Number of hospitals below and at/above high-volume thresholds identified by AHRQ**




Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

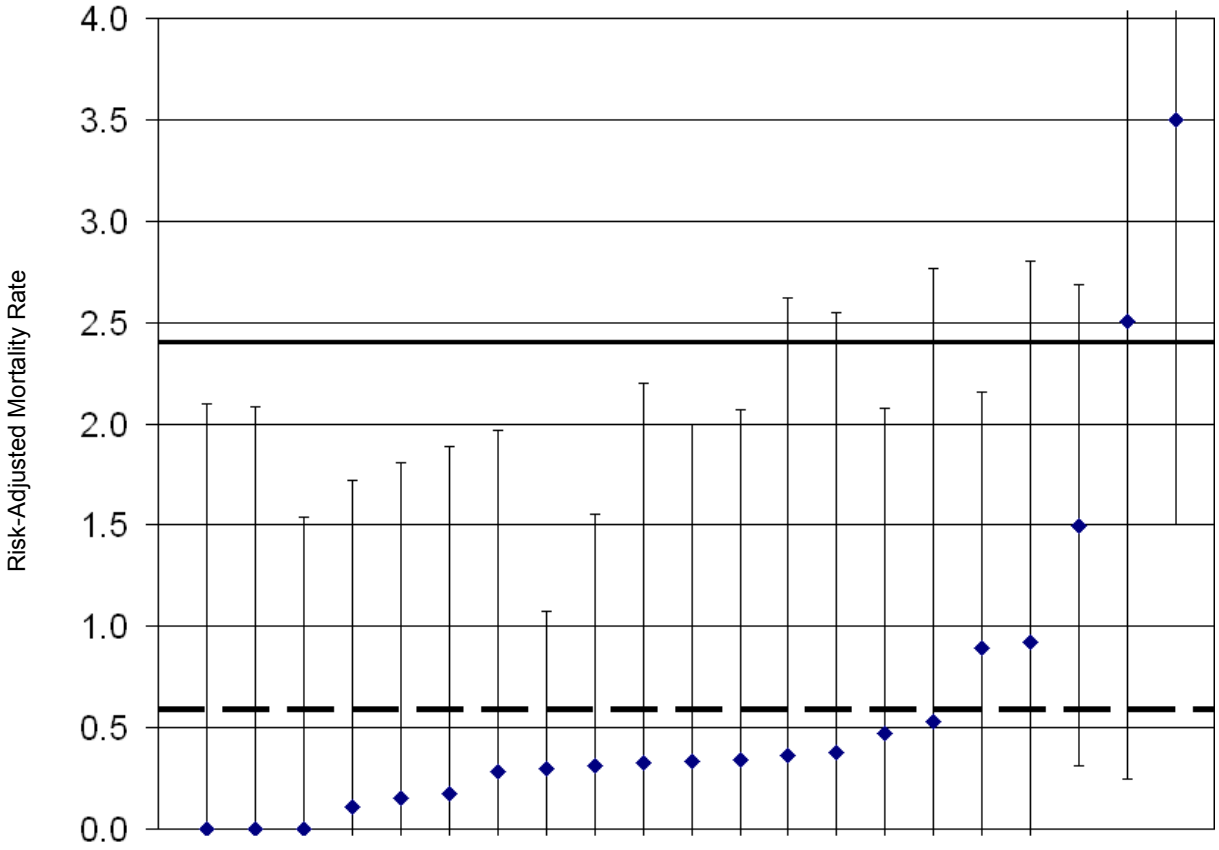
## State-Level CEA Mortality

The Wisconsin statewide risk-adjusted inpatient mortality rate for CEA surgery was 0.6, or approximately one death per 100 procedures.

## Hospital-Level CEA Mortality (Figure 10)

- Risk-adjusted inpatient mortality rates among the Wisconsin hospitals represented in this report ranged from 0 to 3.5 per 100. (Rates for hospitals with fewer than 50 procedures in 2003 were excluded.)
- The average risk-adjusted inpatient CEA mortality rate for the 21 included hospitals was 0.6 per 100 procedures.
- Two hospitals had rates greater than two standard deviations above the hospital average.
- One hospital risk-adjusted mortality rate was significantly higher than the average, based on a 95% confidence interval. Confidence-interval width should be considered when interpreting this rate.

**Figure 10. Carotid Endarterectomy:**
**Risk-Adjusted Mortality Rates with 95% Confidence Intervals**
**(Number of deaths per 100 discharges with procedure code of carotid endarterectomy in any field)**




**Each data point represents the rate of a single hospital.**
**Solid line represents two standard deviations above dashed line, which represents a hospital average of 0.6 for this indicator.**

Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of HealthCare Financing, Department of Health and Family Services (1Q - 3Q data).

Note: Values for hospitals with fewer than 50 cases are excluded.

# ABDOMINAL AORTIC ANEURYSM (AAA) REPAIR - VOLUME

An aneurysm occurs when there is a weakness in the wall of an artery. This often results in a bulging or enlargement of the artery that can leak or burst causing a rapid loss of blood. An AAA occurs in the abdominal area in the aorta, the main artery from the heart supplying the body with oxygen-rich blood. An estimated eight percent of people over the age of 65 experience AAA.[18] Men are affected four times as often as women. Large abdominal aortic aneurysms (more than two inches) must be repaired to prevent rupture of the artery. AAA surgery involves making a vertical incision in the midline of the abdomen, removing the damaged portion of the aorta and replacing it with a man-made graft. A newer, non-surgical procedure involving the placement of a stent in the affected area through a catheter in the groin area is available for many people.

### AAA Repair Volume

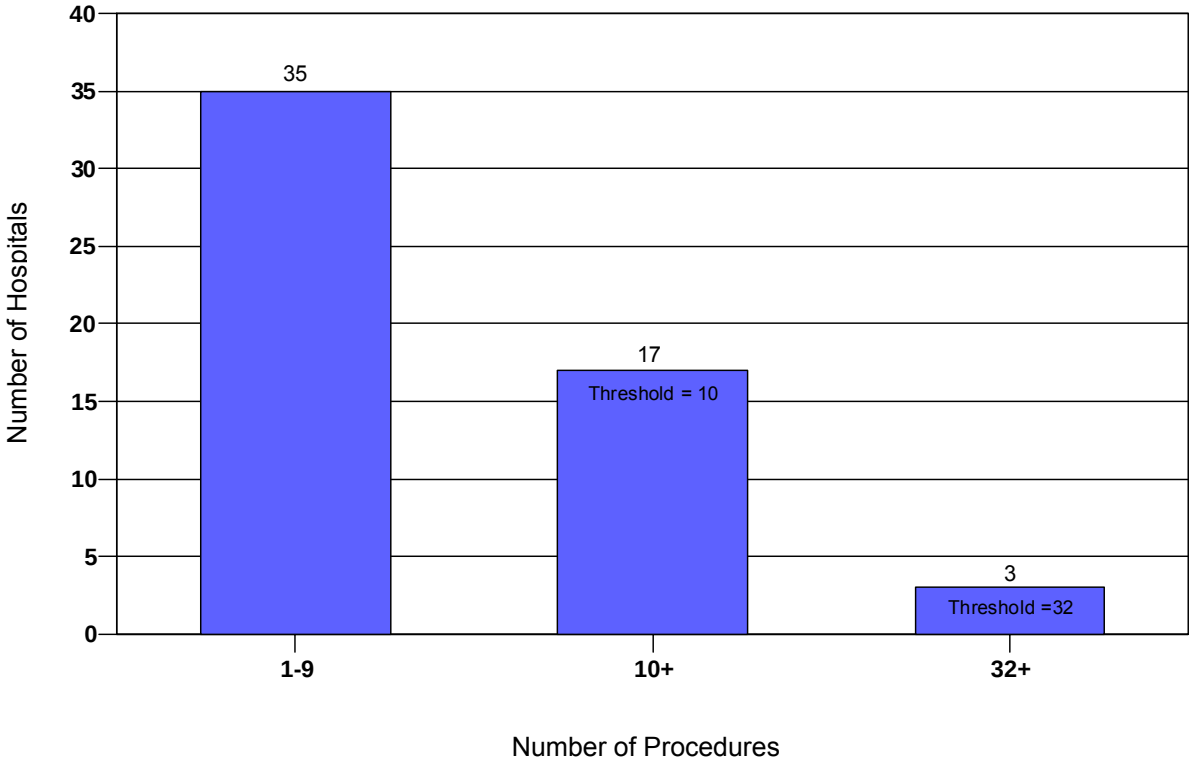
AHRQ identified two high-volume thresholds for AAA repair surgery—10 procedures and 32 procedures annually. The medical literature citations supporting these volume thresholds are shown in Appendix D. Seventy-five percent of AAA repair surgeries done in Wisconsin in 2003 were performed at hospitals meeting the high-volume threshold of 10 procedures; 27 percent were performed at hospitals meeting the higher threshold of 32 procedures.

### AAA Repair High-Volume Thresholds (Figure 11)

- Fifty-two Wisconsin hospitals performed at least one AAA repair surgery in 2003.
- Seventeen of the 52 hospitals (33 percent) met the AHRQ volume threshold of 10 procedures.
- Three of the 52 hospitals (6 percent) met the AHRQ volume threshold of 32 procedures.

[18] The Society of Interventional Radiology. Abdominal Aortic Aneurysm. www.sirweb.org/patPub/abdominalAorticAneurysms.shtml. Accessed December 2004.

**Figure 11. Abdominal Aortic Aneurysm Repair:**
**High-Volume Thresholds**
**Number of hospitals below and at/above high-volume thresholds identified by AHRQ**




Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

# *Orthopedics*

## HIP FRACTURE - MORTALITY

The hip is the largest large ball-and-socket joint in the body. Every year, approximately 320,000 people are hospitalized for a hip fracture in the U.S., and 90 percent are older than 65 years of age.[19] Women sustain 80 percent of hip fractures.[20] With aging, bones lose their mineral content and become brittle, increasing the chances of hip fracture. Hip fractures are serious events in themselves and may be accompanied by complications such as significant blood loss and lung clots (pulmonary emboli).

### State-Level Hip-Fracture Mortality

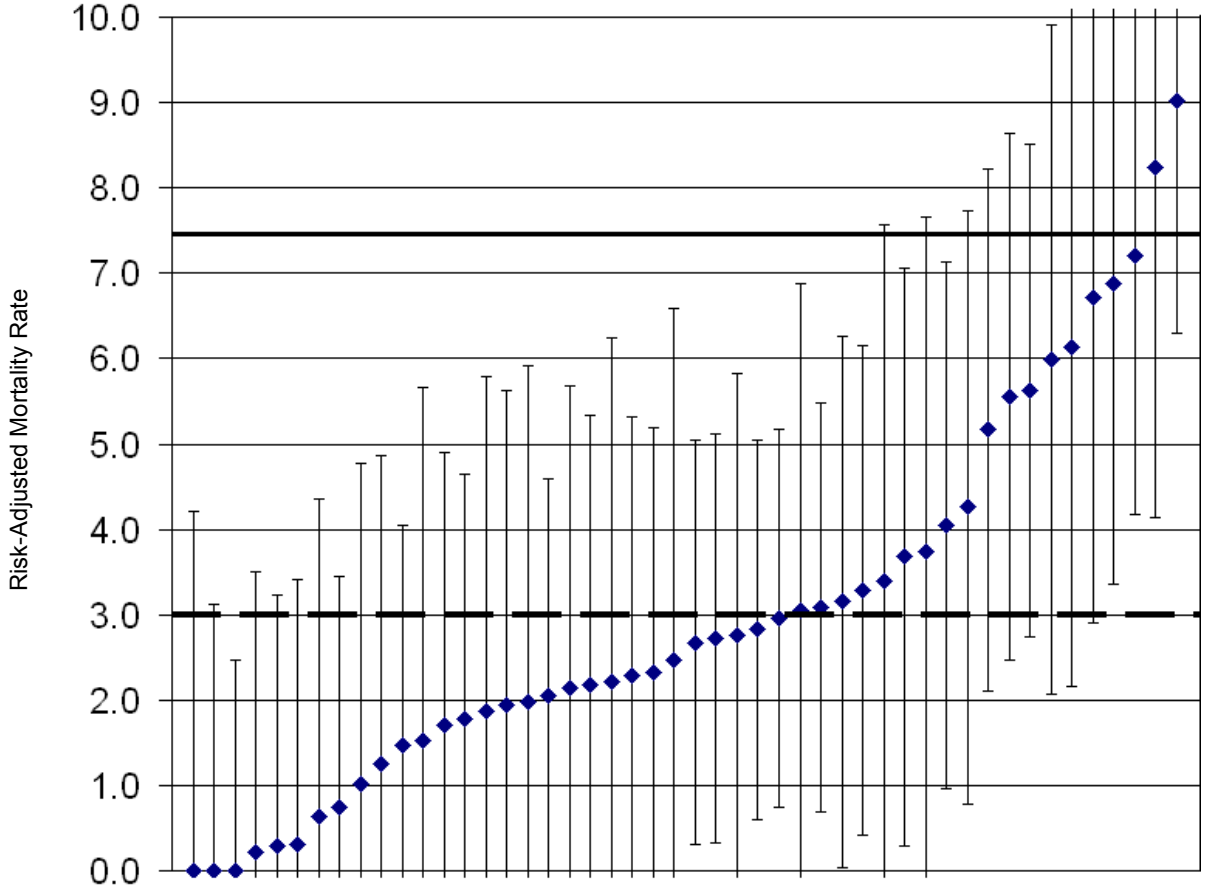
The Wisconsin statewide risk-adjusted inpatient mortality rate for hip fracture in 2003 was 3.0 per 100 hospitalized cases.

### Hospital-Level Hip-Fracture Mortality (Figure 12)

- Risk-adjusted mortality rates for hip fracture among the hospitals represented in Figure 12 ranged from 0 to 9.0 per 100 cases. (Rates for hospitals with fewer than 50 discharges for hip fracture were excluded.)
- The average risk-adjusted hip-fracture mortality rate for the 48 included hospitals was 3.0 per 100 cases.
- Two hospitals had rates greater than two standard deviations above the hospital average.
- Four hospitals had risk-adjusted mortality rates significantly higher than the average, and one hospital had a rate significantly lower than the average, based on 95% confidence intervals. Confidence-interval widths should be considered when interpreting these rates.

[19] MayoClinic.com-Hip Fracture. March, 2004. www.mayoclinic.com/invoke.cfmi?id=DS00185. Accessed December 2004.
[20] Falls and Hip Fractures, Facts – National Center for Injury Prevention and Control (Stevens 2000). www.cdc.gov/ncipc/factsheets/falls.htm. Accessed December 2004.

**Figure 12. Hip Fracture:**
**Risk-Adjusted Mortality Rates with 95% Confidence Intervals**
**(Number of deaths per 100 discharges with principal diagnosis code of hip fracture)**




**Each data point represents the rate of a single hospital.**
**Solid line represents two standard deviations above dashed line, which represents a hospital average of 3.0 for this indicator.**

Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

Note: Values for hospitals with fewer than 50 cases are excluded.

## HIP REPLACEMENT - MORTALITY

Hip replacement is performed to repair a fractured hip or to prevent fracture in a hip joint damaged by arthritis, infection or problems with blood supply. Approximately 138,000 hip-replacement surgeries are performed annually in the U.S.[21] Hip replacement surgery involves the removal of damaged parts of the hip joint and replacement with artificial parts that include a socket anchored in the pelvis and a ball-type anchor placed in the thigh bone (femur).

### State-Level Hip Replacement Mortality

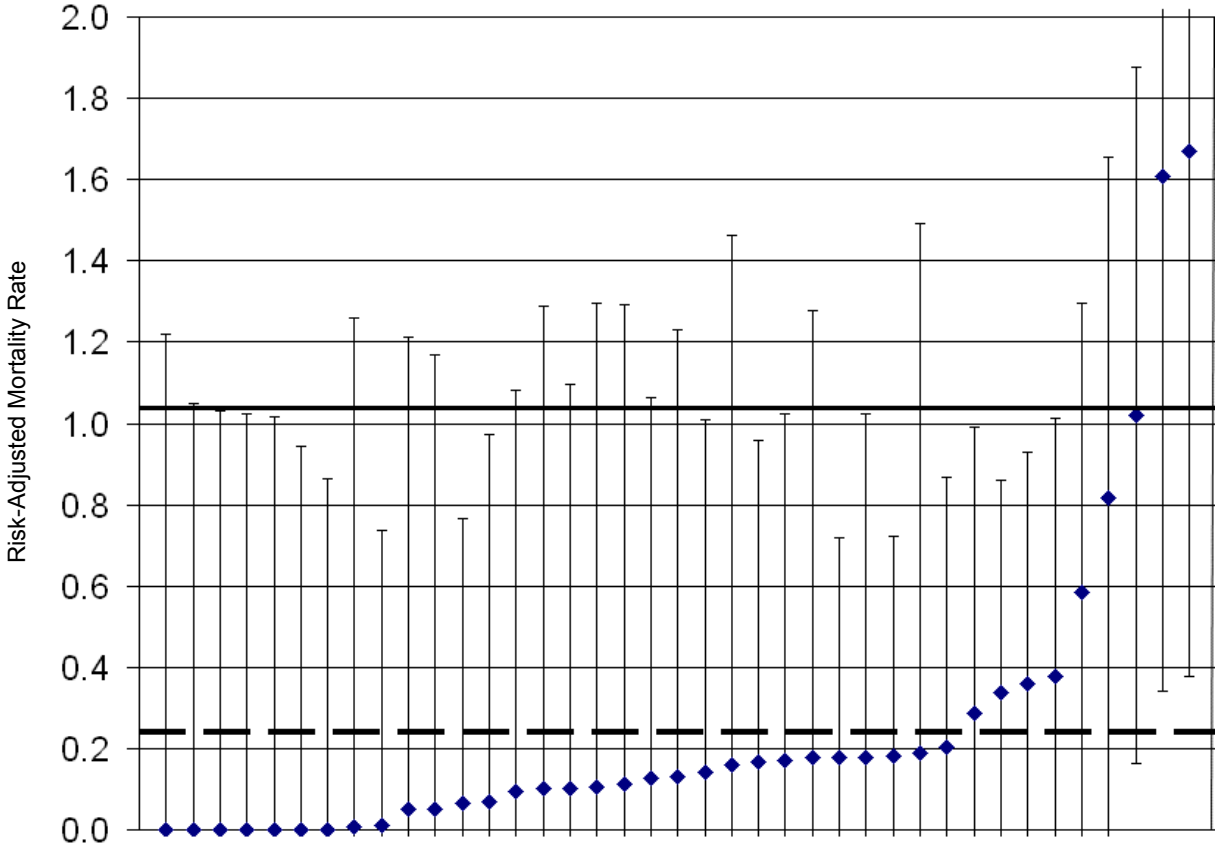
The Wisconsin statewide risk-adjusted mortality rate for hip replacement surgery in 2003 was 0.23, or less than one death per 100 procedures.

### Hospital-Level Hip Replacement Mortality (Figure 13)

- Risk-adjusted mortality rates for hip-replacement surgery at hospitals represented in this report ranged from 0 to 1.7 per 100 procedures. (Hospitals with fewer than 50 procedures in 2003 were excluded.)
- The average risk-adjusted mortality rate among 39 hospitals included in this report was 0.25 deaths, or less than one per 100 procedures. Only three hospitals had risk-adjusted rates as high as one death per 100 procedures.
- Two hospitals had rates greater than two standard deviations above the average.
- The same two hospitals had risk-adjusted mortality rates significantly higher than the hospital average, based on 95% confidence intervals. Confidence interval widths should be considered when interpreting these rates.

[21] Health, United States, 2004. U.S. Department of Health and Human Services. Center for Disease Control and Prevention, National Center for Health Statistics. Table 97. Page 301.

**Figure 13. Hip Replacement:**
**Risk-Adjusted Mortality Rates with 95% Confidence Intervals**
**(Number of deaths per 100 discharges with procedure code of partial or full hip replacement in any field)**




**Each data point represents the rate of a single hospital.**
**Solid line represents two standard deviations above dashed line, which represents a hospital average of 0.25 for this indicator.**

Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

Note: Values for hospitals with fewer than 50 cases are excluded.

# *Cancer Surgery*

## ESOPHAGEAL RESECTION - VOLUME

More than 14,000 cases of cancer of the esophagus are diagnosed annually in the U.S.[22] Men are three times more likely than women to develop esophageal cancer. Excessive alcohol consumption and tobacco use increase the likelihood of developing esophageal cancer. Five-year survival rates for esophageal cancer have increased three-fold in whites and nine-fold in African Americans, but five-year survival rates are still only 15 percent and 8 percent for whites and African Americans respectively.[23] Early diagnosis and medical and surgical treatment have contributed to increased survival rates.

Esophageal resection is the most common treatment for cancer of the esophagus. This cancer surgery involves removing the diseased portion of the esophagus and reconnecting the remaining healthy portion of the esophagus to the stomach. A plastic tube or a part of the intestine may be used to make the connection.

### Esophageal Resection Volume

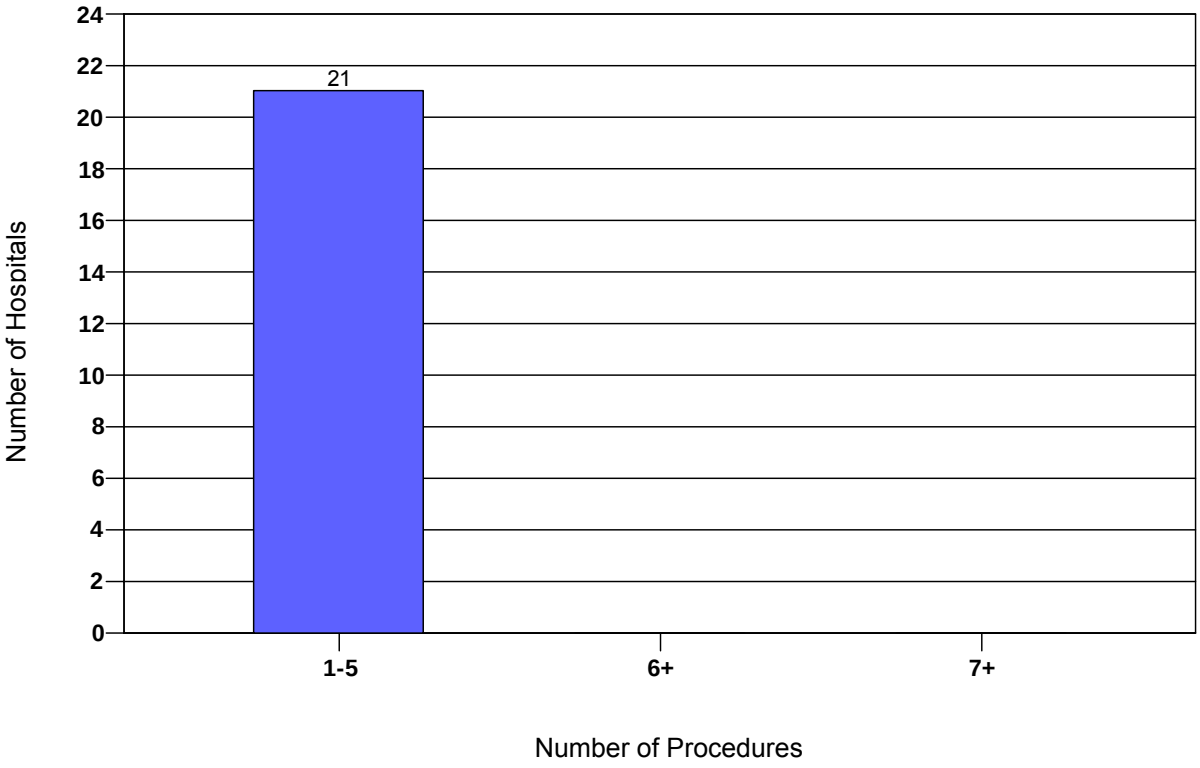
AHRQ identified two high-volume thresholds for esophageal resection surgery—6 and 7 procedures annually. The medical literature citations supporting these volume thresholds are shown in Appendix D. None of the 40 esophageal resections done in Wisconsin in 2003 were performed at hospitals meeting either of the high-volume thresholds identified by AHRQ (6 and 7 procedures annually).

### Esophageal Resection High-Volume Thresholds (Figure 14)

- Twenty-one Wisconsin hospitals performed at least one esophageal resection surgery in 2003.
- None of the 21 Wisconsin hospitals performing esophageal resections met either high-volume threshold identified by AHRQ for this procedure.

[22] National Cancer Institute – Esophageal Cancer Treatment. www.cancer.gov/cancerinfo/pdq/treatment/esophageal/patient. Accessed December 2004.
[23] National Cancer Institute – Esophageal Cancer Treatment. http://www.cancer.gov/cancerinfo/pdq/treatment/esophageal/HealthProfessional. Accessed December 2004.

**Figure 14. Esophageal Resection:**
**High-Volume Thresholds**
**Number of hospitals below and at/above high-volume thresholds identified by AHRQ**




Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

## PANCREATIC RESECTION - VOLUME

Pancreatic cancer accounts for two percent of all new cancers in the U.S., but five percent of cancer deaths.[24] The pancreas is an important organ that produced insulin and many digestive enzymes. Since pancreatic cancer is often far advanced at the point of first diagnosis, mortality rates are high. Pancreatic resections are performed for both curative and palliative purposes.

Pancreatic resection is a complex surgery that involves the removal of either the entire pancreas or the diseased part of the pancreas, the first part of the small intestine known as the duodenum, the gallbladder and a portion of the common bile duct. Depending on the procedure required, the bile duct and portions of the stomach and spleen may be removed as well. Patients undergoing a pancreatic resection may need to take insulin and pancreatic enzyme supplements after the surgery.

### Pancreatic Resection Volume

AHRQ identified two high-volume thresholds for pancreatic resection surgery—10 and 11 procedures annually. The medical literature citations supporting these volume thresholds are shown in Appendix D. Fourteen percent of pancreatic resection surgeries in Wisconsin were performed at hospitals that met the high-volume thresholds of 10 and 11 procedures.

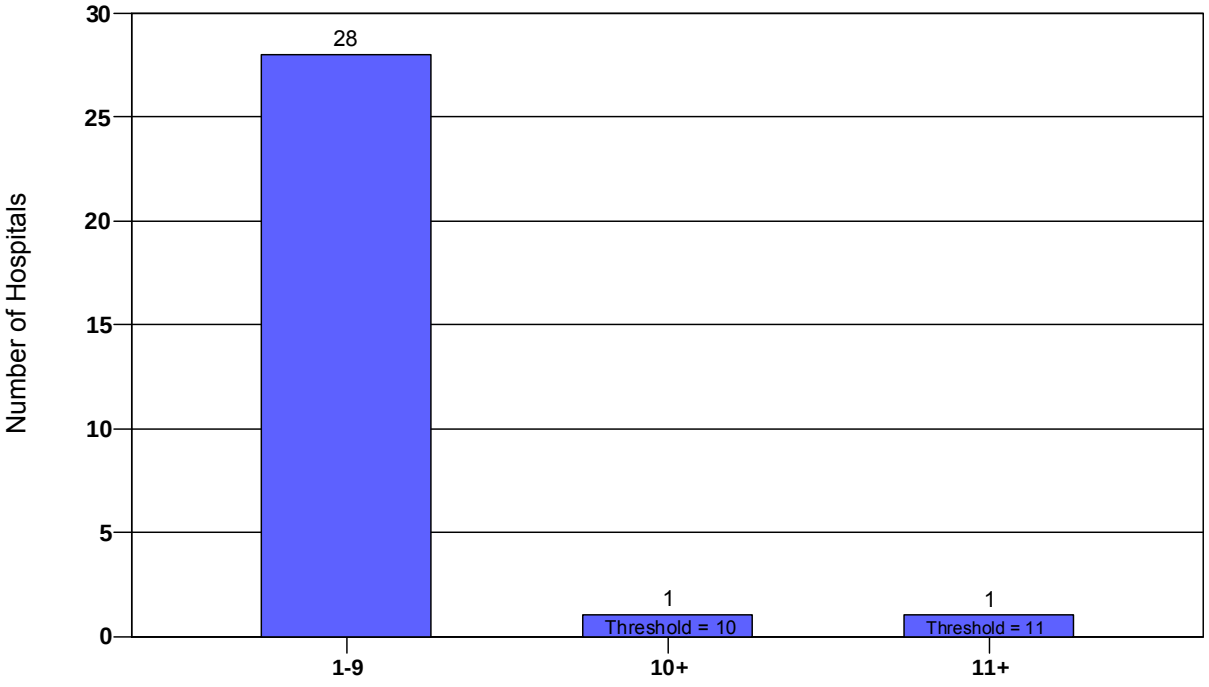
### Pancreatic Resection High-Volume Thresholds (Figure 15)

- Twenty-nine Wisconsin hospitals performed at least one pancreatic resection in 2003.
- One hospital met both the AHRQ high-volume thresholds of ten and eleven procedures.
- Most (28) Wisconsin hospitals performing the procedure did not meet either high-volume threshold.

[24] Cancer Facts & Figures 2003. American Cancer Society.

## Figure 15. Pancreatic Resection: High-Volume Thresholds

**Number of hospitals below and at/above high-volume thresholds identified by AHRQ**




Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

# *Women's Health*

## CESAREAN DELIVERY - UTILIZATION

Cesarean delivery is the surgical delivery of a baby through an incision in the mother's abdomen and uterus. Cesarean deliveries are indicated when the baby or mother is in danger or distress. Some common examples of these situations are toxemia of pregnancy, infection, bleeding, failure of labor to progress normally and breech position. Many women with a previous Cesarean delivery will require or elect to have Cesarean deliveries for subsequent births. Some health care experts believe that a significant percentage of Cesarean deliveries are unnecessary. Wide variation in Cesarean delivery rates has been observed across the United States. The 2002 national Cesarean delivery rate was approximately 26 percent.[25]

### State-Level Cesarean Delivery Utilization

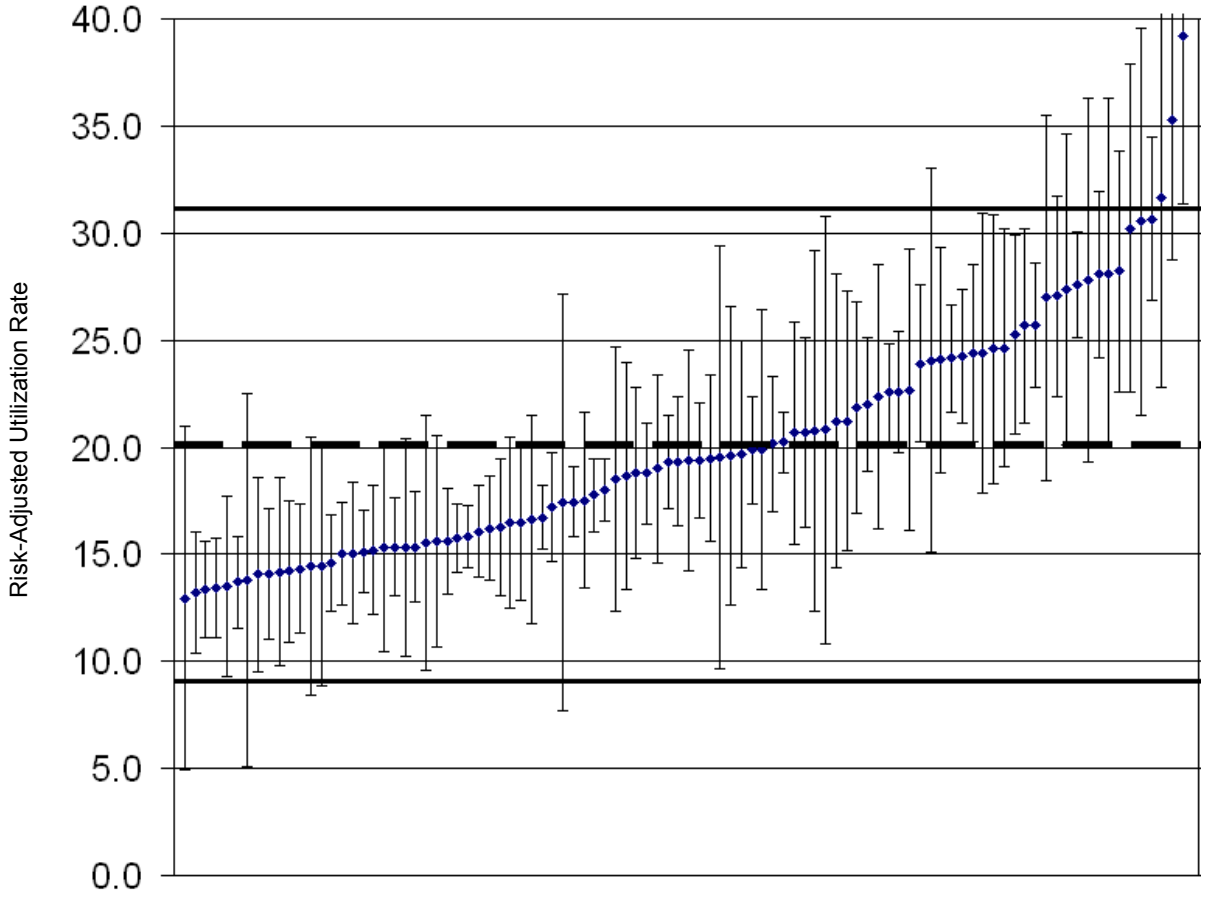
The Wisconsin statewide risk-adjusted Cesarean delivery rate in 2003 was 18.3 per 100 deliveries, or approximately 18 percent. This is substantially lower than the national rate of 26 percent based on 2002 birth-certificate data.

### Hospital-Level Cesarean Delivery Utilization (Figure 16)

- The risk-adjusted Cesarean delivery utilization rates among Wisconsin hospitals with at least 50 deliveries ranged from 13.0 to 39.2 per 100. (Hospitals with fewer than 50 deliveries were excluded.)
- The average risk-adjusted Cesarean delivery rate for the 96 hospitals included in Figure 16 was 20.1 per 100 deliveries.
- Three hospitals had rates greater than two standard deviations above the hospital average.
- Eighteen hospitals had risk-adjusted utilization rates significantly higher than the hospital average, and 29 hospitals had rates significantly lower than the hospital average, based on 95% confidence intervals. Confidence-interval widths should be considered when interpreting these rates.

[25] Center for Disease Control and Prevention – National Center for Health Statistics 2002. FASTATS – Births – Method of Delivery. www.cdc.gov/nchs/fastats/delivery.htm. Accessed December 2004.

**Figure 16. Cesarean Delivery:**
**Risk-Adjusted Utilization Rates with 95% Confidence Intervals**
**(Number of Cesarean deliveries per 100 deliveries)**




**Each data point represents the rate of a single hospital.**
**Solid lines represent two standard deviations above and below dashed line, which represents a hospital average of 20.1 for this indicator.**

Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

Note: Values for hospitals with fewer than 50 cases are excluded.

## PRIMARY CESAREAN DELIVERY - UTILIZATION

### State-Level Primary Cesarean Delivery Utilization

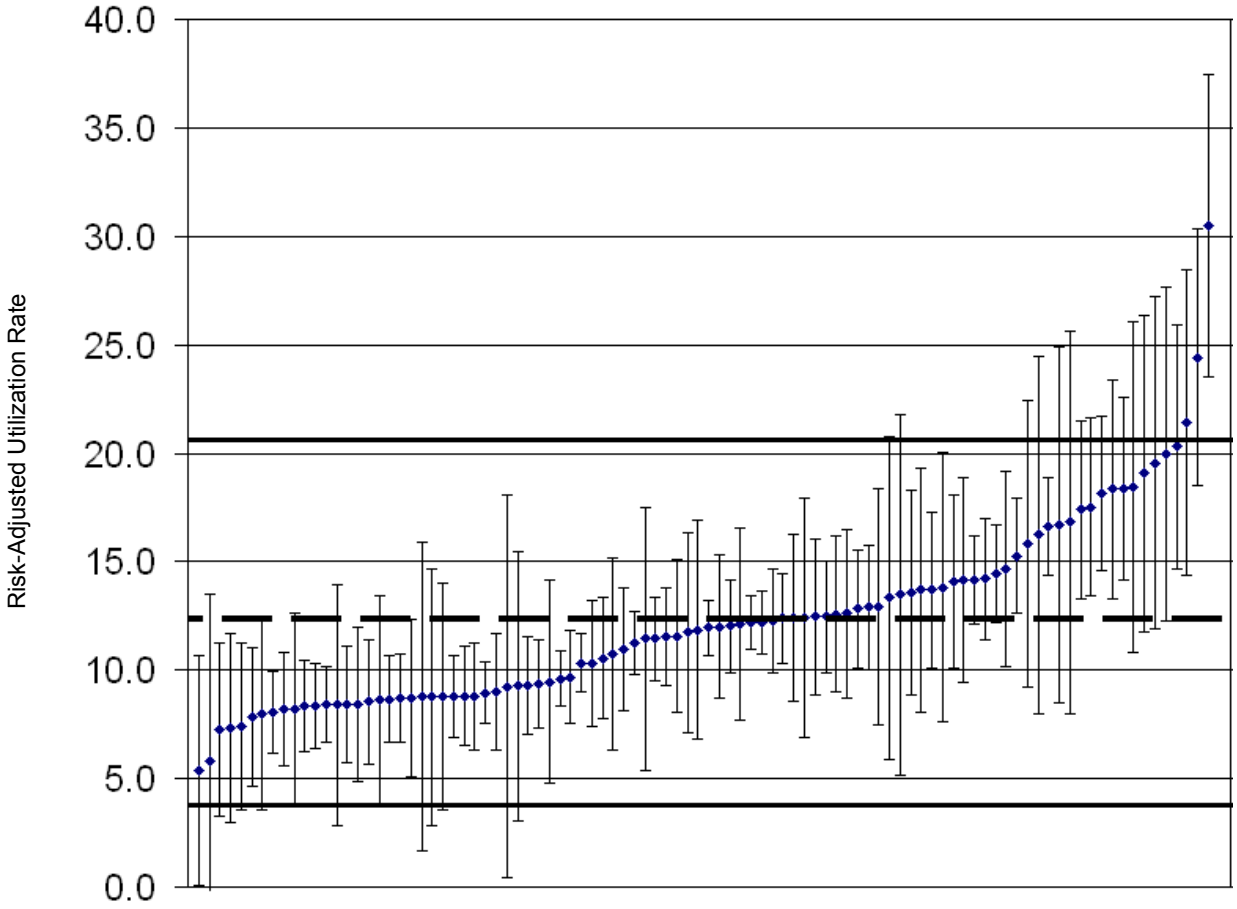
Primary Cesarean delivery refers to Cesarean deliveries in women with no history of previous Cesarean delivery.

The Wisconsin statewide risk-adjusted primary Cesarean delivery rate in 2003 was 11.1 per 100 deliveries, or approximately 11 percent. This is substantially lower than the national rate of 16 percent based on 2002 birth-certificate data.

### Hospital-Level Primary Cesarean Delivery Utilization (Figure 17)

- The risk-adjusted primary Cesarean delivery utilization rates among Wisconsin hospitals with at least 50 deliveries ranged from 5.4 to 30.5 per 100. (Hospitals with fewer than 50 deliveries were excluded.)
- The average risk-adjusted primary Cesarean delivery rate for the 96 hospitals included in Figure 17 was 12.3 per 100 deliveries.
- Three hospitals had rates greater than two standard deviations above the hospital average.
- Twelve hospitals had risk-adjusted utilization rates significantly higher than the hospital average, and 25 hospitals had rates significantly lower than the hospital average, based on 95% confidence intervals. Confidence-interval widths should be considered when interpreting these rates.

**Figure 17. Primary Cesarean Delivery:**
**Risk-Adjusted Utilization Rates with 95% Confidence Intervals**
**(Number of Cesarean deliveries per 100 deliveries in women with no history of previous Cesarean delivery)**




**Each data point represents the rate of a single hospital.**
**Solid lines represent two standard deviations above and below dashed line, which represents a hospital average of 12.3 for this indicator.**

Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

Note: Values for hospitals with fewer than 50 cases are excluded.

# *Hospitalizations for Acute Conditions*

## PNEUMONIA - MORTALITY

Pneumonia is a serious infection of the lungs. The lung's tiny air sacs (alveoli) become inflamed and filled with pus and fluid. Pneumonia is caused by many different kinds of bacteria, viruses and other organisms. Pneumonia accounts for 1.3 million hospitalizations and more than 63,000 deaths annually in the U.S.

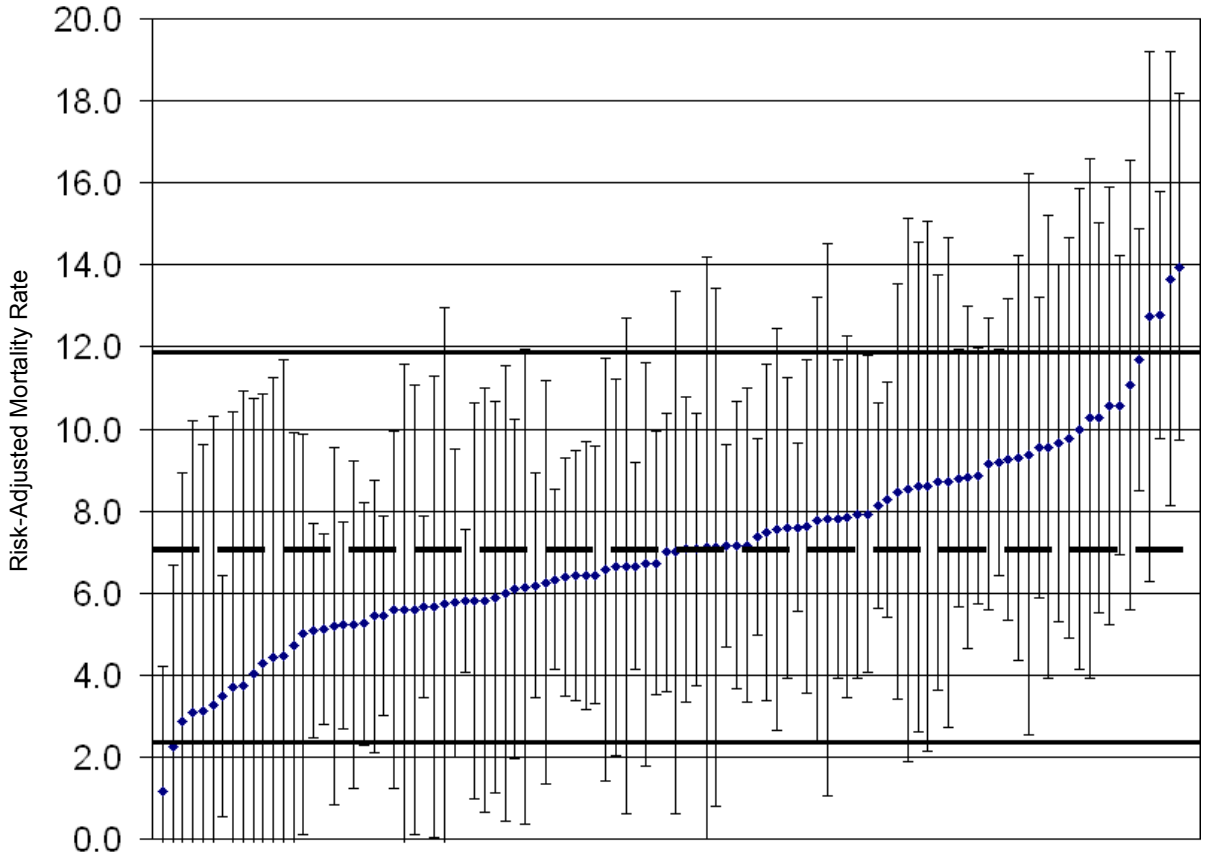
### State-Level Pneumonia Mortality

The statewide risk-adjusted inpatient mortality rate for pneumonia was 7.0, or seven percent of hospitalized cases.

### Hospital-Level Pneumonia Mortality (Figure 18)

- Risk-adjusted inpatient mortality rates for pneumonia ranged from 1.2 to 13.9 among the Wisconsin hospitals represented in this report. (Hospitals with fewer than 50 pneumonia discharges in 2003 were excluded.)
- The average risk-adjusted inpatient mortality rate for pneumonia for the 102 included hospitals was 7.1 per 100 cases.
- Four hospitals had rates greater than two standard deviations above the hospital average and two hospitals had rates greater than two standard deviations below the hospital average.
- Four hospitals had risk-adjusted mortality rates significantly higher than the average and three hospitals had rates significantly lower than the average, based on 95% confidence intervals. Confidence-interval widths should be considered when interpreting these rates.

**Figure 18. Pneumonia:**
**Risk-Adjusted Mortality Rates with 95% Confidence Intervals**
**(Number of deaths per 100 discharges with principal diagnosis code of pneumonia)**




**Each data point represents the rate of a single hospital.**
**Solid lines represent two standard deviations above and below dashed line, which represents a hospital average of 7.1 for this indicator.**

Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

Note: Values for hospitals with fewer than 50 cases are excluded.

## GASTROINTESTINAL (GI) HEMORRHAGE - MORTALITY

Gastrointestinal (GI) bleeding ranges from a microscopic loss of blood to life-threatening hemorrhage. Bleeding can occur at any point in the GI tract. There are many causes of GI bleeding including ulcers, inflammation, infection, cancer, and abnormal blood vessel formations.

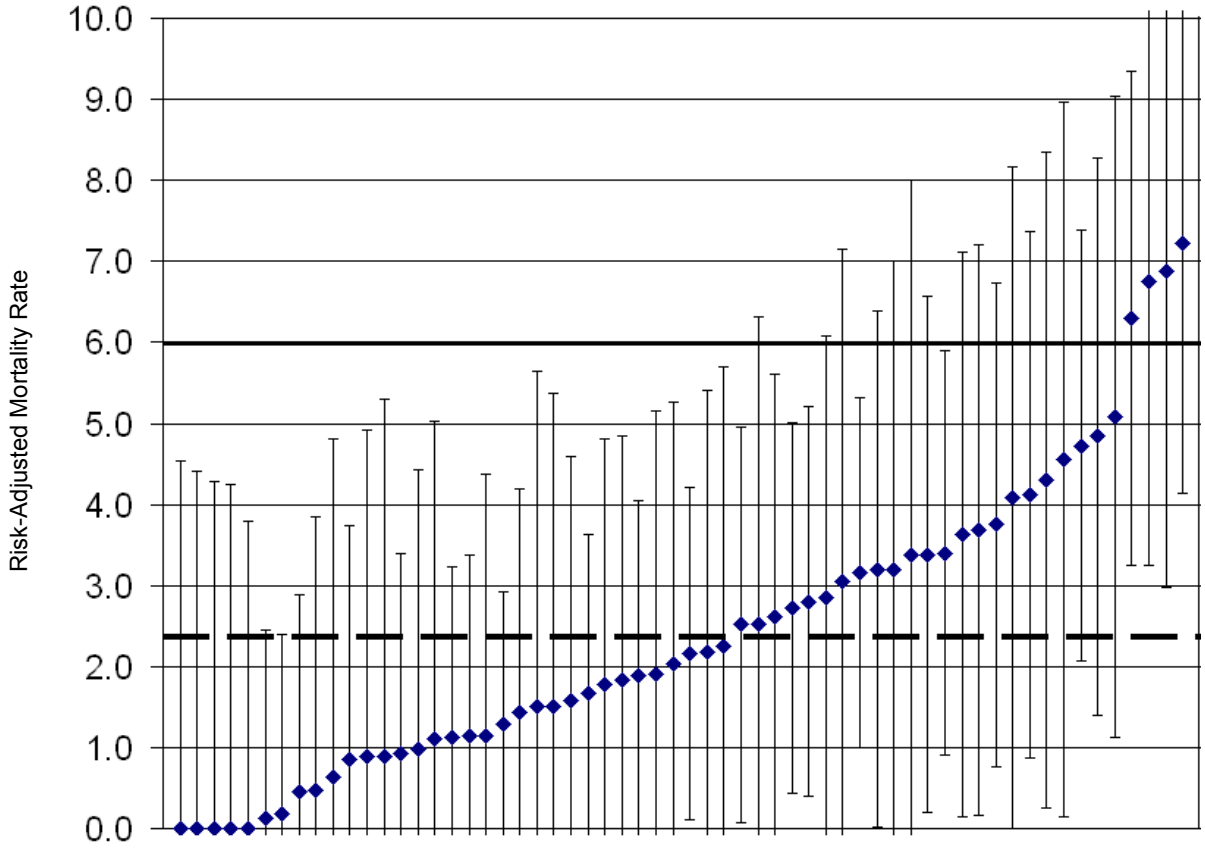
### State-Level GI Hemorrhage Mortality

The statewide risk-adjusted inpatient mortality rate for persons hospitalized with GI hemorrhage in 2003 was 2.3 per 100 cases.

### Hospital-Level GI Hemorrhage Mortality (Figure 19)

- Risk-adjusted inpatient mortality rates for GI hemorrhage ranged from 0 to 7.2 among Wisconsin hospitals included in this report. (Hospitals with fewer than 50 GI hemorrhage discharges in 2003 were excluded.)
- The average risk-adjusted inpatient mortality rate for GI hemorrhage for the 60 included hospitals was 2.4 per 100 cases.
- Four hospitals had inpatient mortality rates greater than two standard deviations above the hospital average.
- The same four hospitals had risk-adjusted mortality rates significantly higher than the average and one hospital had a rate significantly lower than average, based on 95% confidence intervals. Confidence-interval widths should be considered when interpreting these rates.

**Figure 19. Gastrointestinal Hemorrhage:**
**Risk-Adjusted Mortality Rates with 95% Confidence Intervals**
**(Number of deaths per 100 discharges with principal diagnosis code of gastrointestinal hemorrhage)**




**Each data point represents the rate of a single hospital.**
**Solid line represents two standard deviations above dashed line, which represents a hospital average of 2.4 for this indicator.**

Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

Note: Values for hospitals with fewer than 50 cases are excluded.

## *Other*

# CRANIOTOMY - MORTALITY

Craniotomy refers to any surgery that involves surgically entering the cranium or skull for therapeutic purposes. This indicator includes a very broad range of procedures associated with diverse diagnoses. Craniotomy or "brain surgery" may be performed for benign or cancerous tumors, bleeding, vascular abnormalities, severe seizure disorders, brain abscesses and other conditions such as Parkinson's disease.

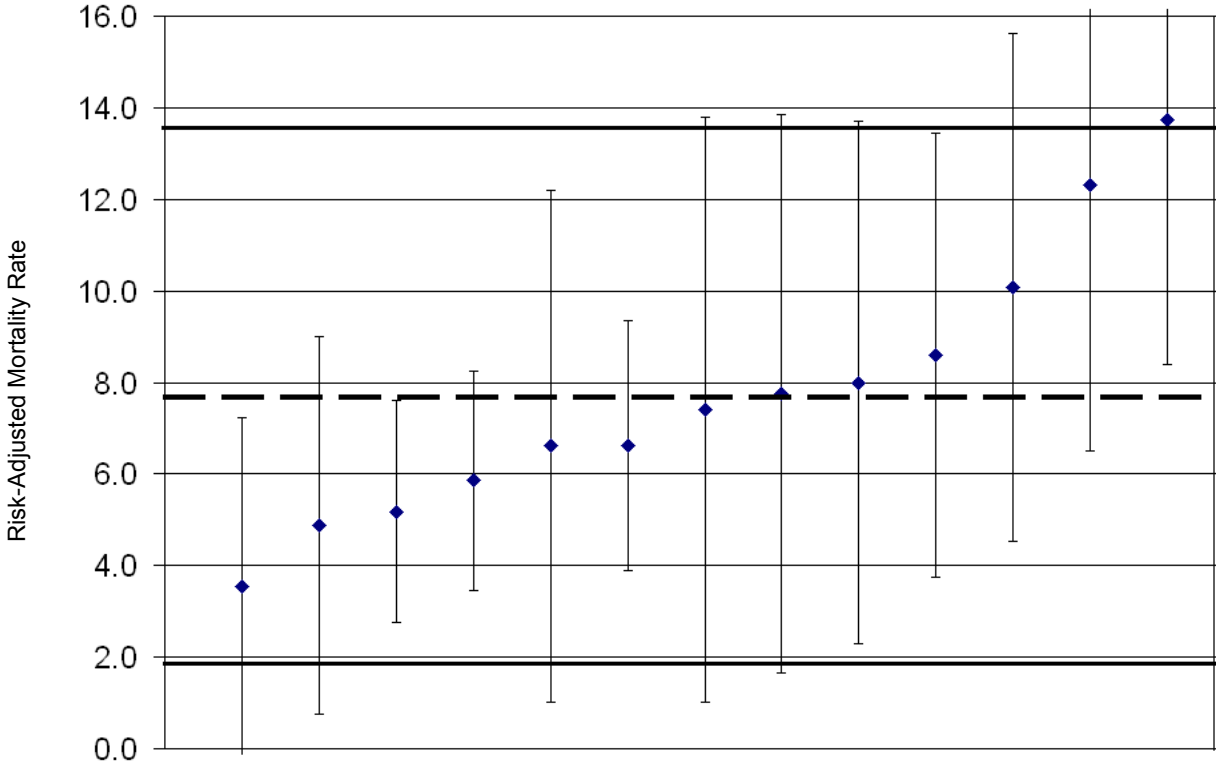
### State-Level Craniotomy Mortality

The statewide risk-adjusted inpatient mortality rate for craniotomy in 2003 was 6.4 per 100 procedures.

### Hospital-Level Craniotomy Mortality (Figure 20)

- Inpatient mortality rates for craniotomy among the 13 hospitals represented in Figure 20 ranged from 3.5 to 13.7 per 100 procedures. (Hospitals with fewer than 50 procedures in 2003 were excluded.)
- The average risk-adjusted craniotomy mortality rate for the included hospitals was 7.7 per 100 procedures.
- One hospital rate was greater than two standard deviations above the hospital average.
- The same hospital rate was significantly higher than the average, and two hospital rates were significantly lower than the average, based on 95% confidence intervals. Confidence-interval width should be considered when interpreting this rate.

**Figure 20. Craniotomy:**
**Risk-Adjusted Mortality Rates with 95% Confidence Intervals**
**(Number of deaths per 100 discharges with procedure code of craniotomy in any field, age 18 years and older)**




**Each data point represents the rate of a single hospital.**
**Solid lines represent two standard deviations above and below dashed line, which represents a hospital average of 7.7 for this indicator.**

Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

Note: Values for hospitals with fewer than 50 cases are excluded.

## INCIDENTAL APPENDECTOMY AMONG THE ELDERLY - UTILIZATION

Elderly persons undergo abdominal surgery for a wide variety of conditions. Performing an incidental appendectomy during these surgeries is rarely indicated.

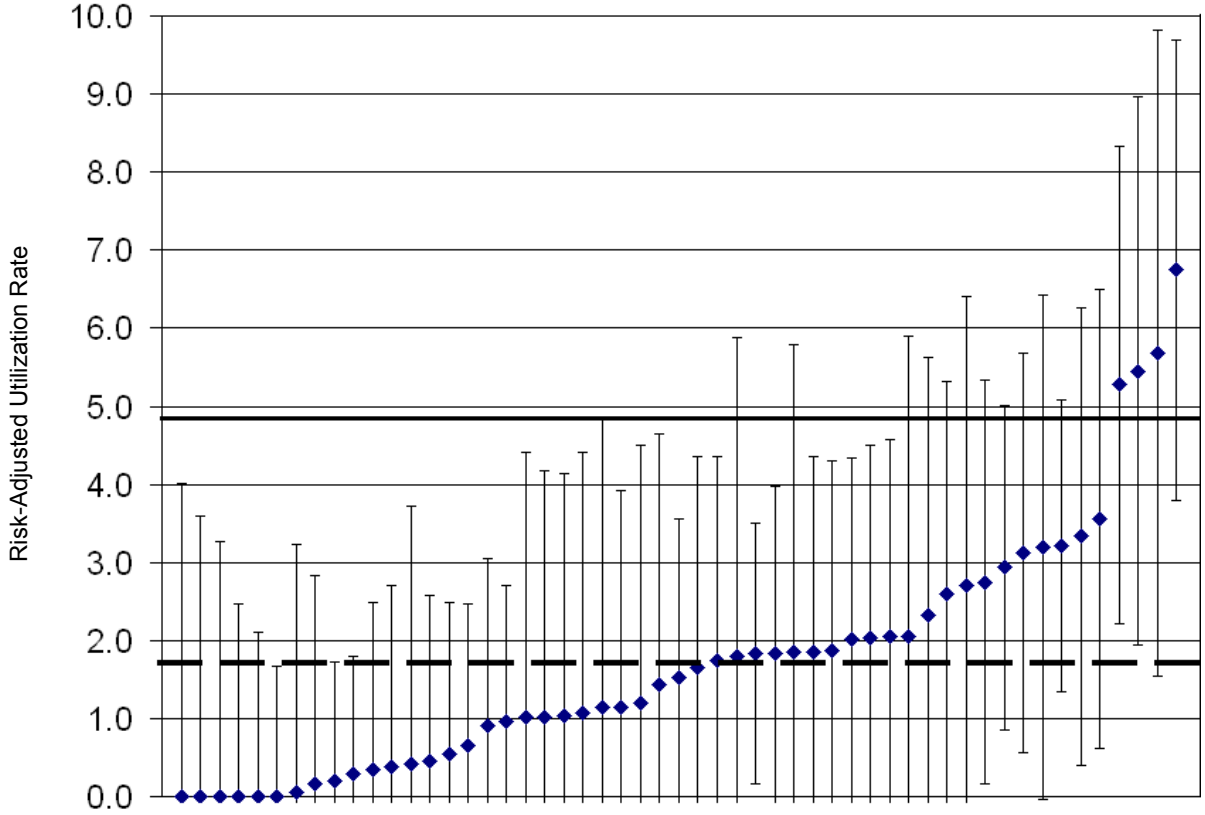
### State-Level Incidental Appendectomy

The statewide utilization rate for incidental appendectomy (elderly, age 65 years and older) in 2003 was 1.5 per 100 intra-abdominal procedures.

### Hospital-Level Incidental Appendectomy Utilization (Figure 21)

- Risk-adjusted incidental appendectomy utilization rates ranged from 0 to 6.7 per 100 procedures among the hospitals represented in this report. (Hospitals with fewer than 50 intra-abdominal procedures performed on elderly patients in 2003 were excluded.)
- The average risk-adjusted rate for the 53 included hospitals was 1.7 per 100 procedures.
- Four hospitals had rates greater than two standard deviations above the average.
- Three hospitals had risk-adjusted utilization rates significantly higher than the average and two hospitals had utilization rates significantly lower than average, based on 95% confidence intervals. Confidence-interval widths should be considered when interpreting these rates.

**Figure 21. Incidental Appendectomy:**
**Risk-Adjusted Utilization Rates with 95% Confidence Intervals**
**(Number of incidental appendectomies per 100 elderly discharges with intra-abdominal procedure)**




**Each data point represents the rate of a single hospital.**
**Solid line represents two standard deviations above dashed line, which represents a hospital average of 1.7 for this indicator.**

Source: Inpatient Data, WHA Information Center, LLC (4Q 2003 data), Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services (1Q - 3Q data).

Note: Values for hospitals with fewer than 50 cases are excluded.

# Summary and Conclusions

This report presents a "snapshot" of the general performance of Wisconsin hospitals across a number of inpatient quality indicator areas. The results are only descriptive, not conclusive, owing to such drawbacks as the limitations of billing data, small numbers of procedures in many hospitals, and the prohibition against identification of hospitals. In spite of these drawbacks, a few things appear likely based on the results.

First, we noted earlier that the literature identified by AHRQ suggests a relationship between procedure volume and outcome, specifically that higher volumes are associated with better outcomes. While such a relationship makes sense on an intuitive level, the unreliability of rates calculated for Wisconsin hospitals with small numbers of cases presents a built-in limitation for the testing of a volume-outcome relationship.

Second, for most of the indicators presented, overall variation is not extreme among hospitals with sufficient numbers of cases for the computation of reliable rates (mortality and utilization). A few apparent high outliers do exist for various indicators. However, it is important to reiterate that the indicator results in this report reflect only one-year of hospital "performance," thus they cannot be taken as suggestive of entrenched patterns. Random variation could produce anomalies in any given year for otherwise well-performing hospitals. Subsequent reports involving multiple years of data may convey more information about true systematic differences in hospital performance quality.

Side-by-side information on 2001 and 2003 Wisconsin Inpatient Quality Indicators is presented in the Executive Summary. The 2001 report is based on version 2.1 of the AHRQ Quality Indicators software and documents released in June 2002. The 2003 report is based on version 2.1, revision 3, of the AHRQ Quality Indicators software and documents released in July 2004.

## Appendix A

Quality Indicators Workgroup

The WHA Information Center and their Advisory Board wish to thank the members of the Quality Indicators Workgroup for sharing their time, expertise and advice concerning the development and presentation of this report.

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# Appendix B

## Healthcare Cost and Utilization Project (HCUP)

AHRQ is the lead federal agency for producing information about health care quality. AHRQ was charged by the U.S. Congress to produce the first National Healthcare Quality Report in 2003. This report was published in December 2003 and is available on the AHRQ Web site at http://www.ahrq.gov/qual/nhqr03/nhqrsum03.htm. Some of the information in the national report came from the hospital discharge database maintained by AHRQ.

Thirty-two states submit clinical, utilization and demographic information on inpatient hospital stays to AHRQ. This uniform database is the foundation of the HCUP. HCUP is a public partnership of states, hospitals and the federal government intended to provide comparative information about specific aspects of health care. Wisconsin began participating in the HCUP project in 1992. A set of 33 HCUP Quality Indicators (HCUP QIs) was developed in the early 1990s in response to requests from state-level organizations and hospital associations with inpatient data collection systems. Currently there are 34 Quality Indicators.

Since the development of the original HCUP QIs, better methods for assessing quality of care have evolved. For example, improved models for risk adjustment have been developed. As a result, AHRQ funded the UCSF-Stanford EPC to refine and further develop the original HCUP QIs. Using the Institute of Medicine's widely cited definition of quality[26] the UCSF-Stanford EPC was guided by six key research questions:

1. Which quality indicators currently in use or described in the existing literature could be defined using existing hospital discharge data?

2. What quality relationships, identified by current research, could help identify new indicators using hospital discharge data?

3. What evidence exists for indicators not well represented in the original indicators – pediatric conditions, chronic disease, new technologies, and ambulatory-care-sensitive conditions?

4. Which quality indicators have literature-based evidence to support face validity, precision of measurement, minimum bias, and construct validity of the indicator?

5. What risk-adjustment method should be suggested for use with the recommended indicators, given the limits of administrative data and other practical concerns?

[26] "The degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge." (Institute of Medicine Division of Health Services. Medicare: a strategy for quality assurance. Washington, DC: National Academy Press; 1990.)

6. Which indicators perform well on empirical tests of precision of measurement, minimum bias, and construct validity?

The UCSF-Stanford EPC analyses resulted in the development of three types of indicators based on administrative hospital discharge data:

- **Prevention Quality Indicators** provide insight into care delivered in an outpatient setting.
- **Patient Safety Indicators** provide information about medical errors occurring during a hospital stay
- Hospital **Inpatient Quality Indicators** provide information about procedure volume, patterns of utilization and mortality associated with common conditions and procedures.

## Appendix C

Procedure and Diagnosis Codes Associated with the AHRQ Inpatient Quality Indicators Used in this Report

**Volume/Mortality for Procedures:**

- **Esophageal Resection Volume**
  Procedure codes:
  4240, 4241, 4242
  Esophageal cancer diagnosis codes:
  1500-1505, 1508, 1509

- **Pancreatic Resection Volume**
  Procedure codes:
  526, 527
  Pancreatic cancer diagnosis codes:
  1520, 1561, 1562, 1571-1574, 1578, 1579

- **Abdominal Aortic Aneurysm (AAA) Repair Volume**
  Procedure codes:
  3834, 3844, 3864
  AAA diagnosis codes:
  4413, 4414

- **Coronary Artery Bypass Graft (CABG) Volume/Mortality**
  Procedure codes:
  3610-3617, 3619

- **Percutaneous Transluminal Coronary Angioplasty (PTCA) Volume/Mortality**
  Procedure codes:
  3601, 3602, 3605, 3606

- **Carotid Endarterectomy (CEA) Volume/Mortality**
  Procedure codes:
  3812

- **Craniotomy Mortality**
  Procedure codes:
  DRG 001, 002, 528, 529, 530 - craniotomy (ICD-9-CM procedure codes not provided by AHRQ)

- **Hip Replacement Mortality**
  Procedure codes:
  8151-8153

Osteoarthritis diagnosis codes:
71500, 71509, 71510, 71515, 71518, 71520, 71525, 71528, 71530, 71535, 71538, 71580, 71589, 71590, 71595, 71598,71650, 71655, 71658-71660, 71665, 71668, 71690, 71695, 71698, 71699

**Mortality for Conditions:**

- **Acute Myocardial Infarction (AMI) Mortality**
  Diagnosis codes:
  41001, 41011, 41021, 41031, 41041, 41051, 41061, 41071, 41081, 41091

- **Acute Myocardial Infarction (AMI) Mortality, Without Transfer Cases**
  Diagnosis codes:
  41001, 41011, 41021, 41031, 41041, 41051, 41061, 41071, 41081, 41091
  Exclude patients with missing admission source or transferring from another short-term general hospital.

- **Congestive Heart Failure (CHF) Mortality**
  Diagnosis codes (excludes cases with cardiac procedure code in any field):
  39891, 40201, 40211, 40291, 40401, 40403, 40411, 40413, 40491, 40493, 4280, 4281, 42820-42823, 42830-42833, 42840-42843, 4289

- **Acute Stroke Mortality**
  Diagnosis codes:
  43301, 43311, 43321, 43331, 43381, 43391, 43401, 43411, 43491, 4320, 4321, 4329, 436, 430, 431
- **Gastrointestinal Hemorrhage (GI) Mortality**
  Diagnosis codes:
  5302, 53082, 53100, 53101, 53120, 53121, 52140, 53141, 53160, 53161, 53200, 53201, 53220, 53221, 53240, 53241, 53260, 53261, 53300, 53301, 53320, 53321, 53340, 53341, 53360, 53361, 53400, 53401, 53420, 53421, 53440, 53441, 53460, 53461, 53501, 53511, 53521, 53531, 53541, 53551, 53561, 53783, 53784, 56202, 56203, 56212, 56213, 56985, 56986, 4560, 5307, 5693, 5780, 5781, 5789

- **Hip Fracture Mortality**
  Diagnosis codes:
  82000, 82001-82003, 82009-82013, 82019-82022, 82030-82032, 8208, 8209

- **Pneumonia Mortality**
  Diagnosis codes:
  00322, 0212, 0391, 0521, 0551, 0730, 1124, 1140, 1144, 1145, 11505, 11515, 11595, 1304, 1363, 4800-4809, 481, 48230-48239, 48240-48249, 48281-48289, 4829, 4830-4838, 4841-4848, 485, 486, 5070, 5100, 5109, 5110, 5130, 4820-4822

**Utilization:**

- **Cesarean Delivery**

  Numerator:
  Cesarean delivery DRGs: 370-371

  Denominator:
  All delivery DRGs: 370-375

  Exclude patients with abnormal presentation, preterm delivery, fetal death, multiple gestation diagnosis codes, and breech procedure codes.

- **Primary Cesarean Delivery**

  Numerator
  Cesarean delivery DRGs 370-371

  Denominator
  All delivery DRGs 370-375

  Exclude patients with abnormal presentation, preterm delivery, fetal death, multiple gestation diagnosis codes, breech procedure codes, or a previous Cesarean delivery diagnosis in any diagnosis field.

  **Incidental Appendectomy Among the Elderly**

  Numerator:

  ICD-9-CM procedure codes:

  4711, 4719

  Denominator:
  Intra-abdominal procedure DRGs:

  146-155, 170, 171, 191-198, 201, 354-359, 365

## Appendix D
References Cited by AHRQ for Procedure High-Volume Thresholds

- Esophageal Resection

  **Threshold 1 (6):** Patti MG, et al. A hospital's annual rate of esophagectomy influences the operative mortality rate. *Journal of Gastrointestinal Surgery* 1998;2(2):186-192.

  **Threshold 2 (7):** Dudley RA, et al. Selective referral to high-volume hospitals: estimating potentially avoidable deaths. *JAMA* 2000;283(9):1159-1166.

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- Pancreatic Resection

  **Threshold 1 (10):** Glasgow RD, Mulvhill SJ. Hospital volume influences outcome in patients undergoing pancreatic resection for cancer. *Western Journal of Medicine* 1996;165(5):294-300.

  **Threshold 2 (11):** Glasgow RD, Mulvhill SJ. 1996.

  Nationwide Inpatient Sample and State Inpatient Databases. Healthcare Cost and Utilization Project. Agency for Healthcare Research and Quality, Rockville, MD. http://www.ahrq.gov/data/hcup

- Abdominal Aortic Aneurysm (AAA) Repair

  **Threshold 1 (10):** Hannan EL, et al. A longitudinal analysis of the relationship between in-hospital mortality in New York State and the volume of abdominal aortic aneurysm surgeries performed. *Health Services Research* 1998;27(4):517-542.

  **Threshold 2 (32):** Kazmers A, et al. Abdominal aortic aneurysm repair in Veterans Affairs medical centers. *Journal of Vascular Surgery* 1996;23(2):191-200.

  Pronovost PJ, Jenckes MW, Corman T, et al**.** Organizational characteristics of intensive care units related to outcomes of abdominal aortic surgery. *JAMA* 1999;281(14):1310-1317.

  Nationwide Inpatient Sample and State Inpatient Databases. Healthcare Cost and Utilization Project. Agency f or Healthcare Research and Quality, Rockville, MD. http://www.ahrq.gov/data/hcup

- Coronary Artery Bypass Graft (CABG)

**Threshold 1 (100):** Eagle KA, et al. Guidelines for coronary artery bypass graft surgery: A report of the American College of Cardiology/ American Heart Association Task Force on Practice Guidelines (Committee to revise the 1991 guidelines for coronary artery bypass graft surgery). *Journal of the American College of Cardiology* 1999;34(4):1262-1347.

**Threshold 2 (200):** Hannan EL, et al. Coronary artery bypass surgery: the relationship between in-hospital mortality rate and surgical volume after controlling for clinical risk factors. *Medical Care* 1991;29(11):1094-1107.

Nationwide Inpatient Sample and State Inpatient Databases. Healthcare Cost and Utilization Project. Agency for Healthcare Research and Quality, Rockville, MD. http://www.ahrq.gov/data/hcup

- Percutaneous Transluminal Coronary Angioplasty (PTCA)

**Threshold 1 (200):** Ryan TJ. Guidelines for percutaneous transluminal coronary angioplasty: A report of the American Heart Association/American College of Cardiology Task Force on Assessment of Diagnostic and Therapeutic Cardiovascular Procedures (Committee on Percutaneous Transluminal Coronary Angioplasty). *Circulation* 1993;88(6):2987-3007.

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Nationwide Inpatient Sample and State Inpatient Databases. Healthcare Cost and Utilization Project. Agency f or Healthcare Research and Quality, Rockville, MD. http://www.ahrq.gov/data/hcup

- Carotid Endarterectomy (CEA)

**Threshold 1 (50):** Manheim LM, et al. Hospital vascular surgery volume and procedure mortality rates in California. *Journal of Vascular Surgery* 1998;28(1): 45-46.

Nationwide Inpatient Sample and State Inpatient Databases. Healthcare Cost and Utilization Project. Agency for Healthcare Research and Quality, Rockville, MD. http://www.ahrq.gov/data/hcup

**Threshold 2 (101):** Dudley RA, et al. Selective referral to high-volume hospitals: Estimating potentially avoidable deaths. *JAMA* 2000;283(9):1159-1166.

Hannan EL, et al. Relationship between provider volume and mortality for carotid endarterectomies in New York State. *Stroke* 1998;29(11):2292-2297.

# Appendix E
## Risk Adjustment

Risk adjustment addresses the concern that systematic differences in case-mix severity among hospitals potentially bias outcome measures such as mortality following surgical procedures. Risk adjustment systems typically use multivariate regression to adjust expected hospital performance based on patient characteristics.

A risk-adjusted rate (in this case a mortality or utilization rate) is a modification of the unadjusted rate, and is the rate that would be expected if the hospital had an "average" case mix. The average case mix is estimated using data from the 27 State Inpatient Databases (SIDs) compiled by the AHRQ. In effect, risk adjustment standardizes rates, making it possible to compare hospitals with dissimilar case mixes. In addition, if the risk-adjusted value of an indicator for a hospital differs from the unadjusted value, it suggests that the hospital's case mix is more severe, or less severe, than average. Comparisons of a hospital's adjusted and unadjusted rates can be used to evaluate the impact of measured case mix characteristics on hospital performance.

AHRQ recommends using 3M' s APR-DRG (All Patient Refined Diagnosis Related Groups) risk-adjustment system for use with its inpatient hospital quality indicators.

The APR-DRGs are an expansion of DRGs, a patient classification system used by the Centers for Medicare and Medicaid Services to relate hospital case mix to cost, or hospital resources consumed. The APR-DRGs were developed in response to the demand for a patient classification system with applicability beyond assessments of resource use - one that can be used to evaluate differences in outcomes such as inpatient mortality.

APR-DRGs expand basic DRGs through the addition of four subclasses that address distinct patient attributes related to severity of illness and risk of mortality.

Severity of illness denotes the extent of physiologic de-compensation or organ-system loss of function experienced by the patient, while risk of mortality refers to the likelihood of dying. The four severity-of-illness subclasses and four risk-of-mortality subclasses denote minor, moderate, major and extreme severity of illness and risk of mortality. Patients with the highest severity of illness and/or risk of mortality are characterized by the presence of multiple serious diseases.[27]

Assignment to APR-DRG severity-of-illness and risk-of-mortality subclasses takes into consideration principal diagnosis, secondary diagnoses and their combinations (co-morbidities), patient age and sex, and the presence of certain OR (operating room) and non-OR procedures.

[27] Averill RF, et al.. Development of the All Patient Refined DRGs (APR-DRGs). 3M Health Information Systems Research Report. 1997.

The 3M™ Core Grouping Software uses patient attributes to calculate a severity-of-illness score and a risk-of-mortality score for each relevant patient data record in a hospital inpatient data file. These scores are added to the record and are used as variables in the calculation of risk-adjusted mortality and utilization rates for hospitals.

# Appendix F
Technical Notes and Methodology

## Data

This report uses data from the Wisconsin inpatient discharge data file, an administrative data set constructed using data submitted by hospitals to BHI and the WHA Information Center. By state statute, all acute care, non-federal hospitals are required to submit inpatient data on a quarterly basis. In addition to charge and payer data, each record contains primary and secondary diagnoses and procedures, and information about the patient's age, gender, admission and discharge status. BHI and the WHA Information Center edited the data for errors and gave hospitals the opportunity to review and correct mistakes before releasing final data sets.

The inpatient discharge data file is a data set from which individual patient identifiers have been removed to preserve confidentiality.

The data used in this report refer only to care provided in Wisconsin hospitals during calendar year 2003.

## Methods

AHRQ provides downloadable software and documentation for use in computing its hospital quality indicators from administrative data. The results displayed in this report were produced using the SPSS programming language version of AHRQ's Inpatient Quality Indicators software.[28] The indicator production process consists of several steps outlined below.

1. Create the APR-DRG categories using 3M™ Core Grouping Software.

   3M™ Core Grouping Software-APR-DRG Grouper[29], obtained for this report directly from 3M's Health Information Systems Division, creates two additional data elements for each record denoting *severity of illness* and *risk of mortality*. These data elements are required for the calculation of risk-adjusted rates. For more information about risk adjustment, see Appendix E.

[28] AHRQ Quality Indicators – Inpatient Quality Indicators: Software Documentation, Version 2.1 – SPSS. Rockville, MD. Agency for Healthcare Research and Quality, 2002. Revision 3 (July 21, 2004). AHRQ Pub. No. 02-R208.
[29] 3M™ Core Grouping Software, Version C. 3M Health Information Systems. (October 2004). Document No. GRP-044.

2. Format inpatient data.

   The AHRQ software uses a subset of data elements commonly included in administrative inpatient data files (see "Data," above). Since such files vary slightly from state to state in the formatting of data, the AHRQ software documentation provides necessary format specifications for each element to be used in producing the indicators. In the present case, some initial re-formatting of data was done to recode the data to HCUP specifications[30], and hospital location codes (FIPS codes) were added, to bring all the required data elements into conformity with AHRQ's specifications.

3. Use AHRQ software to search inpatient data file for relevant cases.

   The AHRQ inpatient indicators software contains several program files that perform different functions. The first program file searches the administrative (inpatient) data set for cases with diagnosis and procedure codes that match those associated with the volume, mortality and utilization indicators, and creates a new data file which is used by subsequent program files to produce the indicator values.

4. Produce volume indicators.

   Indicators are produced in sequence, starting with volume indicators. Volume indicators are simple counts of the number of procedures associated with each hospital and all procedures are counted regardless of ultimate discharge status. Later, in the calculation of mortality rates, discharge status is a factor, and cases involving transfers to other inpatient facilities are excluded.

5. Calculate mortality and utilization rates, unadjusted and risk-adjusted.

   The AHRQ software produces unadjusted and risk-adjusted mortality and utilization rates for each hospital. A state-level rate (i.e., a rate for the state as a whole) is also produced for each indicator.

6. Calculate confidence intervals.

   Confidence intervals are calculated for each hospital reported in the mortality and utilization indicators using risk-adjusted rates and the AHRQ national mean square of error.[31] The reference data values are provided by AHRQ. For more information about confidence intervals, see Appendix H.

[30] http://hcup-us.ahrq.gov/db/state/siddbdocumentation.jsp
[31] AHRQ Inpatient Quality Indicators-Interpretative Guide. Dallas-Fort Worth Hospital Council Data Initiative. 2002.

## Appendix G

## Complete List of AHRQ Inpatient Quality Indicators

### Volume

Esophageal Resection
Pancreatic Resection
Pediatric Heart Surgery
Abdominal Aortic Aneurysm (AAA) Repair
Coronary Artery Bypass Graft (CABG)
Percutaneous Transluminal Coronary Angioplasty (PTCA)
Carotid Endarterectomy (CEA)

### Mortality-—Procedures

Esophageal Resection
Pancreatic Resection
Pediatric Heart Surgery
AAA Repair
CABG
PTCA
CEA
Craniotomy
Hip Replacement

### Mortality---Conditions

Acute Myocardial Infarction (AMI)
AMI Without Transfer
Congestive Heart Failure
Stroke
Gastrointestinal (GI) Hemorrhage
Hip Fracture
Pneumonia

### Utilization---Hospital Level

Bilateral Cardiac Catheterization
Cesarean Delivery
Primary Cesarean Delivery
Vaginal Birth After Cesarean (VBAC), all
VBAC, uncomplicated
Laparoscopic Cholecystectomy
Incidental Appendectomy (Elderly)

### Utilization---Area Level

CABG
PTCA
Hysterectomy
Laminectomy or Spinal Fusion

## Appendix H
Glossary of Terms

**Confidence interval:** the amount of error in either direction (+/-) associated with an estimate or value, for example, a rate. Rates calculated from small numbers of cases are subject to a large amount of error and have wide confidence intervals that reflect the lack of precision. Rates based on large numbers of cases are subject to less error and have correspondingly narrower confidence intervals. Stated differently, confidence intervals show the *range* of values (or rates) within which one can be confident that the true value lies. A 95% confidence interval shows the range of values that would contain the true value 95 out of 100 times. In this report, we show rates only for hospitals with *a minimum* of 50 cases of a procedure or condition; however, *rates calculated with 50-100 cases should be interpreted with caution* as well. (Such rates will appear with wide confidence intervals. See above.)

In this report, 95% confidence intervals also illustrate the statistical significance of the difference between two rates. In the figures, if the broken line for the statewide rate passes through the confidence interval for a hospital's rate, it suggests that the difference between the two rates is not statistically significant. However, if the statewide rate is completely *outside* the confidence interval for a hospital, it suggests that the hospital's rate may be significantly higher or lower than the statewide rate.

**Error associated with rates:** the possibility that the true value of the rate is larger or smaller than the one calculated and shown. Rates calculated with small numbers of cases are subject to large potential error (see Confidence Interval).

**High-volume threshold:** the number of procedures performed annually that defines hospitals as high-volume for that procedure. For example, if a high-volume threshold for CABG surgery is 100, hospitals performing 100 or more CABG surgeries annually are considered high-volume for that procedure.

**Hospital average rate:** The rate for the quality indicator for all included hospitals combined.

**Risk-adjusted rate:** a modification of the unadjusted rate that takes into account a hospital's case-mix severity. It can be thought of as the rate that would be expected if the hospital had an "average" case mix. Generally, a risk-adjusted rate lower than the unadjusted rate suggests that case mix severity is greater than average. A risk-adjusted rate higher than the unadjusted rate suggests that the case mix is less severe than average.

**Risk of mortality:** the likelihood of dying.

**Statewide rate:** the total number of events (e.g., in-hospital deaths associated with a given procedure) in Wisconsin, irrespective of hospital, divided by the total number of procedures where the event could have occurred. Example: the statewide rate for

CABG mortality is the total number of in-hospital deaths, statewide, associated with CABG surgery divided by the total number of CABG surgeries (statewide).

**Unadjusted rate:** a simple proportion with no adjustment for case-mix severity.

Examples:

1. The unadjusted mortality rate is the number of in-hospital deaths, as indicated by discharge status, divided by: 1) the total number of specified procedures; ***or*** 2) the total number of discharges for a specified condition.
2. The unadjusted utilization rate is the number of procedures divided by the total number of discharges where the procedure could have been performed. For example, the Cesarean delivery utilization rate is the number of Cesarean deliveries divided by the total number of deliveries.