

Examining the Safety and Cost of Risk-Reducing Salpingectomies as Prophylactic Treatment for Women Seeking Sterilization who are at Low to Moderate Risk for Ovarian Cancer



Farmin Samareh-Jahani, Paul Kang, Matt McEchron PhD, and Bruce Kaufmann MD
University of Arizona College of Medicine, Phoenix



Abstract

Ovarian cancer ranks fifth among the most common cause of cancer deaths in women. There is evidence that the site of origin for the majority of the most serious form of ovarian cancers is the fallopian tube. There is growing consensus for risk-reducing salpingectomies (RRS) to be performed for women who are at moderate risk for developing ovarian cancer especially at a time of patient desired sterilization. A retrospective chart review to determine the safety and cost of risk-reducing salpingectomies in comparison to tubal ligations was performed using the Healthcare Cost and Utilization Project inpatient database from 2008-2012.

Results showed no significant difference between each procedure for length of stay in days (95%CI -0.19, 0.79 p: 0.24) or intraoperative complications (OR 4.84 (95%CI 0.38, 60.9 p: 0.22)). There was a significant difference between the total charges associated with each procedure with tubal ligation having a mean cost of \$2,227.21 (95%CI \$403.2, \$4051.10) and the bilateral salpingectomy procedure having a mean cost of \$11,189.80 (95%CI \$6,582.70, \$15,796.80 p<0.001).

The cost difference between the two procedures should shift the conversation towards the question of whether hospital billing and insurance coverage for bilateral salpingectomy without oophorectomy should be examined more closely in order to provide RRS as a prophylactic treatment for women at moderate risk for developing ovarian cancer seeking sterilization.

Introduction

Prophylactic bilateral salpingo-oophorectomies (BSO) have been indicated for women that are *BRCA1/2* carriers and has even been suggested for women at moderate risk of developing ovarian cancer.

A large analysis by the Nurses' Health Study revealed that all-cause mortality, as well as cancer mortality, increased with women who received BSO. In 2000, a review of US health care statistics stated that approximately 11 million US women 15 to 44 years of age relying on tubal sterilization as a form of contraception.

Instead of performing tubal ligations, consideration should be given to RRS for women seeking permanent sterilization. In addition, RRS should be considered as an optional procedure during other open or laparoscopic surgeries for women at average risk of developing ovarian cancer.

Methods

Available data found in the Healthcare Cost and Utilization Project nationwide inpatient database on patients who received ICD-9 procedure codes related to the procedures were collected from January 1, 2008 through December 31, 2012. Women older than 50 yrs., with a family history of ovarian cancer, *BRCA* positive, a lack of menstrual activity in the past 12 months, and imaging suggestive of ovarian cyst or tubal pathology at transvaginal ultrasound will be excluded. Data for length of hospital stay, total charges, and unintentional intraoperative injury were analyzed using multiple linear regression models to calculate coefficients with 95% confidence intervals, p-values, and odds ratios.

Results:

Table 1: Association between Population, Hospital Characteristics, LOS and Total Charges

| Demographics and Hospital Characteristics | Length of Stay | | Total Cost | |
|---|----------------------|---------|---------------------------|---------|
| | Coefficient (95% CI) | P-value | Coefficient (95% CI) | P-value |
| Age, years (Per 10-year Increase) | 0.015 (-0.19, 0.22) | 0.88 | 1903.5 (426.8, 3380.1) | 0.01 |
| Race | | | | |
| Caucasian | REF | | REF | |
| African American | 0.57 (0.04, 1.10) | 0.03 | 3157.1 (-37.5, 6351.7) | 0.05 |
| Hispanic | 0.05 (-0.23, 0.34) | 0.74 | 1369.6 (-725.0, 3464.2) | 0.20 |
| Others | -0.01 (-0.28, 0.26) | 0.92 | 1612.7 (-1894.8, 5120.3) | 0.36 |
| Charlson Score for Comorbidities | | | | |
| 0 | REF | | REF | |
| 1 | 0.25 (-0.33, 0.83) | 0.40 | 1364.2 (-3790.0, 6518.5) | 0.60 |
| >=2 | 3.46 (-1.05, 7.98) | 0.13 | 30625.7 (6878.4, 54372.9) | 0.01 |
| Admission Type | | | | |
| Non-Elective | REF | | REF | |
| Elective | -0.25 (-0.39, -0.11) | 0.001 | -632.2 (-1556.6, 292.0) | 0.18 |
| Median Income | | | | |
| 1 st Quartile | REF | | REF | |
| 2 nd Quartile | -0.07 (-0.36, 0.22) | 0.62 | -162.5 (-2293.1, 1968.0) | 0.88 |
| 3 rd Quartile | 0.06 (-0.41, 0.52) | 0.81 | 1623.3 (-892.6, 4139.4) | 0.20 |
| 4 th Quartile | 0.006 (-0.35, 0.36) | 0.97 | 29.5 (-2922.4, 2981.6) | 0.98 |
| Primary Payer | | | | |
| Medicare | REF | | REF | |
| Medicaid | -0.47 (-1.85, 0.91) | 0.50 | 1782.4 (-3523.1, 7087.9) | 0.51 |
| Private uninsured | -0.77 (-2.12, 0.57) | 0.26 | 4022.5 (-1161.3, 9206.3) | 0.12 |
| Self-Pay/Others | -0.06 (-1.65, 1.52) | 0.93 | 4038.9 (-2783.3, 10861.2) | 0.24 |
| Hospital Bed Size | | | | |
| Small | REF | | REF | |
| Medium | -0.08 (-0.63, 0.46) | 0.76 | -775.4 (-3594.7, 2043.9) | 0.58 |
| Large | -0.22 (-0.75, 0.31) | 0.41 | -959.3 (-3735.7, 1816.9) | 0.49 |
| Hospital location | | | | |
| Rural | REF | | REF | |
| Urban | -0.006 (-0.23, 0.23) | 0.95 | 4669.8 (2421.9, 6917.7) | <0.001 |
| Hospital Region | | | | |
| Northwest | REF | | REF | |
| Midwest | 0.05 (-0.32, 0.43) | 0.77 | -2583.3 (-6002.3, 835.5) | 0.13 |
| South | 0.20 (-0.11, 0.52) | 0.21 | -1382.6 (-4805.7, 2040.5) | 0.42 |
| West | -0.03 (-0.35, 0.29) | 0.85 | 7956.2 (4105.7, 11806.6) | <0.001 |
| Hospital Teaching Status | | | | |
| Non-Teaching | REF | | REF | |
| Teaching | 0.33 (0.07, 0.59) | 0.01 | -2754.5 (-4521.2, -987.7) | 0.002 |
| Year | | | | |
| 2008 | REF | | REF | |
| 2009 | -0.03 (-0.42, 0.36) | 0.88 | 581.5 (-1699.9, 2863.0) | 0.61 |
| 2010 | 0.05 (-0.21, 0.31) | 0.69 | N/A | |
| 2011 | N/A | | N/A | |
| 2012 | N/A | | N/A | |

Table 2: Assessing the Association between Procedure, Length of Stay and Total Charges

| Predictors | Coefficient (95% CI) | P-Value |
|---------------------------------------|------------------------------|---------|
| Length of Stay | | |
| Procedure | | |
| Bilateral Tubal Ligation: Occlusion | REF | |
| Bilateral Tubal Ligation: Destruction | -0.09 (-0.42, 0.24) | 0.58 |
| Bilateral Salpingectomy | 0.29 (-0.19, 0.79) | 0.24 |
| Total Charges (Cost \$) | | |
| Procedure | | |
| Bilateral Tubal Ligation: Occlusion | REF | |
| Bilateral Tubal Ligation: Destruction | 2,227.21 (403.2, 4051.1) | 0.01 |
| Bilateral Salpingectomy | 11,189.8 (6,582.7, 15,796.8) | <0.001 |

Table 3: Unintentional Intraoperative Complications by Procedure

| Predictors | OR (95% CI) | P-Value |
|---|-------------------|---------|
| E-Code 8700: Accidental cut | | |
| Procedure | | |
| Bilateral Tubal Ligation: Occlusion | REF | |
| Bilateral Tubal Ligation: Destruction | 9.21 (0.87, 96.9) | 0.06 |
| Bilateral Salpingectomy | 4.84 (0.38, 60.9) | 0.22 |
| E-CODE 8786: Removal of organ causing abnormal patient reaction | | |
| Procedure | | |
| Bilateral Tubal Ligation: Occlusion | REF | |
| Bilateral Tubal Ligation: Destruction | 0.89 (0.14, 5.56) | 0.90 |
| Bilateral Salpingectomy | 1.41 (0.04, 47.2) | 0.84 |
| E-CODE 8788: Other surgical procedures causing abnormal patient reaction | | |
| Procedure | | |
| Bilateral Tubal Ligation: Occlusion | REF | |
| Bilateral Tubal Ligation: Destruction | 3.04 (0.57, 16.1) | 0.19 |
| Bilateral Salpingectomy | 4.17 (0.55, 31.5) | 0.16 |

Results Summary

There was no significant difference in the length of hospital stay between each of the procedures with the bilateral salpingectomy procedure having a mean stay of 0.29 days greater than tubal ligation (95%CI -0.19, 0.79 p: 0.24). There was no significant difference between intraoperative injuries when comparing bilateral salpingectomy to tubal ligation with an odds ratio of 4.84 (95%CI 0.38, 60.9 p: 0.22). There was a significant difference between the total charges associated with each procedure with tubal ligation having a mean cost of \$2,227.21 (95%CI \$403.2, \$4051.10) and the bilateral salpingectomy procedure having a mean cost of \$11,189.80 (95%CI \$6,582.70, \$15,796.80 p<0.001).

Discussion and Conclusions

The major focus of this paper, existing data, and future studies regarding the safety, cost, and efficacy of bilateral salpingectomy as prophylaxis against ovarian cancer is to address the concerns of four parties: patients, physicians, hospitals, and insurance companies.

We want to provide patients ease of mind in knowing that this procedure is safe, simple, and cheap. As physicians, we want to ensure that this procedure is not only feasible, but has proven long-term outcomes for ovarian cancer prophylaxis, and one that won't increase morbidity or mortality. For hospitals and insurance companies, this procedure should be able to save them from having to pay for future costly medical expenses that revolve around first preventing unwanted pregnancies and secondly preventing the cost of having future hospitalizations due to complications of ovarian cancer.

As of now, it appears that risk-reducing salpingectomy is relatively safe compared to its tubal ligation counterpart. However, the high cost of this procedure, which is most likely tied to hospital billing, should be closely examined in the hopes that negotiations can be set between hospitals and insurance companies to make the procedure more affordable for patients to pay in the short-term for ultimate long-term gain.

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