

## **Gynecologic Surgery Ratings 2014 Methodology**

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### **Introduction**

To help consumers evaluate and compare hospital performance in gynecologic surgery, Healthgrades analyzed patient outcome data for all patients (all-payer data) provided by 17 individual states for years 2010 through 2012. Ratings were based on Healthgrades risk-adjustment methodology, and the Healthgrades ratings are available at [www.healthgrades.com](http://www.healthgrades.com).

Gynecologic Surgery refers to surgery on the female reproductive system and includes surgeries for benign conditions, cancer, infertility, incontinence, and various other conditions. A list of surgeries included in Gynecologic Surgery ratings is in *Appendix A*.

## Data Source

For the gynecologic surgery hospital ratings, all-payer state data were used in those states where state data are available. These data were chosen because they represent virtually all discharges (all ages) for the associated states; however, patient volumes may differ due to data masking by state agencies to protect patient privacy. The data represent three years of discharges. The 17 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 Gynecologic Surgery Ratings

Fair and valid comparisons between hospital providers can be made only to the extent that the risk-adjustment methodology considers important differences in patient demographic and clinical characteristics. The purpose of risk adjustment is to obtain fair statistical comparisons among disparate populations or groups. Significant differences in demographic and clinical risk factors are found among patients treated in different hospitals. Risk adjustment of the data is needed to make accurate and valid comparisons of clinical outcomes at different hospitals.

The risk-adjustment methodology used by Healthgrades defines risk factors as those clinical and demographic variables that influence patient outcomes in significant and systematic ways. Risk factors may include age, gender, specific procedure performed, and comorbid conditions, such as hypertension, chronic renal failure, heart failure, and diabetes. The methodology is disease-specific and outcome-specific. This means that individual risk models are constructed and tailored for each clinical condition or procedure using multivariate logistic regression.

For multivariate logistic regression-based ratings (see below), Healthgrades conducted a series of data quality checks to preserve the integrity of the ratings. Based on the results of these checks, we excluded a limited number of cases because they were inappropriate for inclusion due to miscoding or missing data or other reasons as listed below.

The following patient records were excluded:

- Patients who left the hospital against medical advice or who were transferred to another acute care hospital
- Patients who were still in the hospital when the claim was filed
- Patients with male gender
- Patients under the age of 18

## Multivariate Logistic Regression-Based Ratings

The initial analysis of the data utilized 17 states of all-payer data from 2010 through 2012. Gynecologic surgery patients were identified by their ICD-9 principal procedure of a gynecologic procedure (see *Appendix A*).

For this population, potential risk factors and the outcome measure (complications) were then defined.

- 1 Potential risk factors were defined as all clinically relevant co-morbid conditions and procedures. In addition, patient demographic factors, such as age and gender and source of admission were also considered. Some diagnosis codes were merged together (e.g., primary and secondary pulmonary hypertension) to minimize the impact of coding variations.
- 2 Complications were identified using previous peer-reviewed research and thorough input from clinical and coding experts. While complications sometimes occur during a patient's hospital stay, Healthgrades pinpoints complications that should not occur with a typical patient. Many of these complications are preventable and usually cause a prolonged hospital stay, additional and costly medical treatments, harm, and sometimes even death.

In some cases, an ICD-9 code can be either a risk or a complication. In these cases, if Present on Admission information is not available, a code is differentiated by the presence or absence of a 900 postoperative complication code. For example, in the case where a patient record contains "427.31 Atrial Fibrillation," that code is considered a risk if it occurs by itself and a complication if there is a corresponding "997.1 Cardiac Complications NEC" code also present in the patient record. Outcomes were binary, with documented complications either present or not. Mortality is considered a complication. *Appendix B* lists the complications for gynecologic surgery.

### Developing Healthgrades Gynecologic Surgery Ratings

Developing the Healthgrades Gynecologic Surgery ratings involved four steps.

- 1 The predicted value (predicted complications) was obtained using a logistic regression model discussed in the next section.
- 2 The predicted value was compared with the actual or observed number of complications. Only hospitals with at least 30 cases across three years of data and at least five cases in the most current year were included.
- 3 A test was conducted to determine whether the difference between the predicted and actual values was statistically significant. This test was performed to make sure that differences were very unlikely to be caused by chance alone.
- 4 Hospital performance was stratified into one of three performance categories as listed below:
  - ★★★★★ **Better Than Expected** – Actual performance was better than predicted and the difference was statistically significant.
  - ★★★ **As Expected** – Actual performance was not significantly different from what was predicted.
  - ★ **Worse Than Expected** – Actual performance was worse than predicted and the difference was statistically significant.

The top 10% of hospitals were selected as Healthgrades Gynecologic Surgery Excellence Award™ recipients. For details on the Gynecologic Surgery Excellence Award™ methodology, see the Healthgrades Specialty Excellence Award™ and America's 100 Best Hospitals for Specialty Care™ Methodology at [www.Healthgrades.com](http://www.Healthgrades.com).

### Statistical Models

Using the list of potential risk factors described above, we used logistic regression to determine to what extent each one was correlated with the quality measure (complications). A risk factor stayed in the model if it had an odds ratio greater than one (except clinically relevant procedures, cohort defining principal diagnoses, and some protective factors as documented in the medical literature were allowed to have an odds ratio less than one) and was also statistically significant ( $p < 0.05$ ).

Complications were not counted as risk factors as they were considered a result of care received during the admission. Risk factors are those diagnoses that are the most highly correlated with the outcomes studied (complications). The most highly correlated risk factors are not necessarily those with the highest volume. (See *Appendix C* for the *Top Five Diagnosis/Procedure Risk Factors*.)

The statistical model was checked for validity and finalized. This model was then used to estimate the probability of a complication for each patient in the cohort. Patients were then aggregated for each hospital to obtain the predicted number of complications for each hospital. Statistical significance tests were performed to identify, by hospital, whether the actual and predicted rates were significantly different.

### 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

Cohort	Inclusions	Exclusions
Gynecologic Surgery Principal Procedure	<ul style="list-style-type: none"> <li>Hysterectomies</li> <li>Oophorectomies</li> <li>Fallopian tube procedures</li> <li>Cystocele, rectocele and vaginal suspension procedures</li> <li>Pelvic eviscerations</li> <li>Vulvectomies</li> <li>Fistulas</li> <li>Urinary incontinence procedures (bladder suspension procedures)</li> </ul>	<ul style="list-style-type: none"> <li>History of organ transplant</li> </ul>

### Gynecologic Surgery

#### Inclusions

**Procedure (First listed):** 59.5, 59.71, 59.79, 65.01, 65.25, 65.31, 65.39, 65.41, 65.49, 65.51, 65.52, 65.53, 65.54, 65.63, 65.64, 65.81, 65.95, 66.01, 66.02, 66.21, 66.22, 66.4, 66.61, 66.62, 66.63, 66.69, 68.31, 68.39, 68.41, 68.49, 68.51, 68.59, 68.61, 68.69, 68.71, 68.79, 68.8, 70.4, 70.50, 70.51, 70.52, 70.53, 70.54, 70.55, 70.71, 70.72, 70.73, 70.74, 70.75, 70.77, 70.78, 70.8, 71.5, 71.61, 71.62

#### Exclusions

**Diagnoses (Any position):** V42.0, V42.1, V42.4, V42.6, V42.7, V42.81, V42.82, V42.83, V42.84, V42.89, V42.9

## **Appendix B. Gynecologic Surgery Complications**

### **Gynecologic Surgery – Independent Complications**

Independent complications are conditions that are clearly hospital-acquired or by the coding definition are defined as postoperative. These conditions were not counted as complications if the POA indicator was "Yes" or "Clinically Undetermined."

410.71	ACUTE MYOCARDIAL INFARCTION, SUBENDOCARDIAL INFARCTION, INITIAL EPISODE OF CARE
415.11	IATROGENIC PULMONARY EMBOLISM AND INFARCTION
426.4	RIGHT BUNDLE BRANCH BLOCK
458.29	OTHER IATROGENIC HYPOTENSION
480.0	PNEUMONIA DUE TO ADENOVIRUS
480.1	PNEUMONIA DUE TO RESPIRATORY SYNCYTIAL VIRUS
480.2	PNEUMONIA DUE TO PARAINFLUENZA VIRUS
480.3	PNEUMONIA DUE TO SARS-ASSOCIATED CORONAVIRUS
480.8	PNEUMONIA DUE TO OTHER VIRUS NOT ELSEWHERE CLASSIFIED
481	PNEUMOCOCCAL PNEUMONIA [STREPTOCOCCUS PNEUMONIAE PNEUMONIA]
482.0	PNEUMONIA DUE TO KLEBSIELLA PNEUMONIAE
482.1	PNEUMONIA DUE TO PSEUDOMONAS
482.2	PNEUMONIA DUE TO HEMOPHILUS INFLUENZAE [H. INFLUENZAE]
482.30	PNEUMONIA DUE TO UNSPECIFIED STREPTOCOCCUS
482.31	PNEUMONIA DUE TO STREPTOCOCCUS, GROUP A
482.32	PNEUMONIA DUE TO STREPTOCOCCUS, GROUP B
482.39	PNEUMONIA DUE TO OTHER STREPTOCOCCUS
482.40	PNEUMONIA DUE TO STAPHYLOCOCCUS, UNSPECIFIED
482.41	METHICILLIN SUSCEPTIBLE PNEUMONIA DUE TO STAPHYLOCOCCUS AUREUS
482.42	METHICILLIN RESISTANT PNEUMONIA DUE TO STAPHYLOCOCCUS AUREUS
482.49	OTHER STAPHYLOCOCCUS PNEUMONIA
482.81	PNEUMONIA DUE TO ANAEROBES
482.82	PNEUMONIA DUE TO ESCHERICHIA COLI [E. COLI]
482.83	PNEUMONIA DUE TO OTHER GRAM-NEGATIVE BACTERIA
482.84	LEGIONNAIRES' DISEASE
482.89	PNEUMONIA DUE TO OTHER SPECIFIED BACTERIA
482.9	BACTERIAL PNEUMONIA, UNSPECIFIED
483.0	PNEUMONIA DUE TO MYCOPLASMA PNEUMONIAE
483.1	PNEUMONIA DUE TO CHLAMYDIA
483.8	PNEUMONIA DUE TO OTHER SPECIFIED ORGANISM
484.1	PNEUMONIA IN CYTOMEGALIC INCLUSION DISEASE
484.3	PNEUMONIA IN WHOOPING COUGH
486	PNEUMONIA, ORGANISM UNSPECIFIED
507.0	PNEUMONITIS DUE TO INHALATION OF FOOD OR VOMITUS
512.1	IATROGENIC PNEUMOTHORAX
518.51	ACUTE RESPIRATORY FAILURE FOLLOWING TRAUMA AND SURGERY
518.53	ACUTE AND CHRONIC RESPIRATORY FAILURE FOLLOWING TRAUMA AND SURGERY
54.12	REOPENING OF RECENT LAPAROTOMY SITE
54.61	RECLOSURE OF POSTOPERATIVE DISRUPTION OF ABDOMINAL WALL
780.2	SYNCOPE AND COLLAPSE

867.1	INJURY TO BLADDER AND URETHRA WITH OPEN WOUND INTO CAVITY
996.64	INFECTION AND INFLAMMATORY REACTION DUE TO INDWELLING URINARY CATHETER
997.01	CENTRAL NERVOUS SYSTEM COMPLICATION
997.02	IATROGENIC CEREBROVASCULAR INFARCTION OR HEMORRHAGE
997.1	CARDIAC COMPLICATIONS
997.3	RESPIRATORY COMPLICATIONS
997.31	VENTILATOR ASSOCIATED PNEUMONIA
997.32	POSTPROCEDURAL ASPIRATION PNEUMONIA
997.39	OTHER RESPIRATORY COMPLICATIONS
997.4	DIGESTIVE SYSTEM COMPLICATION
997.49	OTHER DIGESTIVE SYSTEM COMPLICATIONS
997.5	URINARY COMPLICATIONS
998.0	POSTOPERATIVE SHOCK
998.00	POSTOPERATIVE SHOCK, UNSPECIFIED
998.01	POSTOPERATIVE SHOCK, CARDIOGENIC
998.02	POSTOPERATIVE SHOCK, SEPTIC
998.09	POSTOPERATIVE SHOCK, OTHER
998.11	HEMORRHAGE COMPLICATING A PROCEDURE
998.12	HEMATOMA COMPLICATING A PROCEDURE
998.2	ACCIDENTAL PUNCTURE OR LACERATION DURING A PROCEDURE
998.30	DISRUPTION OF WOUND, UNSPECIFIED
998.31	DISRUPTION OF INTERNAL OPERATION (SURGICAL) WOUND
998.32	DISRUPTION OF EXTERNAL OPERATION (SURGICAL) WOUND
998.4	FOREIGN BODY ACCIDENTALLY LEFT DURING A PROCEDURE
998.51	INFECTED POSTOPERATIVE SEROMA
998.59	OTHER POSTOPERATIVE INFECTION
998.7	ACUTE REACTION TO FOREIGN SUBSTANCE ACCIDENTALLY LEFT DURING A PROCEDURE
999.31	OTHER AND UNSPECIFIED INFECTION DUE TO CENTRAL VENOUS CATHETER
999.32	BLOODSTREAM INFECTION DUE TO CENTRAL VENOUS CATHETER
999.34	ACUTE INFECTION FOLLOWING TRANSFUSION, INFUSION, OR INJECTION OF BLOOD AND BLOOD PRODUCTS
999.39	INFECTION FOLLOWING OTHER INFUSION, INJECTION, TRANSFUSION, OR VACCINATION
999.80	TRANSFUSION REACTION, UNSPECIFIED
999.83	HEMOLYTIC TRANSFUSION REACTION, INCOMPATIBILITY UNSPECIFIED
999.84	ACUTE HEMOLYTIC TRANSFUSION REACTION, INCOMPATIBILITY UNSPECIFIED
999.85	DELAYED HEMOLYTIC TRANSFUSION REACTION, INCOMPATIBILITY UNSPECIFIED

## Gynecologic Surgery – Dependent Complications

Dependent complications are conditions that must either have the POA indicator set to "No," or if the POA indicator is set to "Unknown" or is missing, there must also be the listed 900 postoperative complication code present in the patient record.

### Must occur with 997.1 CARDIAC COMPLICATIONS, NOT ELSEWHERE CLASSIFIED

427.31	ATRIAL FIBRILLATION
428.0	CONGESTIVE HEART FAILURE, UNSPECIFIED
428.21	ACUTE SYSTOLIC HEART FAILURE
428.23	ACUTE ON CHRONIC SYSTOLIC HEART FAILURE
428.31	ACUTE DIASTOLIC HEART FAILURE
428.33	ACUTE ON CHRONIC DIASTOLIC HEART FAILURE
428.41	ACUTE COMBINED SYSTOLIC AND DIASTOLIC HEART FAILURE
428.43	ACUTE ON CHRONIC COMBINED SYSTOLIC AND DIASTOLIC HEART FAILURE

### Must occur with 997.3 RESPIRATORY COMPLICATIONS or 997.39 OTHER RESPIRATORY COMPLICATIONS

518.81	ACUTE RESPIRATORY FAILURE
518.84	ACUTE AND CHRONIC RESPIRATORY FAILURE

### Must occur with 997.3 RESPIRATORY COMPLICATIONS , 997.39 OTHER RESPIRATORY COMPLICATIONS or 998.59 OTHER POSTOPERATIVE INFECTION

995.91	SEPSIS
995.92	SEVERE SEPSIS

### Must occur with 997.5 URINARY COMPLICATIONS

584.5	ACUTE KIDNEY FAILURE WITH LESION OF TUBULAR NECROSIS
584.8	ACUTE KIDNEY FAILURE WITH OTHER SPECIFIED PATHOLOGICAL LESION IN KIDNEY
584.9	ACUTE KIDNEY FAILURE, UNSPECIFIED

### Must occur with 998.59 OTHER POSTOPERATIVE INFECTION

038.0	STREPTOCOCCAL SEPTICEMIA
038.10	STAPHYLOCOCCAL SEPTICEMIA, UNSPECIFIED
038.11	METHICILLIN SUSCEPTIBLE STAPHYLOCOCCUS AUREUS SEPTICEMIA
038.12	METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS SEPTICEMIA
038.19	OTHER STAPHYLOCOCCAL SEPTICEMIA
038.2	PNEUMOCOCCAL SEPTICEMIA
038.3	SEPTICEMIA DUE TO ANAEROBES
038.40	SEPTICEMIA DUE TO GRAM-NEGATIVE ORGANISM, UNSPECIFIED
038.41	SEPTICEMIA DUE TO HEMOPHILUS INFLUENZAE [H. INFLUENZAE]
038.42	SEPTICEMIA DUE TO ESCHERICHIA COLI [E. COLI]
038.43	SEPTICEMIA DUE TO PSEUDOMONAS
038.44	SEPTICEMIA DUE TO SERRATIA
038.49	OTHER SEPTICEMIA DUE TO GRAM-NEGATIVE ORGANISMS
038.8	OTHER SPECIFIED SEPTICEMIAS
038.9	UNSPECIFIED SEPTICEMIA
041.02	BACTERIAL INFECTION DUE TO STREPTOCOCCUS, GROUP B
041.04	BACTERIAL INFECTION DUE TO STREPTOCOCCUS, GROUP D [ENTEROCOCCUS]
041.09	BACTERIAL INFECTION DUE TO OTHER STREPTOCOCCUS
041.19	BACTERIAL INFECTION DUE TO OTHER STAPHYLOCOCCUS
041.2	PNEUMOCOCCUS INFECTION IN CONDITIONS CLASSIFIED ELSEWHERE AND OF UNSPECIFIED SITE
041.3	KLEBSIELLA PNEUMONIAE INFECTION IN CONDITIONS CLASSIFIED ELSEWHERE AND OF UNSPECIFIED SITE
041.4	ESCHERICHIA COLI [E. COLI] INFECTION IN CONDITIONS CLASSIFIED ELSEWHERE AND OF UNSPECIFIED SITE
041.85	BACTERIAL INFECTION DUE TO OTHER GRAM-NEGATIVE ORGANISMS
567.22	PERITONEAL ABSCESS
785.52	SEPTIC SHOCK
790.7	BACTEREMIA



## Gynecologic Surgery - Dependent Complications

Dependent complications are conditions that must either have the POA indicator set to "No", or if the POA indicator is set to "Unknown" or is missing, there must also be the listed 900 postoperative complication code present in the patient record.

### Must occur with 997.1 Cardiac Complications, Not Elsewhere Classified

427.31	ATRIAL FIBRILLATION	428.31	ACUTE DIASTOLIC HF
428.0	CHF NOS	428.33	AC & CHR DIASTOLIC HF
428.21	ACUTE SYSTOLIC HF	428.41	AC SYS & DIASTOLIC HF
428.23	AC & CHR SYSTOLIC HF	428.43	ACCHR SYS & DIASTOLIC HF

### Must occur with 997.3 Respiratory Complications or 997.39 Other Respiratory Complications

511.9	PLEURAL EFFUSION NOS
518.0	PULMONARY COLLAPSE
518.81	AC RESPIRATORY FAILURE

### Must occur with 997.5 Urinary Complications, Not Elsewhere Classified

584.5	AC KF W TUBULAR NEPHR	599.0	URINARY TRACT INF NOS
584.8	ACUTE KIDNEY FAILURE NEC	788.20	RETENTION OF URINE NOS
584.9	ACUTE KIDNEY FAILURE NOS	788.29	RETENTION OF URINE NEC

### Must occur with 998.0 Postoperative Shock, Not Elsewhere Classified

458.8	HYPOTENSION NEC
458.9	HYPOTENSION NOS
799.02	HYPOXEMIA

### Must occur with 998.59 Other Postoperative Infection

038.0	STREPTOCOCCAL SEPTICEMIA	038.9	SEPTICEMIA NOS
038.10	STAPH SEPTICEMIA NOS	041.02	GROUP B STREP INFECTION
038.11	MSSA SEPTICEMIA	041.04	GROUP D STREP INFECTION
038.12	MRSA SEPTICEMIA	041.09	STREP INFECTION NEC
038.19	STAPH SEPTICEMIA NEC	041.19	OTHER STAPH INFECTION
038.2	PNEUMOCOCCAL SEPTICEMIA	041.2	PNEUMOCOCCUS INFECT NOS
038.3	ANAEROBIC SEPTICEMIA	041.3	K. PNEUMONIAE INFECT
038.40	GRAM-NEG SEPTICEMIA NOS	041.4	E. COLI INFECT NOS
038.41	H. INFLUENZAE SEPTICEMIA	041.85	GRAM-NEG BACT INFECT NEC
038.42	E. COLI SEPTICEMIA	567.22	PERITONEAL ABSCESS
038.43	PSEUDOMONAS SEPTICEMIA	785.52	SEPTIC SHOCK
038.44	SERRATIA SEPTICEMIA	790.7	BACTEREMIA
038.49	GRAM-NEG SEPTICEMIA NEC	995.91	SEPSIS
038.8	SEPTICEMIA NEC	995.92	SEVERE SEPSIS

## Appendix C. Top Five Risk Factors

ICD-9 Diagnosis or Procedure Code	Description
Proc 68.8	PELVIC EVISCERATION
Proc 70.74	REPAIR OF OTHER VAGINOENTERIC FISTULA
Proc 70.72	REPAIR OF COLOVAGINAL FISTULA
Proc 68.69	OTHER AND UNSPECIFIED RADICAL ABDOMINAL HYSTERECTOMY
Proc 54.11	EXPLORATORY LAPAROTOMY