2007 Oregon Hospital Inpatient Quality Indicators (IQIs)

Technical Guide

This document outlines key technical issues related to hospital Inpatient Quality Indicators (IQIs), developed by the federal Agency for Healthcare Research and Quality (AHRQ). The most complete and up-to-date information about the AHRQ IQIs can be found at AHRQ's web site: http://www.qualityindicators.ahrq.gov/iqi_overview.htm. This website provides a short overview, free downloads, FAQs, technical guides and specifications including the inclusion and exclusion criteria for all the indicators.

Indicator Definitions

AHRQ's Inpatient Quality Indicators are patient volumes and death rates for selected medical conditions or surgical procedures. Inclusion and exclusion criteria are defined by AHRQ and are specific to each indicator. Specific diagnosis codes, procedure codes, and other criteria are listed in AHRQ's Inpatient Quality Indicators Technical Specifications, Version 3.2a:

http://www.qualityindicators.ahrq.gov/downloads/iqi/iqi_technical_specs_v32a.pdf

Volume indicators represent the number of patients that meet the inclusion and exclusion criteria for the given procedure.

- Procedures for which volumes are reported are highly specialized and extremely complex, such as heart bypass surgery. The best available evidence suggests that there is a positive relationship between higher patient volumes and improved outcomes.
- The research literature suggests possible threshold volumes at which improved patient outcomes have been observed. These threshold volumes are specific to each procedure and range from as few as 7 and as many as 400 discharges. To assess each hospital's volume indicators, they should be compared to the corresponding threshold volume.
- Hospital volumes should be assessed in conjunction with the corresponding death rates to obtain a more complete picture of each hospital's performance.
- For Oregon's report, volumes were excluded if there were less than five cases or all cases were transferred out to another hospital.

Volume Indicators Reported for 2007

Indicator	Title
IQI 1	Esophageal Resection Volume
IQI 2	Pancreatic Resection Volume
IQI 4	Abdominal Aortic Aneurysm Repair Volume
IQI 5	Heart Bypass Surgery (CABG) Volume
IQI 6	Balloon Angioplasty (PCTA) Volume
IQI 7	Carotid Endarterectomy Volume

Death rates represent the percentage of patients with the specified condition or procedure that died in the hospital. The published death rates are risk-adjusted and the patient population (denominator) must be at least 30.

- **Numerator** values are the number of in-hospital deaths that occurred in the denominator population.

- **Denominator values are** the patient population with the specified conditions or procedures, defined in most cases by ICD-9-CM diagnosis and/or procedure code(s). For some indicators, only certain age groups were included. Patients that were transferred out to another short-term hospital were excluded. In general, maternal and neonatal discharge patients were excluded. Inclusion and exclusion criteria for corresponding **volume** indicators are the same as for the denominator, except that transfers to other short-term hospitals are included in volume calculations.

Death Rate Indicators Reported for 2007

Indicator	Title
IQI 11	Abdominal Aortic Aneurysm Repair Mortality Rate
IQI 12	Heart Bypass Surgery (CABG) Mortality Rate
IQI 13	Craniotomy Mortality Rate
IQI 16	Heart Failure (CHF) Mortality Rate
IQI 17	Stroke Mortality Rate
IQI 18	Gastrointestinal Hemorrhage Mortality Rate
IQI 19	Hip Fracture Mortality Rate
IQI 20	Pneumonia Mortality Rate
IQI 30	Balloon Angioplasty (PCTA) Mortality Rate
IQI 32	Heart Attack (AMI) Mortality Rate, w/out Transfer

AHRQ's Guidelines for Using Different Types of QI Rates

If the user's primary interest is to identify cases for further follow-up and quality improvement, then the **observed rate** would help to identify them. Areas for improvement can be identified by the magnitude of the observed rate compared to available benchmarks or by the number of patients impacted.

Another approach to identify areas for quality improvement is to compare the observed rate to the **expected rate**. If the observed rate is higher than the expected rate, then the implication is that the provider performed worse than the reference population for that particular indicator. Users may want to focus on these indicators for quality improvement. If the observed rate is lower than the expected rate, then the implication is that the provider performed better than the reference population. Users may want to focus on these indicators for identifying best practices.

Users can also compare the expected rate to the **population rate** to see how their case-mix compares to the reference population. The population rate is estimated by AHRQ from a large nationwide sample of hospital patients. If the population rate is higher than the provider's expected rate, then the provider's case-mix is less severe than the reference population and vice versa. The risk of dying in the hospital is affected by factors such as age, gender, and severe injuries. Some hospitals, such as those with trauma centers, tend to treat more high-risk patients than other hospitals, creating a more severe case-mix.

Risk Adjustment

We use the difference between the population rate and the expected rate to "adjust" the observed rate to account for the difference between the case-mix of the reference population and the provider's case-mix. This is the provider's **risk-adjusted rate**. Risk-adjustment attempts to "level the playing field" among hospitals by accounting for differences in case-mix severity. If the provider has a less severe case-mix (population rate is greater than the expected rate), then the adjustment is positive and the risk-adjusted rate is higher than the observed rate. If the provider has a more severe case-mix

(population rate is less than the expected rate), then the adjustment is negative and the risk-adjusted rate is lower than the observed rate.

All-Patient Refined Diagnosis Related Groups (APR-DRGs) are proprietary classifications incorporated into grouping software by 3M Health Information Services. APR-DRGs are used to classify inpatient discharge records into clinically cohesive groups. They are similar to the Medicare Severity Diagnosis Related Groups (MS-DRGs) used by the Centers of Medicare and Medicaid Services (CMS), but were developed in non-Medicare populations. The 3M Core Grouping Software assigns the APR-DRG and also assigns each discharge record a "severity of illness" score and "risk of mortality" score (ranging from 1 to 4) based on age, diagnoses, procedures, and other factors.

Risk Adjustment Process. The two key components of risk adjustment are the observed rate and the expected rate. The risk adjusted rate is then obtained using the calculated observed and expected rates.

Observed Death Rate. The observed death rates, or crude rates, are simply the number of deaths divided by the number of discharges for a given condition or procedure. See AHRQ's Guide to Inpatient Quality Indicators for details about inclusion and exclusion criteria for each condition and procedure.

Expected Death Rate. The expected death rate is the death rate one would expect if the hospital's performance was the same as the national average, given the hospital's case mix for a specified indicator.

AHRQ used hierarchical modeling to generate regression coefficients for important patient characteristics. Age, gender, APR-DRG, risk of mortality score, and age-gender interaction terms were included in the regression models as independent variables, and the probability of death was the dependant variable. The models were fit to three years of data from the Nationwide Inpatient Sample.

- The AHRQ QI software applied the regression coefficients to the discharge records.
- Predicted values were calculated for each discharge record. These were summed statewide and by hospital.
- Expected death rates were calculated from the summed predicted values divided by the patient population.

Risk-Adjusted Death Rate. Risk-adjusted rates are the estimated performance if the hospital had an "average" patient mix, given the actual performance. It is the more appropriate rate upon which to compare across hospitals. The AHRQ QI software calculated the risk-adjusted rates by:

- Calculating the ratio of the observed rate to the expected rate for each IQI.
- Multiplying this ratio by AHRQ's estimate of the national rate for each IQI.

Because the risk-adjusted rates are treated as linear variables, the 95% confidence intervals may include values less than 0. In this case the AHRQ software recodes the value to 0.

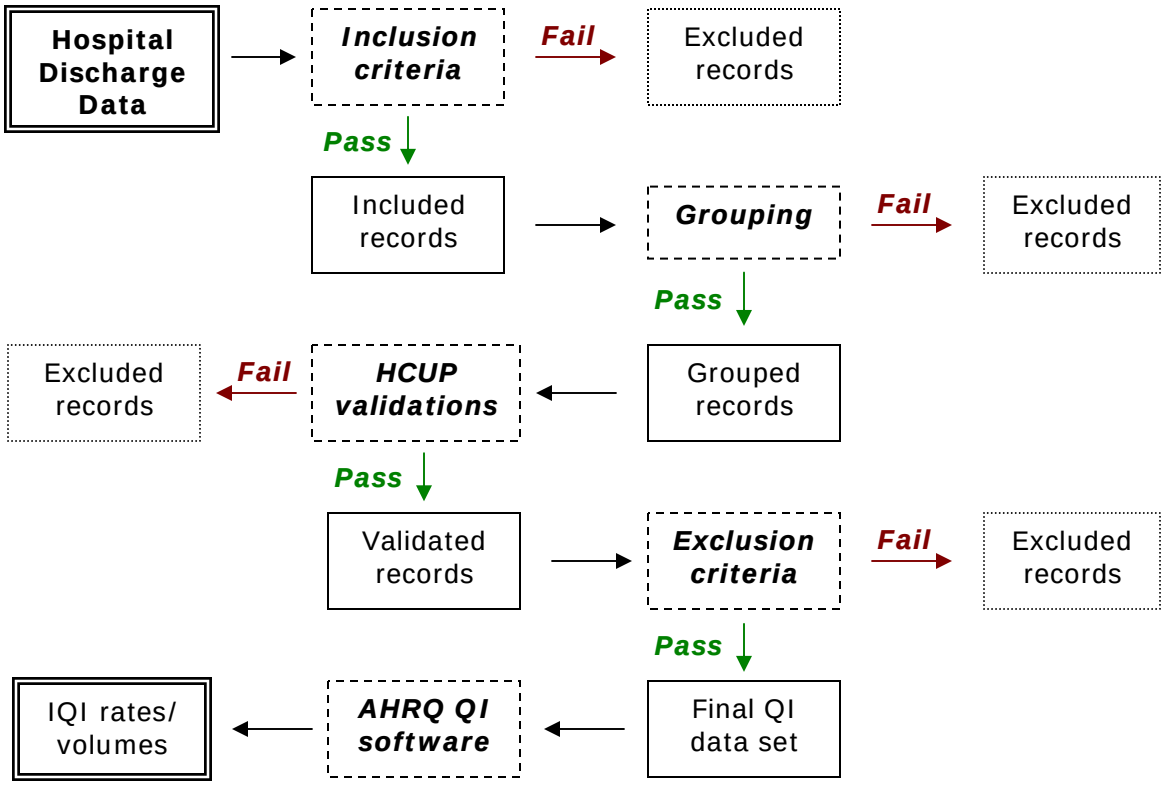
Data Source

The 2007 Inpatient Quality Indicators were calculated on Oregon Hospital Discharge Data collected and distributed by Oregon Association of Hospitals and Health Systems (OAHHS). The data include demographic information, admission and discharge characteristics, and detailed diagnosis and procedure information.

Methods

Data Flow. Data processing occurred as depicted in Figure 1.

Figure 1: Data Flow



Inclusion criteria. Prior to processing by the AHRQ QI software, the inpatient discharge records are subject to the following inclusion criteria:

- Patient resides in the United States
- Patient was treated at a general acute-care hospital located in Oregon
- Discharge date is during calendar year 2007

Separate inclusion criteria are applied by the AHRQ QI software and these are specific to each indicator. These inclusion criteria are described in AHRQ's Inpatient Quality Indicators Technical Specifications, Version 3.2a.

Grouping. Prior to processing by the AHRQ QI software, the hospital discharge data is grouped by APR-DRG using the most recent version of 3M's Core Grouping Software (CGS). CGS also assigns the severity of illness and risk of mortality scores. Grouping requires that the following fields have valid values:

- Principal diagnosis
- Principal procedure
- Date of admission
- Date of discharge
- Discharge status
- Date of birth
- Gender

In addition, the assigned severity of illness can be affected by secondary diagnoses and secondary procedures, making it necessary for these fields to have valid values. Records that cannot be grouped by CGS are excluded from further analyses, although records that cannot be grouped are very rare in the hospital discharge data.

Quality Checks. With a few exceptions, quality control procedures outlined in AHRQ's Health Care Utilization Project's (HCUP) Quality Control Procedures were applied to Oregon's hospital discharge data. Records that fail one or more of these quality control validations are excluded from further analyses, although records from the hospital discharge data very rarely fail. More details about the validations can be found at HCUP's web site:
http://www.hcup-us.ahrq.gov/db/quality.pdf

Exclusion Criteria. After grouping and quality control validations, the inpatient discharge records are subject to the following exclusion criteria:

- Source of admission is missing
- Patient discharged against medical advice
- Patient was treated at Shriner's or the VA

Separate exclusion criteria are applied by the AHRQ QI software and these are specific to each indicator. These exclusion criteria are described in AHRQ's IQI Technical Specifications, Version 3.2a.

Standardization of Data. The hospital discharge data were standardized in SAS prior to processing by the AHRQ QI software. The AHRQ IQI software uses the same standard formats and coding established by HCUP. Some variables required recoding Oregon-specific formatting and values to achieve consistency with the HCUP standard. See the AHRQ QI Windows Software Documentation for more information on how to prepare the data:
AHRQ QI Windows Software Documentation

Geographic Regions. The IQIs are reported in the same geographic regions used for the Oregon Population Survey (OPS). Due to the small numbers of hospitals in eastern and central Oregon, four of the OPS regions were combined into two regions for reporting purposes.

Region	Counties
North Coast	Clatsop, Columbia, Lincoln, and Tillamook
Portland Metropolitan Area	Clackamas, Multnomah, Washington, and Yamhill
Willamette Valley	Benton, Lane, Linn, Marion, and Polk
South Coast/SW Oregon	Coos, Curry, Douglas, Jackson, and Josephine
Gorge/Central Oregon	Crook, Deschutes, Gilliam, Hood River, Jefferson, Morrow, Sherman, Umatilla, Wasco, and Wheeler
Eastern/Southern Oregon	Baker, Grant, Harney, Klamath, Lake, Malheur, Union, and Wallowa

AHRQ QI Software. Version 3.2a of AHRQ's QI Windows Application, released in May, 2008, was downloaded from the AHRQ QI web site. The Final QI data set was imported and processed as described in the AHRQ QI Windows Software Documentation. Volume and rate indicators were calculated statewide, by region, and by hospital. Selected statewide, regional, and hospital-level indicators were exported to Excel. Rates were formatted as a percentage of the at-risk patient population. Rates were suppressed if the at-risk patient population was less than 30. Volumes were suppressed if the number of cases was less than 5.

The selected indicators were aggregated by hospital to solicit feedback from each hospital. The selected rate indicators (IQIs 11, 12, 13, 16, 17, 18, 19, 20, 30 and 32) were also aggregated by indicator in order to compare the hospital-level risk-adjusted rates to the statewide risk-adjusted rates. Hospitals were designated "Average" if their risk-adjusted rate was included in the 95% confidence interval (CI) for the statewide risk-adjusted rate, "Better than average" if their risk adjusted rate was below the 95% CI for the statewide risk-adjusted rate, and "Worse than average" if their risk-adjusted rate was above the 95% CI for the statewide risk-adjusted rate. The selected volume indicators (IQIs 1, 2, 4, 5, 6, and 7) were also aggregated by indicator in order to compare the hospital-level volumes to the benchmark volumes.