2006 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's (AHRQ). The most complete and up-to-date information and guide about AHRQ IQIs can be found at http://www.qualityindicators.ahrq.gov. This website provides a short overview, free downloads, FAQs, technical guides and specifications including the inclusion and exclusion criteria for all indicators developed by AHRQ. The 2006 Oregon Hospital Inpatient Quality Indicators report used AHRQ's QI Windows Application Version 3.1, released in June, 2007.

Indicator Definitions.

AHRQ's Inpatient Quality Indicators pertain to selected medical conditions and surgical procedures. Inclusion and exclusion criteria are defined by AHRQ for each indicator, and typically based on ICD-9-CM diagnosis and procedure codes. Specific codes and definitions are provided in AHRQ's Guide to Inpatient Quality Indicators[1]. These definitions are integrated into the AHRQ Inpatient Quality Indicator software, which is then applied to inpatient discharge data by calendar year.

Inpatient Quality Indicators include volume and death rates (mortality).

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

- Procedures for which volume is reported have been demonstrated to show a positive relationship between volume and patient outcomes in large, representative samples. In general, these procedures are very specialized and require a certain degree of experience both by the surgeons and other members of the medical team. Volumes are not reported for conditions.

- The research literature provides 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 200. To assess each hospital's volume indicators, they should be compared to the corresponding threshold volume.

- Hospital volumes should be viewed 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 total cases are less than 5 or all cases were transferred to another hospital.

Death Rates (mortality) represent the percent of discharges with the specified condition or procedure that died in the hospital (Deaths after discharge are excluded). Death rates are risk-adjusted, and rates based on less than 30 cases are not included in data displays.

- **Denominator** populations include discharges 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. Discharges that were transferred to another short-term hospital were excluded. In general, maternal and neonate discharge records (Major Diagnostic Category 14 and 15) were excluded. Inclusion and exclusion criteria for corresponding **volume** indicators are the same as the denominator, except that transfers to other short-term hospitals are included in volume calculations.

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

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[1] http://www.qualityindicators.ahrq.gov/iqi_download.htm <accessed 10.12.2007>

Rates and Risk Adjustment

Why Risk Adjust? Some patient characteristics such as age, gender, and co-morbidities impact the likelihood of dying in the hospital, and some hospitals treat more high-risk patients than others. Risk adjustment "levels the playing field" among hospitals by adjusting for differences in patients treated at each hospital. These risk-adjusted values are needed for making hospital-to-hospital comparisons. There are a variety of off the shelf packages as well as regression modeling techniques that can be used for risk adjustment; the AHRQ software uses the 3M APR-DRG for risk adjustment.

All-Patient Refined Diagnosis-Related Groups (APR-DRG) is 3M product designed to classify administrative discharge records into clinically-cohesive groups. It is similar to the Diagnosis Related Group (DRG) used by the Centers of Medicare and Medicaid Services (CMS), but more expansive, particularly for pediatric populations. It further classifies the discharge record into "severity" scores (ranging from 1 to 4) based on co-morbidities and other factors: risk of Mortality and severity of Illness. Risk of mortality was used in the risk adjustment by the AHRQ IQI software.

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 rate, or raw rate, 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[1] 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 provides national statistics obtained using a nationally representative sample of inpatient hospital discharge records. AHRQ used multivariate regression modeling to predict death rates for various patient characteristics. Age group, gender, APR-DRG (base code), and the APR-DRG Risk of Mortality score were included in the regression model as independent variables, and risk of death was the dependant variable. Risk of death was treated as a linear variable, resulting in some complications discussed below.

- The regression coefficients from these regression models are applied by the AHRQ Inpatient Quality Indicator software to the discharge records being analyzed. Expected death rates are calculated based on the regression coefficients and the patient characteristics at each hospital.

- In sum, the expected rate is based:

    o Average death rates for certain patient characteristics (age, gender, APR-DRG, and risk of mortality) in a national sample, and

    o The same set of patient characteristics at any given hospital. It is calculated without regard to the observed rate.

Risk-Adjusted Death Rate. Risk-adjusted death rates are the estimated performance if the hospital had an "average" patient mix, given the actual performance. It is the more appropriate rate to compare hospitals. In theory, comparing the difference between the observed and expected rates is sufficient for assessing higher or lower quality among hospitals. However, adding the reference population rate translates the difference into a more generally intuitive figure that can be compared across hospitals.

Because these rates are treated as linear variables, calculated risk-adjusted rates may be less than 0% or more than 100%. The AHRQ software truncates these rates at 0% and 100%.

Confidence Intervals

Confidence intervals were chosen as the basis of statistical comparison because they allowed comparison with an intuitive reference (e.g., the state average) and they provide information about both the risk-adjusted death rate estimate and the reliability of the estimate. AHRQ's QI Windows Application automatically calculates the confidence intervals of the observed and risk-adjusted rates.

AHRQ's Guidelines for Using Different Types of IQI 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 and/or by the number of patients impacted. Additional breakdowns by the default patient characteristics used in stratified rates (e.g., age, gender, or payer) can further identify the target population. Target populations can also be identified by user-defined patient characteristics supplemented to the case/discharge level flags. Trend data can be used to measure change in the rate over time.

Another approach to identify areas to focus on is to compare the observed and expected rates. If the observed rate is higher than the expected rate (i.e., the ratio of observed/expected is greater than 1.0, or observed minus expected is positive), then the implication is 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 (i.e., the ratio of observed/expected is less than 1.0, or observed minus expected is negative), 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 reported in the IQI Guide's detailed evidence section to see how their case-mix compares to the reference population. If the population rate is higher than the expected rate, then the provider's case-mix is less severe than the reference population and vice versa. We use this 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. If the provider has a less severe case-mix, then the adjustment is positive (population rate > expected rate) and the risk-adjusted rate is higher than the observed rate. If the provider has a more severe case-mix, then the adjustment is negative (population rate < expected rate) and the risk-adjusted rate is lower than the observed rate.

Finally, users can compare the risk-adjusted rate to the smoothed or "reliability-adjusted" rate to determine whether this difference between the risk-adjusted rate and reference population rate is likely to remain in the next measurement period. Smoothed rates are weighted averages of the population rate and the risk-adjusted rate, where the weight reflects the reliability of the provider's risk-adjusted rate. A ratio of (smoothed rate - population rate) / (risk-adjusted rate - population rate) greater than 0.80 suggests the difference is likely to persist (whether the difference is positive or negative). A ratio less than 0.80 suggest the difference may be due in part to random differences in patient characteristics (patient characteristics that are not observed and controlled for in the risk-adjustment model). In general, users may want to focus on areas where the differences are more likely to persist.

Data Source and Methods

Data Source. Inpatient Quality Indicators were calculated on inpatient discharge data collected by CompData 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 from 2004, 2005 and 2006 calendar year.[2]

Quality Checks. With few exceptions, quality control procedures outlined in AHRQ's Health Care Utilization Project's (HCUP) Quality Control Procedures were applied to Oregon's inpatient discharge data. Details can be found at http://www.hcup-us.ahrq.gov/db/quality.pdf[3] Flagged invalid records may need to be excluded from analysis, depending on the quality of the source data.

Calculations/Risk Adjustment. Once local data is organized and loaded, the AHRQ application will calculate volumes and rates automatically. The embedded 3M's All-Patient Refined Diagnosis-Related Groups (APR-DRG) software will calculate the severity of illness and risk of mortality scores integrated into the risk-adjustment methods used in the AHRQ IQI calculations. APR-DRGs provide greater comparability between patient populations by adjusting for patient severity and risk of mortality. While no risk-adjustment method is perfect, APR-DRG is widely used and accepted by hospitals, has been used for high-profile hospital-rating projects, and undergoes continuing validation.

Standardization of Data Format and Coding. The AHRQ IQI software is based on data with standard formats and coding established for the H-CUP project. The data elements and layouts can be found in the application documentation overview[4] that provides the necessary information to prepare the data, run the program, and generate reports.

Oregon Specific Data Elements or Values. Some variables required mapping of Oregon-specific codes into AHRQ coding scheme. Refer to page 18 of the documentation overview[4] for more details on coding of admission source, admission type and discharge status. The mapping of Oregon expected primary payer codes into AHRQ IQI payer categories are as follows:

Primary Payer

Oregon Payer	AHRQ IQI Category
Medicare	Medicare
Medicaid	Medicaid
Title V	Medicaid
HMO/Oregon Health Plan (Medicaid)	Medicaid
HMO/Managed Care	Private
Commercial Insurance	Private
Blue Cross/Blue Shield	Private
Kaiser Permanente	Private
PPO	Private
Self-Insured	Private
Self Pay	Self-pay
Medically Indigent/Free Research	No Charge

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[2] Data used for this report contains more extensive information than is provided in public inpatient hospital discharge datasets distributed by the Office for Oregon Health Policy and Research, including nine diagnosis codes and six procedure codes.

[3] Agency for Health Research and Quality, HCUP Quality Control Procedures; http://www.hcup-us.ahrq.gov/db/quality.pdf <accessed 10.12.2007>

[4] http://www.qualityindicators.ahrq.gov/downloads/winqi/AHRQ_QI_Windows_Software_Documentation_V31a.pdf

CHAMPUS	Other
Managed Assistance	Other
Other	Other
Workers Compensation	Other
Division Of Health Services	Other
County Or State	Other

(a) Used for stratification purposes only. Medicare, Medicaid, Private, and Self-Pay are used directly in the IQI software; all others are mapped to "Other"

Geographic Regions. Data are presented by geographic regions to facilitate comparisons among hospitals in the same area. Geographic regions were defined at the county level, as used for the Oregon Population Survey (OPS). Due to the small numbers of hospitals in eastern Oregon, four of the OPS regions were combined into two for the purposes of this report.

Region	Hospital Name	County
PDX Metro Area	Adventist Med Ctr	Multnomah
	Kaiser Sunnyside Med Ctr	Clackamas
	Legacy Emanuel Hospital	Multnomah
	Legacy Good Samaritan Hosp & Med Ctr	Multnomah
	Legacy Meridian Park Hospital	Washington
	Legacy Mt. Hood Med Ctr	Multnomah
	OHSU Hospital	Multnomah
	Providence Milwaukie Hospital	Clackamas
	Providence Newberg Hospital	Yamhill
	Providence Portland Med Ctr	Multnomah
	Providence St. Vincent Med Ctr	Washington
	Shriners Hospitals for Children- Portland	Multnomah
	Tuality Healthcare	Washington
	Willamette Falls Hospital	Clackamas
	Willamette Valley Med Ctr	Yamhill

Region	Hospital Name	County
North Coast	Columbia Memorial Hospital	Clatsop
	Providence Seaside Hospital	Clatsop
	Samaritan North Lincoln Hospital	Lincoln
	Samaritan Pacific Communities Hospital	Lincoln
	Tillamook County General Hospital	Tillamook
Valley	Cottage Grove Community Hospital	Lane
	Good Samaritan Regional Med Ctr (Corvallis)	Benton
	McKenzie-Willamette Med Ctr	Lane
	Peace Harbor Hospital	Lane
	Sacred Heart Med Ctr	Lane
	Salem Hospital	Marion
	Samaritan Albany General Hospital	Linn
	Samaritan Lebanon Community Hospital	Linn
	Santiam Memorial Hospital	Marion
	Silverton Hospital	Marion
	West Valley Community Hospital	Polk
South Coast/SW Oregon	Ashland Community Hospital	Jackson
	Bay Area Hospital	Coos
	Coquille Valley Hospital	Coos
	Curry General Hospital	Curry
	Lower Umpqua Hospital	Douglas
	Mercy Med Ctr	Douglas
	Providence Medford Med Ctr	Jackson
	Rogue Valley Med Ctr	Jackson
	Southern Coos Hospital & Health Ctr	Coos
	Three Rivers Community Hosp & Hlth Ctr	Josephine
Central Oregon/Gorge	Good Shepherd Med Ctr	Umatilla
	Mid-Columbia Med Ctr	Wasco
	Mountain View Hospital	Jefferson
	Pioneer Memorial Hospital (Heppner)	Morrow
	Pioneer Memorial Hospital (Prineville)	Crook
	Providence Hood River Memorial Hospital	Hood River
	St. Anthony Hospital	Umatilla
	St. Charles Med Ctr (Bend)	Deschutes
	St. Charles Med Ctr (Redmond)	Deschutes
Eastern/South Central Oregon	Blue Mountain Hospital	Grant
	Grande Ronde Hospital	Union
	Harney District Hospital	Harney
	Holy Rosary Med Ctr	Malheur
	Lake District Hospital	Lake
	Merle West Med Ctr	Klamath
	St. Elizabeth Health Services	Baker
	Wallowa Memorial Hospital	Wallowa