

Maternity Care Ratings 2014 Methodology

Contents

Introduction	1
Data Source	2
Determining Maternity Care Ratings.....	2
Maternal Vaginal and C-section Deliveries	2
Maternal Complication Rate: Vaginal and C-section Single Live-Born Deliveries	2
Newborn Volume Adjusted for Birth Weight.....	3
Newborn Risk-Adjusted Mortality	3
Assigning Maternity Care Star Ratings.....	4
Designating 2014 Maternity Care Excellence Award™ Recipients	4
Limitations of the Data Analysis	5
Appendix A. Patient Cohorts and Related ICD-9-CM Codes	6

Introduction

To help consumers evaluate and compare hospital performance in maternity care, Healthgrades analyzed patient outcome data for virtually every hospital in the 17 states that provide all-payer state data for years 2010 through 2012.

Maternity Care refers to care provided to mothers during and after childbirth or for the care of their newborn babies. It includes the period of time in which a woman is pregnant or has just given birth to a child. Healthgrades Maternity Care ratings are available at www.Healthgrades.com.

Data Source

Healthgrades purchased the initial patient-level data for all states that made their data available. The data represent three years of discharges (2010 – 2012). These data were chosen because they represent all discharges for the associated states. The 17 all-payer states evaluated were as follows:

- Arizona
- Colorado
- Florida
- Iowa
- Maryland
- Massachusetts
- Nevada
- New Jersey
- New York
- Oregon
- Pennsylvania
- Rhode Island
- Texas
- Utah
- Virginia
- Washington
- Wisconsin

Determining Maternity Care Ratings

Maternity Care ratings are based on the analysis of four factors:

- Maternal complication rate among women undergoing single live-born vaginal deliveries
- Maternal complication rate among women undergoing single live-born C-section deliveries
- Newborn volume adjusted for low birth weight
- Newborn mortality risk-adjusted using eight birth weight categories and congenital risk factors developed by the Agency for Healthcare Research and Quality

Maternal Vaginal and C-section Deliveries

For the Healthgrades maternal complication rate calculations, only women with single live-born deliveries were considered. A list of the DRGs (Diagnosis Related Groups) and diagnosis codes used by Healthgrades to identify patients can be found in *Appendix A*. The following records were excluded from the analysis:

- Patients with a code of V23.7 Insufficient Prenatal Care
- Patients under the age of 18 or over the age of 55
- Patients whose sex were listed as male or unknown
- Patients who left against medical advice, were still in the hospital, were transferred to another acute care facility, or whose discharge status was unknown

Maternal Complication Rate: Vaginal and C-section Single Live-Born Deliveries

For the patient population determined above, the rate of complications was calculated for both vaginal and C-section deliveries. A list of the complication codes analyzed can be found in *Appendix B*.

Percentiles were calculated for each measure (vaginal or C-section delivery complication rates). Lower complication rates correspond to lower percentiles.

Newborn Volume Adjusted for Birth Weight

To adjust for hospitals with specialized neonatal services that receive higher rates of low birth weight newborns, Healthgrades calculated a newborn birth weight-adjusted volume score for each hospital. For each hospital, a percentile was calculated based on the overall volume of single live-born deliveries and the percentage of neonates born into the 1,000 to 1,749 gram weight category. Higher volumes in both categories fall into lower percentiles.

This combination of birth weight and volume adjusts for hospitals that have more difficult cases. The measure was developed using "discriminant analysis" – a statistical method that, in this case, was used to create a prediction equation indicating the presence of a Newborn Intensive Care Unit.

Hospitals with newborn intensive care units attract the most difficult pregnancies. With the discriminant analysis approach, numerous factors, including diagnoses and procedures, were included and only the factors that provided the best prediction remained. In this case, volume and neonates in the 1,000 to 1,749 gram weight category provided the best prediction of the presence of a newborn intensive care unit.

A percentile is calculated for each hospital based on the discriminant function, and hospitals with the greatest number of births and the highest percentages of neonates in the 1,000 to 1,749 gram category fall into the lowest percentile.

Newborn Risk-Adjusted Mortality

Healthgrades identified single live-born newborns that were not transferred in or out of the hospital. Codes are listed in *Appendix A*.

To preserve the integrity of the calculation for newborn mortality, Healthgrades conducted a series of data quality checks. Based on the results of these checks, Healthgrades excluded a limited number of cases because they were inappropriate for inclusion based on missing data or other reasons as listed below. Examples of excluded patient records for newborn mortality are:

- Patients over the age of 0 or whose age was unknown
- Patients who had weights in two or more categories for the same admission
- Patients who left against medical advice, were still in the hospital, or whose discharge status was unknown
- Patients having diagnosis codes indicating congenital defects or other conditions that would be incompatible with a live birth (see *Appendix C*)
- Patients with birth weights less than 500 grams
- Patients who were transferred to another acute care facility or were admitted from another facility

Newborn risk-adjusted mortality rates were determined using a multivariate logistic regression model. We utilized eight neonate weight categories and congenital risk factor categories based on those developed by the Agency for Healthcare Research and Quality (Risk Adjustment Coefficients for the PDI, Version 4.2, September 2010. Available at: http://www.qualityindicators.ahrq.gov/Archive/PDI_TechSpec_V42.aspx) as potential risk factors, and using logistic regression determined which of these potential risk factors were statistically important in predicting mortality.

Using the model above, a predicted probability of mortality was calculated for each newborn. The individual predicted probabilities were summed to get an overall predicted number of deaths for the hospital, and this was compared to the actual mortality. The z-score between the predicted and actual was calculated using the standard deviation, and then ordered from lowest to highest.

Newborn mortality outcomes are measured by Newborn Survival ratings:

- **Better Than Expected** – Fewer newborn mortalities than expected
- **As Expected** – About the same newborn mortalities as expected
- **Worse Than Expected** – More newborn mortalities than expected

Low percentiles corresponded to the hospitals that had fewer deaths than expected, and the greatest statistical significance associated with this difference.

Assigning Maternity Care Star Ratings

The four factors were weighted equally. Based upon each hospital's overall percentile, Healthgrades applied the following rating system.

- ★★★★★ **Better Than Average** – Top 15% of all hospitals within 17 all-payer states
- ★★★ **Average** – Middle 70% of all hospitals within 17 all-payer states
- ★ **Worse Than Average** – Bottom 15% of all hospitals within 17 all-payer states

Designating 2014 Maternity Care Excellence Award™ Recipients

The top 10% of hospitals for Maternity Care are recognized as Healthgrades Maternity Care Excellence Award™ recipients, as measured by lowest risk-adjusted mortality and complication rates.

The Maternity Care Excellence Award is based on the analysis of four factors:

- Maternal complication rate among women undergoing single live vaginal deliveries
- Maternal complication rate among women undergoing single live C-section deliveries
- Newborn volume adjusted for low birth weight
- Risk-adjusted neonatal mortality

For each of the four factors above, a percentile score is calculated. Lower maternal complication rates correspond to lower percentiles. For newborn volume, hospitals are assigned a percentile based on their overall volume of single-live born neonates combined with the percentage of neonates falling into the 1,000 to 1,749 gram birth weight categories compared to the national average.

Hospitals with higher volumes and higher percentages of these low birth weight infants receive lower percentiles. Finally, a percentile is assigned based on the z-score for risk-adjusted newborn. To be considered for an award, a hospital must be located in one of the all-payer states that provide maternity care data.

Limitations of the Data Analysis

While these analyses may be valuable in identifying hospitals that perform better than others, one should not use this information alone to determine the quality of care provided at each hospital. The analyses are limited by the following factors:

- Cases may have been coded incorrectly or incompletely by the hospital.
- Healthgrades conditions and procedures models can only account for risk factors that are coded into the billing data. Therefore, if a particular risk factor was not coded into the billing data (such as a patient's socioeconomic status and health behavior) then it was not accounted for.
- Although Healthgrades has taken steps to carefully compile these data, no techniques are infallible; therefore, some information may be missing, outdated or incorrect.

Please note that a high ranking for a particular hospital is not a recommendation or endorsement by Health Grades, Inc. of a particular hospital; it means that the data associated with a particular hospital has met the foregoing qualifications. Only individual patients can decide whether a particular hospital is suited for their unique needs.

Also note that if more than one hospital reported under a single provider ID, Healthgrades analyzed patient outcome data for those hospitals as a single unit. Throughout this document, therefore, "hospital" refers to one hospital or a group of hospitals reporting under a single provider ID.

Appendix A. Patient Cohorts and Related ICD-9-CM Codes

Cesarean Section with Single Birth

Inclusions

Diagnosis Related Groups: 765, 766

Exclusions

Procedures (Primary or Secondary): 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 765, 766
 Diagnoses (Primary or Secondary): 651.00, 651.01, 651.03, 651.10, 651.11, 651.13, 651.20, 651.21, 651.23, 651.30, 651.31, 651.33, 651.40, 651.41, 651.43, 651.50, 651.51, 651.53, 651.60, 651.61, 651.63, 651.70, 651.71, 651.73, 651.80, 651.81, 651.83, 651.90, 651.91, 651.93, 652.61, 660.50, 660.51, 660.53, 678.10, 678.11, 678.13, 996.8, 996.80, 996.81, 996.82, 996.83, 996.84, 996.85, 996.86, 996.87, 996.89, V23.7, V27.1, V27.2, V27.3, V27.4, V27.5, V27.6, V27.7, V27.9, V32.00, V32.01, V32.1, V32.2, V33.01, V33.1, V33.2, V34.00, V34.01, V34.1, V34.2, V35.00, V35.01, V35.1, V35.2, V36.00, V36.01, V36.1, V36.2, V37.00, V37.01, V37.1, V42.0, V42.1, V42.4, V42.6, V42.7, V42.81, V42.82, V42.83, V42.84, V42.89, V42.9, V91.00, V91.01, V91.02, V91.03, V91.09, V91.10, V91.11, V91.12, V91.19, V91.20, V91.21, V91.22, V91.29, V91.90, V91.91, V91.92, V91.99

Vaginal Delivery with Single Birth

Inclusions

Diagnosis Related Groups: 767, 768, 774, 775

Exclusions

Procedures (Primary or Secondary): 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 74.0, 74.1, 74.2, 74.4, 74.99, 767, 768, 774, 775
 Diagnoses (Primary or Secondary): 651.00, 651.01, 651.03, 651.10, 651.11, 651.13, 651.20, 651.21, 651.23, 651.30, 651.31, 651.33, 651.40, 651.41, 651.43, 651.50, 651.51, 651.53, 651.60, 651.61, 651.63, 651.70, 651.71, 651.73, 651.80, 651.81, 651.83, 651.90, 651.91, 651.93, 652.61, 660.50, 660.51, 660.53, 678.10, 678.11, 678.13, 996.8, 996.80, 996.81, 996.82, 996.83, 996.84, 996.85, 996.86, 996.87, 996.89, V23.7, V27.1, V27.2, V27.3, V27.4, V27.5, V27.6, V27.7, V27.9, V32.00, V32.01, V32.1, V32.2, V33.01, V33.1, V33.2, V34.00, V34.01, V34.1, V34.2, V35.00, V35.01, V35.1, V35.2, V36.00, V36.01, V36.1, V36.2, V37.00, V37.01, V37.1, V42.0, V42.1, V42.4, V42.6, V42.7, V42.81, V42.82, V42.83, V42.84, V42.89, V42.9, V91.00, V91.01, V91.02, V91.03, V91.09, V91.10, V91.11, V91.12, V91.19, V91.20, V91.21, V91.22, V91.29, V91.90, V91.91, V91.92, V91.99

continued...

Patient Cohorts and Related ICD-9-CM Codes (continued)

Newborn Mortality**Inclusions**

Diagnoses (Primary or Secondary): 764.02, 764.03, 764.04, 764.05, 764.06, 764.07, 764.08, 764.09, 764.12, 764.13, 764.14, 764.15, 764.16, 764.17, 764.18, 764.19, 764.22, 764.23, 764.24, 764.25, 764.26, 764.27, 764.28, 764.29, 764.92, 764.93, 764.94, 764.95, 764.96, 764.97, 764.98, 764.99, 765.02, 765.03, 765.04, 765.05, 765.06, 765.07, 765.08, 765.09, 765.12, 765.13, 765.14, 765.15, 765.16, 765.17, 765.18, 765.19, V30.00, V30.01

Congenital Condition Exclusions**Central Nervous System:**

Excluding patients with diagnosis codes 740.0 Anencephalus, 740.1 Craniorachischis, 740.2 Inencephaly, 742.1 Microcephalus, 742.2 Reduction deformities of brain

Cardiac:

Excluding patients with diagnosis codes 745.7 Cor biloculare, 746.7 Hypoplastic left heart syndrome, 746.82 Cor triatriatum, 747.22 Atresia & stenosis of aorta, 745.10 Complete transposition of great vessels

Renal:

Excluding patients with diagnosis codes 753.0 Renal agenesis & dysgenesis (only if bilateral)

Chromosomal:

Excluding patients with diagnosis codes 758.1 Patau's syndrome (trisomy 13), 758.2 Edward's syndrome (trisomy 18)

Respiratory:

Excluding patients with diagnosis codes 748.5 Lung agenesis/Hypoplasia, Aplasia of lung, Hypoplasia of lung (lobe), Sequestration of lung. An argument can be made that not all are fatal (e.g., hypoplasia if unilateral). Due to the high frequency of associated malformations, the mortality rate is variable but high.

Multiple Birth Exclusions

Multiple Births - Diagnoses (Primary or Secondary): 759.4, V31.00, V31.01, V31.1, V31.2, V32.00, V32.01, V32.1, V32.2, V33.00, V33.01, V33.1, V33.2, V34.00, V34.01, V34.1, V34.2, V35.00, V35.01, V35.1, V35.2, V36.00, V36.01, V36.1, V36.2, V37.00, V37.01, V37.1

Other Exclusions

Procedures (Primary or Secondary): 37.51, 37.52, 37.53, 37.54, 37.62, 37.63

Diagnoses (Primary or Secondary): 764.00, 764.01, 764.10, 764.11, 764.20, 764.21, 764.90, 764.91, 765.00, 765.01, 765.10, 765.11, 996.8, 996.80, 996.81, 996.82, 996.83, 996.84, 996.85, 996.86, 996.87, 996.89, V42.0, V42.1, V42.4, V42.6, V42.7, V42.81, V42.82, V42.83, V42.84, V42.89, V42.9, V66.7