2015 Women’s Care Analysis
Evaluating Robotic-Assisted Surgery
Clinical Outcomes

Including Performance Outcomes for Award Recipients:
  Gynecologic Surgery Excellence Award™
  Labor and Delivery Excellence Award™
  Obstetrics and Gynecology Excellence Award™
  Women’s Health Excellence Award™

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Increase in Robotic-Assisted Gynecologic Surgeries

Technology and its use in medicine is routinely a source of exploration, innovation, and active debate among members of the healthcare community. As new innovations and applications of technology are introduced, the cycle of research, trial, use and outcomes evaluation begins and the healthcare community assesses the benefits to patients and healthcare.

One technology currently in this cycle is the use of robotic assistants in surgeries. Current approved uses of robotics are to assist surgeons to minimize the size of incisions, use advanced imagery in surgical procedures, and to increase levels of accuracy and specificity in measurement and execution of a surgical technique.

The use of robotic assistants continues to increase year over year for specific gynecologic procedures. The medical community continues to discuss the efficacy and the clinical outcomes that would support using robotic assistants for certain procedures.

Nationally, the use of robotic assistants for hysterectomy alone increased from 0.5% of minimally invasive surgeries in 2007 to 9.5% of the same surgeries in 2010. Healthgrades data for 2011 through 2013 shows a 19.9% increase in robotic-assisted gynecologic surgeries.

Assessing the Effectiveness of Robotic Devices on Patient Outcomes

Despite the increase in robotic-assisted gynecologic surgeries, questions remain about the relative improved performance and effectiveness of this type of surgery. In response, various organizations are providing their direction on the topic.

In March 2015, the American College of Obstetricians and Gynecologists (ACOG) released Committee Opinion #628, Robotic Surgery in Gynecology. The opinion provides their recommendations, including credentialing, patient selection, surgical procedures, and ongoing efficacy studies.

Considering the increase in robotic-assisted gynecologic surgeries and ACOG’s recommendations, Healthgrades sought to understand if the use of robotic devices in surgeries positively affected patient outcomes in terms of complication rates. We conducted an analysis based on the data we use to evaluate hospital quality.

We asked the following questions:

- Is there a difference in complication rates (risk adjusted and unadjusted) for the same surgeries, both with and without the use of a robotic assistant?
- Are the results influenced by other factors in the model, like the type of procedure performed?
- Is there a systematic bias for the evaluation (our ratings) related to percentage of volume of use of the robotic procedure?
- What alignment do our findings have with ACOG recommendations?

We evaluated over 500,000 patient records, covering three years (2011–2013), for any statistically significant variation in outcomes, as measured by complication rates, and procedure type.

Interestingly, we found the complication rates to be statistically significantly different for hysterectomy when comparing both types of procedures (laparoscopic vs. open) and the use of a
robotic assistant or not. We investigated further and identified what could be driving the differences—and the answers challenge common assumptions.

As shown in this report, we found that the results of our efforts and analysis support ACOG’s committee opinion and recommendations. In alignment with ACOG, we conclude that:

- Additional research on the use of robotic-assisted devices in gynecologic surgeries is warranted.
- Clinical guidelines for patient selection and procedure appropriateness need to be deliberated and outlined.

Finally, physicians and patients need to fully investigate surgical options, using supporting evidence outlining the benefits of each option, to make an informed decision for their specific situation.

**ACOG’s Recommendations**

The following is a summary of ACOG’s recommendations concerning robotic assistants and gynecologic surgeries.

- Randomized Controlled Trials are needed to establish patient indications.
- Use of robotic assistants should be appropriately selected.
- Both training and continuous quality assurance is required.
- Use of these techniques should be driven by what is best for the patient, and by what is evidence based.
- Adequate informed consent is needed and includes indications and risks for the type of surgery, and alternative options and therapies.
- Surgeons should describe their experience with this technique when counseling patients regarding the surgery.
- Surgeons need to be skilled at the abdominal and laparoscopic approaches prior to utilizing robotic-assisted procedures.
- Training, competency guidelines, and quality metrics need to be determined.
- Development of a registry of robotic-assisted gynecologic procedures is needed for adverse event reporting.
Data Evaluated

This year’s analysis uses 2011 through 2013 claims data for 13 states where it is available and meets Healthgrades data requirements for statistical evaluation. The states claim volume represents 41.6% of the U.S. population.

Over 570,000 Hysterectomy and Gynecologic Surgery patient claims were evaluated.

The specific states included are:

- Colorado
- Florida
- Iowa
- Illinois
- Maryland
- Nevada
- New York
- Oregon
- Pennsylvania
- Rhode Island
- Texas
- Washington
- Wisconsin

Both models were statistically significant with C-statistics greater than 0.67.

Cohorts Evaluated

Healthgrades evaluated the following specific cohorts in hysterectomy and gynecologic surgeries.

**Hysterectomy: First Listed Procedure**

Inclusions:

- Laparoscopic or open approach
- Vaginal or abdominal approach

Notable Exclusions:

- Patients with a history of organ transplant

**Gynecologic Surgery: First Listed Procedure**

Inclusions:

- Removal or repair of ovary(ies)
- Removal, repair or ligation of fallopian tube(s)
- Uterine repair
- Endometrial ablations
- Cervical procedures

Notable Exclusions:

- Hysterectomies and Urogynecologic procedures
- Fistula procedures
- Patients with a history of organ transplant

Specific codes and additional detail is available in the published *Healthgrades Women’s Care Ratings 2015 Methodology* at www.healthgrades.com/quality/ratings-awards/methodology.
Healthgrades Findings

Question 1: Is there a difference in complication rates between surgeries using a robot versus those that do not?

We found statistically significant differences in robotic-assisted procedures compared to non-robotic in the two cohorts evaluated: hysterectomy and gynecologic surgery.

<table>
<thead>
<tr>
<th>Cohorts</th>
<th>Frequency</th>
<th>Risk-Adjusted Complication Rate</th>
<th>Actual Complication Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hysterectomy</td>
<td>15.5% of patients had a robotic-assisted procedure</td>
<td>7% lower in robotic procedures (8.5% non-robotic to 7.8% robotic)</td>
<td>19.8% lower in robotic procedures (8.8% non-robotic to 7.0% robotic)</td>
</tr>
<tr>
<td>Gynecologic Surgery</td>
<td>4.1% of patients had a robotic-assisted procedure</td>
<td>3% lower in robotic (10.7% non-robotic to 10.3% robotic)</td>
<td>36% higher in robotic procedures (7.45% non-robotic to 10.0% robotic)</td>
</tr>
</tbody>
</table>

Hysterectomy shows an improved result, as measured in terms of lower complication rates, for procedures using a robotic assistant compared to those without.

The different results in the gynecologic surgery cohort raised more questions, however. Gynecologic surgery has a much lower relative volume of robotic procedures within the cohort, (4.1% in our sample vs. 15.5% of all hysterectomies); therefore, the volume in gynecologic surgery was too low to allow for conclusive findings for that cohort.

As a result, we focused on hysterectomy for the remainder of our study.

Question 2: Are the results influenced by other factors in the model, like the type of procedure performed or patient risks?

In order to understand if our results were being influenced by other factors, we looked into the possibility of potential procedural bias to explain the difference in complication rates between hysterectomy cases and the use of a robotic assistant and those performed without.

The 63.7% lower unadjusted complication rate for robotic-assisted laparoscopic hysterectomies suggested that a substantial difference in patient outcomes may exist due to specific risk factors in the risk-adjustment model.

We questioned if the procedure itself and how it was performed influenced patient outcomes.

To inform our inquiry, we normalized the data set by removing the procedure codes from our risk-adjustment model. To evaluate this potential procedural bias, we created two models: one that included procedure pairing, indicating the use of a robotic assistant, and one without.

Specifically, we removed laparoscopic procedure codes paired with robotic-assisted procedure codes from the model and compared patient level predicted values from this reduced model to the model with the procedures included.

Our results showed that complication rates between the risk-adjusted models with procedure codes and without procedure codes were statistically identical (correlation of 0.98).
To understand the interaction of patient risk and expected risk, we reviewed the fully risk-adjusted rate, the diagnosis and demographic risk-adjusted rate, and the unadjusted complication rate.

In order to determine if the risk truly varies between robotic and non-robotic cases, we must look at all three metrics. One reason is because the risk-adjusted rate will compensate for statistical variation in patient risk between the procedures.

- We found that the unadjusted rate does vary and it is lower for the patients undergoing a robotic-assisted procedure.
- We also discovered that each patient’s demographics and diagnoses drive much of their predicted risk.

This suggests that the variation in robotic and non-robotic procedures is due to patient selection and not specifically a difference in the inherent risk of the procedure type.

While the procedure codes are statistically significant and do increase the model fit, this analysis implies that a patient’s demographic characteristics, comorbidities, and disease type are responsible for a major proportion of the patient’s risk.

Simply put, these results suggest that a patient’s comorbidities and diagnoses, rather than the use of a robotic assistant, drive the differences in patient outcomes.

**Question 3: Is there a systematic bias for the evaluation related to percentage of volume of use of the robotic procedure?**

It would be reasonable to expect that facilities that had a larger percentage of their hysterectomies performed with robotic assistants would over index in 5-star recipients for Hysterectomy.

Since Healthgrades evaluations use the ratings framework for determining performance measured via complication rates, we questioned if the volume of procedures with robotic assistants had any relationship to the actual performance. It did not.

- Volume and percentage of the cases done with robotic assistants had no correlation with the likelihood of performing better than expected, and receiving 5-star performance ratings.
- Across all three star rating categories the average percent of robotic procedures stands at 15% +/- 1.5%

**Conclusion**

The Healthgrades data and evaluation of robotic-assisted procedures versus those without robot for hysterectomy and gynecologic surgery show variation in both use and outcomes. The variation is not explained by volume of services performed as there was not a statistical difference in performance in the use of robotic assistants in the data set.

After testing for other systematic bias, the data points to the importance of appropriate patient selection, as the patient’s individual risk factors had a greater influence on the outcome than either the use of a robot, or the procedure method.

Healthgrades data analysis confirms there are differences in performance between robotic-assisted procedures versus those without. However, that difference varies between procedures and in impact—either positive or negative.

After focusing on the specific procedure of hysterectomy, we found that patient selection is the primary driver, rather than the procedure type or use of robotic assistant.

Ultimately, this analysis supports the recommendations supplied by ACOG in terms of the use of robotic assistants in gynecologic surgery. Further review and detailed study on the use of the robotic assistants and patient selection are necessary.
Performance Variation Exists in Additional Procedures

In addition to analyzing data on the use of robotic assistants and outcomes, Healthgrades evaluated the performance of hospitals for the following procedures:

- Labor & Delivery: C-Section Delivery and Vaginal Delivery
- Hysterectomy (open vs. closed)
- Gynecologic Surgery (open vs. closed)

The analysis identified significant variation in the performance as measured by risk-adjusted in-hospital complication rates. We also measured performance for 15 common procedures and conditions in women specifically to assess overall clinical quality for women 65 and older.

To help consumers and physicians evaluate the performance of hospitals providing these services, Healthgrades provides the following stratification of performance:

- ★★★★★ **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.

Additional detail is available in the published Healthgrades Women’s Care Ratings 2015 Methodology at www.healthgrades.com/quality/ratings-awards/methodology.

Impact of Performance on Patient Outcomes

Comparing 5-star rated hospitals to 1-star rated hospitals in five cohorts:

**Hysterectomy**

For the 2015 Women’s Care Report, Healthgrades compared hospitals with statistically better-than-expected performance (5 stars) as a group, to those with statistically worse-than-expected performance (1 star) as a group, and found:

From 2011–2013, patients having a Hysterectomy in hospitals with 5 stars have, on average:
- 60.0% lower risk of experiencing a complication while in the hospital than if they were treated in hospitals with 1 star.*

From 2011–2013, patients having a Hysterectomy in hospitals receiving 1 star are, on average:
- 2.5 times more likely to experience one or more complications than if they were treated in hospitals with 5 stars.*

*Statistics are based on Healthgrades analysis of All-Payer data for years 2011–2013 and represent 3-year estimates for patients in 13 states for which all-payer data was made available. (See the Healthgrades Women’s Care Rating 2015 Methodology for more details.)
Gynecologic Surgery

For the 2015 Women’s Care Report, Healthgrades compared hospitals with statistically better-than-expected performance (5 stars) as a group, to those with statistically worse-than-expected performance (1 star) as a group, and found:

From 2011–2013, patients having Gynecologic Surgery in hospitals with 5 stars have, on average:
• 63.9% lower risk of experiencing a complication while in the hospital than if they were treated in hospitals with 1 star.*

From 2011–2013, patients having Gynecologic Surgery in hospitals receiving 1 star are, on average:
• 2.8 times more likely to experience one or more complications than if they were treated in hospitals with 5 stars.*

*Statistics are based on Healthgrades analysis of All-Payer data for years 2011–2013 and represent 3-year estimates for patients in 13 states for which all-payer data was made available. (See the Healthgrades Women’s Care Rating 2015 Methodology for more details.)

Urogynecologic Surgeries and Procedures

For the 2015 Women’s Care Report, Healthgrades compared hospitals with statistically better-than-expected performance (5 stars) as a group, to those with statistically worse-than-expected performance (1 star) as a group, and found:

From 2011–2013, patients having Urogynecologic Surgeries and Procedures in hospitals with 5 stars have, on average:
• 82.8% lower risk of experiencing a complication while in the hospital than if they were treated in hospitals with 1 star.*

From 2011–2013, patients having Urogynecologic Surgeries and Procedures in hospitals receiving 1 star are, on average:
• 5.8 times more likely to experience one or more complications than if they were treated in hospitals with 5 stars.*

*Statistics are based on Healthgrades analysis of All-Payer data for years 2011–2013 and represent 3-year estimates for patients in 13 states for which all-payer data was made available. (See the Healthgrades Women’s Care Rating 2015 Methodology for more details.)

C-Section Delivery

For the 2015 Women’s Care Report, Healthgrades compared hospitals with statistically better-than-expected performance (5 stars) as a group, to those with statistically worse-than-expected performance (1 star) as a group, and found:

From 2011–2013, patients having C-Section Delivery in hospitals with 5 stars have, on average:
• 52.4% lower risk of experiencing a complication while in the hospital than if they were treated in hospitals with 1 star.*

From 2011–2013, patients having C-Section Delivery in hospitals receiving 1 star are, on average:
• 2.1 times more likely to experience one or more complications than if they were treated in hospitals with 5 stars.*

*Statistics are based on Healthgrades analysis of All-Payer data for years 2011–2013 and represent 3-year estimates for patients in 13 states for which all-payer data was made available. (See Healthgrades Women’s Care Rating 2015 Methodology for more details.)
Vaginal Delivery

For the 2015 Women’s Care Report, Healthgrades compared hospitals with statistically better-than-expected performance (5 stars) as a group, to those with statistically worse-than-expected performance (1 star) as a group, and found:

From 2011–2013, patients having Vaginal Delivery in hospitals with 5 stars have, on average:

- 44.5% lower risk of experiencing a complication while in the hospital than if they were treated in hospitals with 1 star.*

From 2011–2013, patients having Vaginal Delivery in hospitals receiving 1 star are, on average:

- 1.8 times more likely to experience one or more complications than if they were treated in hospitals with 5 stars.*

*Statistics are based on Healthgrades analysis of All-Payer data for years 2011–2013 and represent 3-year estimates for patients in 13 states for which all-payer data was made available. (See the Healthgrades Women’s Care Rating 2015 Methodology for more details.)

Identifying Superior Performance

Healthgrades identifies a subset of hospitals that not only outperform their predicted complication rate, but also outperform all other hospitals evaluated. These hospitals represent the top 10% of all hospitals evaluated for these services. This group of hospitals is designated as the recipients of:

- Gynecologic Surgery Excellence Award™
- Labor and Delivery Excellence Award™
- Obstetrics and Gynecology Excellence Award™
- Women’s Health Excellence Award™

Impact of Superior Performance on Patient Outcomes

Comparing award recipients to all other hospitals as a group:

Gynecologic Surgery Excellence Award

From 2011–2013, if all hospitals in the 13 states included in this analysis, as a group, performed similarly to hospitals receiving the Gynecologic Surgery Excellence Award, on average:

- 17,592 patients with complications could potentially have been avoided*

From 2011–2013, patients treated in hospitals receiving the Gynecologic Surgery Excellence Award have, on average:

- 46.1% lower risk of experiencing a complication while in the hospital than if they were treated in hospitals that did not receive the Gynecologic Surgery Excellence Award.*
Labor and Delivery Excellence Award

From 2011–2013, if all hospitals in the 13 states included in this analysis, as a group, performed similarly to hospitals receiving the Labor and Delivery Excellence Award, on average:

- 92,883 patients with complications could potentially have been avoided*

From 2011–2013, patients treated in hospitals receiving the Labor and Delivery Excellence Award have, on average:

- 35.1% lower risk of experiencing a complication while in the hospital than if they were treated in hospitals that did not receive the Labor and Delivery Excellence Award.*

Obstetrics and Gynecology Excellence Award

From 2011–2013, if all hospitals in the 13 states included in this analysis, as a group, performed similarly to hospitals receiving the Obstetrics and Gynecology Excellence Award, on average:

- 100,905 patients with complications could potentially have been avoided*

From 2011–2013, patients treated in hospitals receiving the Obstetrics and Gynecology Excellence Award have, on average:

- 34.4% lower risk of experiencing a complication while in the hospital than if they were treated in hospitals that did not receive the Obstetrics and Gynecology Excellence Award.*

*Statistics are based on Healthgrades analysis of All-Payer data for years 2011–2013 and represent 3-year estimates for patients in 13 states for which all-payer data was made available. (See the Healthgrades Women’s Care Rating 2015 Methodology for more details.)

Superior Performance in Women’s Health

The Healthgrades Women’s Health Excellence Award™ recognizes the best-performing hospitals in women’s health, which includes care provided to women ages 65 and older for common conditions and procedures treated in the hospital.

For this 2015 Report on Women’s Care, Healthgrades compared Women’s Health Excellence Award recipients as a group, to those hospitals eligible for the award but did not receive it, as a group, and found:

From 2011–2013, women undergoing complication-based procedures at Women’s Health Excellence Award recipient hospitals have, on average:

- 9.6% lower risk of experiencing a complication while in the hospital than if they were treated in hospitals that did not receive the award.*

From 2011–2013, women undergoing procedures in hospitals that did not receive the award were, on average:

- 1.11 times more likely to experience one or more complications than if they were treated in Women’s Health Excellence Award recipient hospitals.*

*Statistics are based on Healthgrades analysis of MedPAR data for years 2011–2013 and represent 3-year estimates for female Medicare patients only. (See the Healthgrades Women’s Health 2015 Methodology for more details.)
About Healthgrades

Healthgrades, headquartered in Denver, Colorado, is the leading online resource for comprehensive information about physicians and hospitals. Today, more than one million people a day use the Healthgrades websites to search, compare and connect with hospitals and physicians based on the most important measures when selecting a healthcare provider: experience, hospital quality, and patient satisfaction. For more information about Healthgrades, visit http://www.healthgrades.com or download the Healthgrades iPhone app.

References