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ORIGINAL RESEARCH ARTICLE

First step in implementation of opportunistic salpingectomy for prevention of ovarian cancer: Current care and its determinants

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Abstract

Introduction: Opportunistic salpingectomy (OS) refers to additional removal of the fallopian tubes during abdominal surgery performed for another medical indication, as prevention for ovarian cancer. As OS has been inconsistently implemented, its clinical practice varies worldwide. To reduce this variation, insight is required into current clinical practice and its determinants. Therefore, the study aim was to determine the implementation of counseling and performance of OS between 2015 and 2018, and its patient, surgical, physician, and hospital characteristics.

Material and methods: Retrospective study using electronic medical records from six different Dutch hospitals: two academic, two large teaching, and two non-teaching hospitals. Patients were considered eligible for OS if they underwent elective non-obstetric abdominal surgery for a gynecological indication from January 2015 through December 2018. Primary outcomes were uptake of counseling and performance of OS. Multilevel multivariable logistic regression analyses were conducted to identify characteristics associated with OS.

Results: A total of 3214 patients underwent elective non-obstetric abdominal surgery for a gynecological indication and were eligible for OS. Counseling on OS increased significantly from 2.9% in 2015 to 29.4% in 2018. In this period, 440 patients were counseled on OS, of which 95.9% chose OS. Performance of OS increased significantly from 6.9% in 2015 to 44.5% in 2018. Counseling for and performance of OS were more likely in patients who had surgery by laparoscopic approach, were counseled by a gynecological resident, or had more than three contact moments before surgery. Additionally, OS was less likely in patients who had vaginal surgery.

Conclusions: Although the uptake of OS increased from 2015 to 2018, the majority of patients who were eligible for OS were not counseled and did not undergo OS. Its

Abbreviations: EMR, electronic medical record; EOC, epithelial ovarian cancer; OS, opportunistic salpingectomy.

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clinical practice varies on patient, surgery, and physician characteristics. Therefore, an implementation strategy tailored to associated determinants is recommended.

KEYWORDS
counseling, fallopian tube, opportunistic salpingectomy, ovarian cancer, performance, prevention

1 | INTRODUCTION

Worldwide, approximately 300000 women are diagnosed with ovarian cancer annually.[1] Epithelial ovarian cancer (EOC) is the most common form and is generally diagnosed at an advanced stage due to the lack of early symptoms. EOC is associated with a poor prognosis and high mortality because of the lack of effective early screening methods and limited curative treatment options.[2] Therefore, special attention should be devoted towards primary prevention.

Recent research suggests the fallopian tube as the primary origin of high-grade serous carcinoma, which is the most common type of EOC.[3–5] An opportunistic salpingectomy (OS), which refers to an additional removal of the fallopian tubes during already planned abdominal surgery for other medical indications, has therefore the potential to prevent ovarian cancer. This has been supported by retrospective cohort studies that have shown a risk reduction of ovarian cancer after bilateral salpingectomy.[6–9] OS appears to be feasible and safe without additional surgical risks.[10,11] Therefore, since 2011, an increasing number of gynecological societies recommend discussing OS in women who will undergo abdominal surgery.[12]

However, the emergence of this prevention strategy has led to unwanted substantial variation in clinical practice. First, variation in the uptake of OS in women at low risk for EOC is observed among hospitals and individual gynecologists.[13,14] Second, although gynecological societies support discussion of OS in patients who have completed childbearing, the recommendations differ regarding surgical procedures by which OS could be performed. Most recommend discussing OS during hysterectomy and sterilization, only a few recommend discussing OS during all abdominal surgeries.[12] As a result, the life-time risk reduction for EOC could depend on geography, hospital, or even the patient's physician.

Moving towards more patient-centered care, patients should be involved in the decision-making regarding OS. Closing the gap of practice variation requires insight into its clinical practice and associated characteristics.[15] Based on these characteristics, an implementation strategy can be developed to facilitate the uptake of OS and reduce practice variation. Therefore, this study aims to determine the extent of counseling and performance of OS in clinical practice, and its associated patient, surgical, and physician characteristics within different type of hospitals.

Key message

Counseling and performance of opportunistic salpingectomy increased significantly from 2015 until 2018 without national recommendations within Dutch hospitals. However, counseling and performance varied greatly, which could be explained by patient, surgical, and physician characteristics.

2 | MATERIAL AND METHODS

2.1 | Study design

This retrospective study is conducted to assess actual uptake of counseling and performance of OS using electronic medical records (EMR) from January 2015 through December 2018 in six different Dutch hospitals: two academic hospitals, two large teaching hospitals, and two non-teaching hospitals. The year 2015 was considered as representative baseline because three large cohort studies were published at that time showing a risk reduction for EOC after bilateral salpingectomy.[6–8] This prompted several gynecological societies to recommend discussion of OS during abdominal gynecological surgery for other medical indications. During the study period (2015–2018) national guidelines concerning OS had not been issued in the Netherlands, and the nationwide Stop Ovarian Cancer (STOPOVCA) implementation project (ClinicalTrials.gov; NCT04470921) had not started. The aim of STOPOVCA is to optimize implementation of OS by evaluating both healthcare experiences with OS and its influencing factors, and the effect of implementation efforts on the number of eligible women who have actually been counseled about OS.

Informed consent from each patient was not required on account of causing unnecessary harm. Supposedly informing these women of their risk of ovarian cancer and OS that they no longer have access to might cause redundant concerns.

2.2 | Study population

Patients were eligible for inclusion if they underwent elective non-obstetric abdominal surgery for a gynecological indication from January 2015 through December 2018. Patients were excluded if they

had a history of or indication for bilateral salpingectomy or salpingo-oophorectomy, were aged under 30 years or had not completed childbearing. Childbearing was considered incomplete if the EMR indicated that the patient had an active wish to have (more) children, participated in fertility treatment, had been pregnant after the surgery or was aged under 40 years and para 0. Figure 1 provides a flow chart of the inclusion process with elaboration of the exclusion criteria.

2.3 | Outcomes

The primary outcomes of this study were counseling and performance of OS. Counseling on OS was defined as conducted when its description was present in the EMR. Counseling was defined as not conducted, when both description of counseling and performance of OS were absent. Performance of OS was defined as conducted if performance of OS was described in the surgery report and/or both fallopian tubes were reported in the pathology report.

2.4 | Data extraction

Patient and surgical data were extracted anonymously and collected in an electronic database using Castor EDC (Electronic Data Capture) by three trained researchers. Patient characteristics extracted were: age at surgery, history of pregnancy and/or childbirth, history of intra-abdominal surgery, history of oncological disease, and family history of ovarian cancer (if first-degree relative has/had ovarian cancer). Extracted data concerning the surgery were: type of indication (benign or oncological; and whether pelvic or not), type of surgery, year of surgery (2015, 2016, 2017, or 2018), surgical approach (laparotomic, laparoscopic, or vaginal), and number of contacts before surgery (one, two, three, or more than three). Data were assessed as missing if description concerning this characteristic was not reported. Physician characteristics were obtained by sending an electronic survey to the relevant physician using Castor EDC. Obtained characteristics for these counseling physicians were: position in hospital (gynecologist or gynecological resident), and in case of gynecologists: special interest (obstetrics, reproductive medicine, urogynecology, benign/minimally invasive surgery, [focus area] oncology), years of work experience, and number of surgeries performed yearly (0–50; 51–100; 101–150; 151–200; or >200).

2.5 | Data analysis

Descriptive statistics were used to describe characteristics and determine the proportion of OS counseled and performed. Depending on the distribution, mean ± standard deviation or median and interquartile range for continuous variables were determined. Categorical variables were determined as numbers and percentages. Differences between the two groups were tested with an independent *t* test or Mann–Whitney *U* test for continuous variables and a chi-squared test for categorical variables. Patient, surgery, physician, and hospital characteristics with a *p* value less than 0.20 in univariable multilevel logistic regression analysis were included in a multilevel multivariable logistic regression analysis. The multilevel multivariable logistic regression analysis was performed to identify associated characteristics with counseling and performance of OS adjusted to the hierarchical structure of the data set (patients nested within physicians). A model with a random intercept and all other variables fixed was used. Backward elimination procedure was conducted, sequentially removing the associated characteristics with the highest *p* value until all remaining characteristics were significant. A *p* value of less than 0.05 was considered significant, based on two-sided tests. Intraclass correlation coefficient was calculated to determine the variation explained by clustering using the method of Snijders and Bosker.[16] Statistical analysis was performed using IBM SPSS statistics, software version 25.0 (IBM Corp.).

2.6 | Ethics statement

The Medical Ethical Committee "CMO Regio Arnhem-Nijmegen" (2018–4978) granted ethical approval and exempted it from the Medical Research Involving Human Subject Act (Dutch: WMO) on December 28, 2018.

3 | RESULTS

3.1 | Study population

In total, 8159 EMRs were screened of patients who underwent elective non-obstetric abdominal surgery for a gynecological indication (Figure 1). Of these patients, 41 patients were excluded because of the absence of a surgical or clinical record, and 3520 patients were excluded because of a history of or current indication for bilateral salpingectomy or bilateral salpingo-oophorectomy. These 3520 women underwent preventive bilateral salpingo-oophorectomy, salpingectomy for Essure removal, risk-reducing salpingectomy because of high risk for ovarian cancer (*BRCA1*, *BRCA1* mutation carriers or Lynch syndrome), or cancer debulking. The remaining 4598 patients were screened on age of which 745 were excluded because they were aged less than 30 years. Subsequently, 639 patients were excluded as they had not completed childbearing. Therefore, a total of 3214 patients were included for analysis.

Patients who were considered eligible for OS had a median age of 44 years (interquartile range 38–50 years). Most had been pregnant (80%) and at least one had undergone previous abdominal surgery (48%). Only 1% of the study population were known to have a positive family history for ovarian cancer. Most (95%) patients underwent surgery for benign indications and a laparoscopic approach was most commonly used (67%). In total, 238 different physicians counseled eligible patients on their indicated surgery. At the moment of counseling, 50% of all physicians were

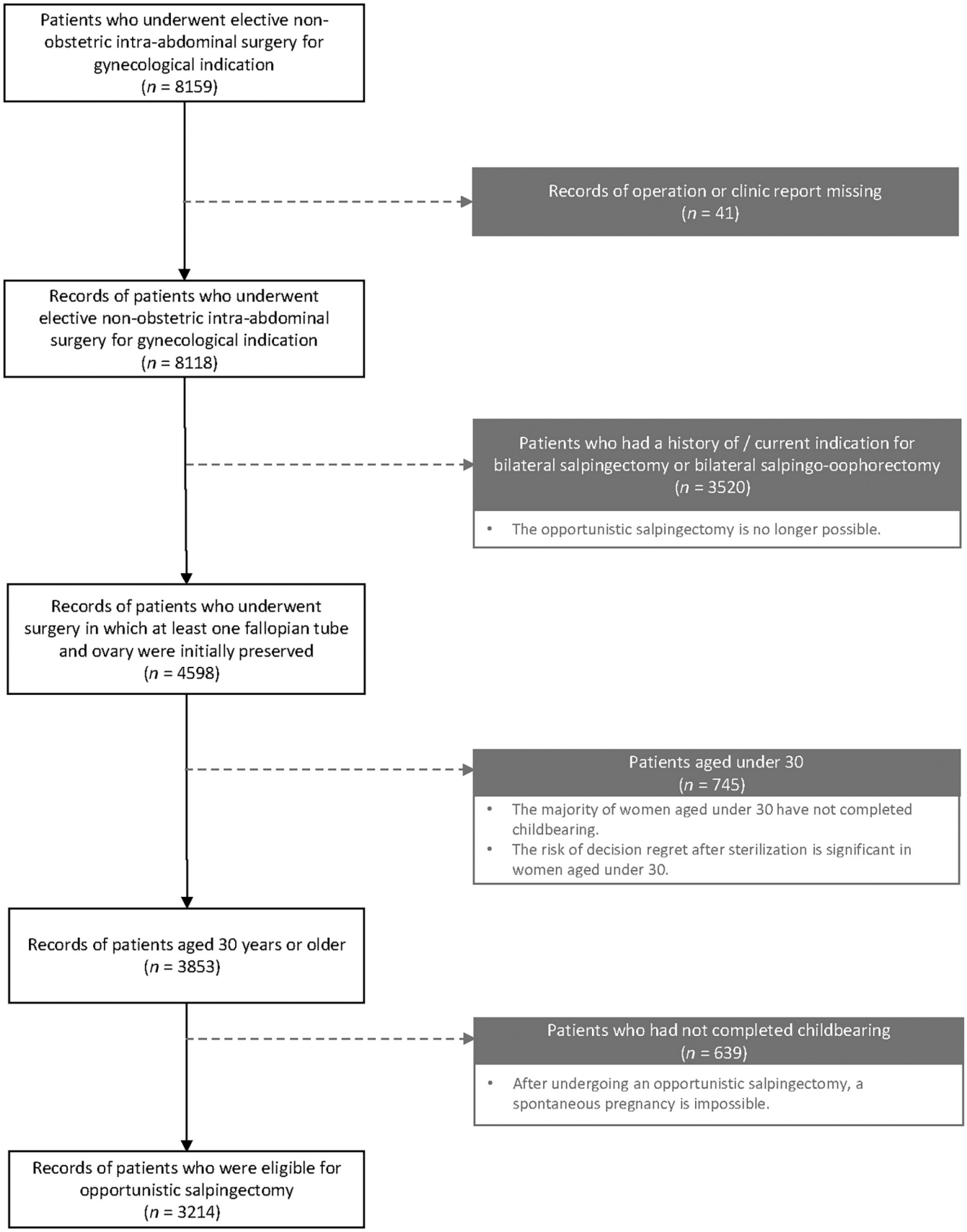

FIGURE 1 Flow chart of inclusion process.

working in an academic hospital. A majority (59%) of the physicians (n = 140) were gynecological residents. All characteristics are presented in Table 1 and detailed physician characteristics are given in Table S1.

3.2 | Clinical practice of OS

From 2015 to 2018, 13.7% (n = 434) of eligible patients were counseled about OS, of which 95.9% opted for OS. Patients who opted against OS underwent mostly sterilization and preferred the usual procedure of tubal ligation (n = 12). Subsequently, 22% (n = 735) of eligible patients underwent OS. OS was unsuccessful in 6.6% due to adhesions (n = 4), deviant anatomy (n = 1), altered intended surgical approach into a vaginal approach (n = 1), and unknown reason (n = 22). Ultimately the success rate of OS was 93.4%.

Our data shows that the most frequently performed surgery was hysterectomy at 62%. In the majority of hysterectomies OS was not performed. The performance rate ranged from 2% in vaginal hysterectomies to 47% in non-vaginal hysterectomies. Examining by age categories, almost half of the patients who underwent hysterectomy were aged between 30 and 39 years. This age category also showed the highest counseling and performance rates, 23% and 36% respectively (Figure 3).

3.3 | Determinants of OS counseling and performance

Univariable multilevel logistic regression analysis shows that various patient, surgery, physician, and hospital characteristics were associated with the counseling and performance of OS (Table 2). Counseling and performance of OS were particularly more likely in patients who had hysterectomy, oncological surgery, were counseled by a gynecological resident, or had more than three contact moments before surgery. In addition, performance of OS was more likely in patients who were counseled by a physician who subspecialized in oncology. Conversely, counseling and performance of OS were less likely in patients who had pelvic surgery or surgery by vaginal approach. Moreover, OS was less likely in patients counseled by physicians subspecialized in obstetrics or urogynecology. In multilevel multivariable logistic analysis, 32.8% of variance on OS counseling and 21.2% on OS performance could be explained by physician differences. Table S2 provides the results obtained from the multivariable logistic analysis.

3.4 | Uptake of OS

Figure 2 illustrates the increased uptake of OS at the time of various intra-abdominal surgeries from 2015 to 2018. Counseling for OS increased significantly from 2.9% in 2015 to 29.4% in 2018 (overall increase of 26.5%; $p < 0.001$; Figure 2A). In 2018 OS was counseled for in 32% of the women who underwent hysterectomy, and in 38% who underwent sterilization (Figure 2C). Performance of OS increased significantly from 6.9% in 2015 to 44.5% in 2018 (overall increase of 37.6%; $p < 0.001$; Figure 2B). In 2018, OS was performed in 57% of the women who underwent hysterectomy, and in 33% who underwent sterilization (Figure 2D). The uptake of OS differed greatly with regard to surgical approach, with smallest increase of 5% and 7% seen within vaginal approach ($p < 0.001$) (Figure 2E,F).

4 | DISCUSSION

This study shows that implementation of both counseling for and performance of OS significantly increased from January 2015 through December 2018 within Dutch hospitals, without official recommendations concerning OS, such as a national guideline or an implementation strategy. Nonetheless, counseling and performance of OS varied within clinical practice, which could be explained by lack of clear guidelines, and by surgical characteristics as approach and type of surgery, and by physician characteristics as position as a resident and oncological subspecialty.

Our study reflects the uptake of OS within clinical practice from 2015 following the publication of three large cohort studies that showed a risk reduction for ovarian cancer after bilateral salpingectomy.[6,7,20] The increase in OS performance, especially during hysterectomy and sterilization, are in line with previous studies.[21–23] Our findings are likely to be related to the increasing number of societies recommending OS[12] and various studies published showing OS as a safe and feasible prevention method.[22,24,25] However, counseling and performance of OS increased less for other indications of abdominal gynecological surgery. This could be explained by a threshold that physicians may experience to actively counsel fertile patients for definitive contraception as it may lead to decision regret.[26] Additionally, physicians may experience longer consultation time as a barrier for implementation.[27]

In 2018, OS had been counseled for in 29.4% of eligible patients and been performed in 44.5%. Accordingly, at least half of eligible patients did not have the opportunity to opt for OS. This could be a result of the potential risk of OS on earlier onset of menopause, the potential risk of complications due to adhesions or inaccessibility of the fallopian tubes, and lack of skills to perform OS by a vaginal approach.[27,28] Notably, OS was more likely in patients who underwent surgery for oncological indications. This result may be explained by the fact that these patients and physicians are more aware of ovarian cancer risks and therefore have a higher motivation for OS.[29]

A discrepancy of 15.1% was observed between patients in which OS was counseled for and performed. This rather contradictory result may be a result of insufficient medical documentation. Steenbeek et al, showed that the proportion of physicians who discussed OS with patients was greater than the proportion who performed OS.[13] Insufficient medical documentation could be a result of the use of standardized EMR texts or even the lack of consultation time.[30] As a result, probably not all discussions have been reported, causing an underestimation of the percentage of patients who have been counseled on OS but opted against it.

TABLE 1 Counseling and performance of opportunistic salpingectomy (OS) by hospital, patient, surgery, and physician characteristics

Characteristics	OS counseled	OS not counseled	*p* value	Total	OS performed	OS not performed	*p* value	Total
Eligible surgeries	440 (15.3)	2431 (84.7)		2871 (100)	735 (22.8)	2479 (77.1)		3214 (100)
Hospital characteristics								
Type of hospital			0.795				<0.001	
Academic	168 (14.9)	959 (85.1)		1127 (39.3)	234 (19.2)	987 (80.8)		1221 (38.0)
Teaching	117 (15.2)	655 (84.8)		772 (26.9)	238 (26.3)	666 (73.7)		904 (28.1)
Non-teaching	155 (15.9)	817 (84.1)		972 (33.9)	263 (24.2)	826 (75.8)		1089 (33.9)
Patient characteristics								
Age (years)			<0.001				0.01	
30–39	141 (16.1)	736 (83.9)		877 (30.5)	206 (21.4)	757 (78.6)		963 (30.0)
40–49	232 (18.6)	1018 (81.4)		1250 (43.5)	404 (28.0)	1037 (72.0)		1441 (44.8)
50–59	63 (14.9)	361 (85.1)		424 (14.8)	105 (22.2)	368 (77.8)		473 (14.7)
≥60	4 (1.3)	316 (98.8)		320 (11.1)	20 (5.9)	317 (94.1)		337 (10.5)
Pregnancy and/or childbirth			<0.001				<0.001	
Yes	329 (14.2)	1984 (85.8)		2313 (80.6)	556 (21.6)	2020 (78.4)		2576 (80.1)
No	70 (23.8)	224 (76.2)		294 (10.2)	113 (32.8)	231 (67.2)		344 (10.7)
Missing	41 (15.5)	223 (84.5)		264 (9.2)	66 (22.4)	228 (78.4)		294 (9.1)
History of intra-abdominal surgery			0.006				0.007	
None	218 (16.0)	1143 (84.0)		1361 (47.4)	371 (24.2)	1165 (75.8)		1536 (47.8)
1	102 (12.4)	718 (87.6)		820 (28.6)	173 (19.1)	732 (80.9)		905 (28.2)
2	57 (16.3)	292 (83.7)		349 (12.2)	88 (23.0)	295 (77.0)		383 (11.9)
3	25 (18.5)	110 (81.5)		135 (4.7)	47 (29.6)	112 (70.4)		159 (4.9)
>3	9 (10.5)	77 (89.5)		86 (3.0)	18 (18.9)	77 (81.1)		95 (3.0)
Missing	29 (24.2)	91 (75.8)		120 (4.2)	38 (27.9)	98 (72.1)		136 (4.2)
Oncological disease in history			0.381				0.597	
Yes	21 (15.0)	119 (85.0)		140 (4.9)	40 (25.0)	120 (75.0)		160 (5.0)
No	397 (15.1)	2224 (84.9)		2621 (91.3)	663 (22.6)	2266 (77.4)		2929 (91.1)
Missing	22 (20.0)	88 (80.0)		110 (3.8)	32 (25.6)	93 (74.4)		125 (3.9)

TABLE 1 (Continued)

Characteristics	OS counseled	OS not counseled	*p* value	Total	OS performed	OS not performed	*p* value	Total
Ovarian cancer in family history			0.001				0.001	
Yes	9 (37.5)	15 (62.5)		24 (0.8)	11 (40.7)	16 (59.3)		27 (0.8)
No	49 (11.7)	370 (88.3)		419 (14.6)	76 (16.9)	373 (83.1)		449 (14.0)
Missing	382 (15.7)	2046 (84.3)		2428 (84.6)	648 (23.7)	2090 (76.3)		2738 (85.2)
Surgery characteristics								
Year of surgery			<0.001				<0.001	
2015	21 (3.0)	677 (97.0)		698 (24.3)	51 (6.9)	683 (93.1)		734 (22.8)
2016	75 (9.3)	730 (90.7)		805 (28.0)	143 (16.2)	741 (83.8)		884 (27.5)
2017	112 (15.5)	611 (84.5)		723 (25.2)	190 (23.5)	618 (76.5)		808 (25.1)
2018	232 (36.0)	413 (64.0)		645 (22.5)	351 (44.5)	437 (55.5)		788 (24.5)
Surgical approach			<0.001				<0.001	
Laparotomic	46 (19.8)	186 (80.2)		232 (8.1)	104 (35.1)	190 (66.9)		294 (9.1)
Laparoscopic	380 (20.4)	1484 (79.6)		1864 (64.9)	617 (28.9)	1519 (71.1)		2136 (66.5)
Vaginal	14 (1.8)	761 (98.2)		775 (27.0)	14 (1.8)	770 (98.2)		784 (24.4)
Pelvic floor surgery			<0.001				<0.001	
Yes	6 (1.4)	421 (98.6)		427 (14.9)	34 (7.5)	422 (92.5)		456 (14.2)
No	434 (17.8)	2010 (82.2)		2444 (85.1)	701 (25.4)	2057 (74.6)		2758 (85.8)
Type of indication			<0.001				<0.001	
Oncologic	36 (35.0)	67 (65.0)		103 (3.6)	96 (58.2)	69 (41.8)		165 (5.1)
Benign	404 (14.6)	2364 (85.4)		2768 (96.4)	639 (21.0)	2410 (79.0)		3049 (94.9)
Type of surgery			<0.001				<0.001	
Hysterectomy	319 (18.9)	1370 (81.1)		1689 (58.8)	607 (30.2)	1395 (69.7)		2002 (62.3)
Sterilization	86 (15.0)	486 (85.0)		572 (19.9)	80 (13.8)	500 (86.2)		580 (18.0)
Myomectomy	0 (0.0)	12 (100.0)		12 (0.4)	0 (0.0)	13 (100.0)		13 (0.4)
Sacrospinous fixation	0 (0.0)	65 (100.0)		65 (2.3)	2 (3.0)	65 (97.0)		67 (2.1)
Diagnostic/Therapeutic laparoscopy	5 (2.6)	191 (97.4)		196 (6.8)	1 (0.5)	195 (99.5)		196 (6.1)
Oophorectomy (unilateral)	27 (10.3)	234 (89.7)		261 (9.1)	42 (15.1)	236 (84.9)		278 (8.6)
Ovarian cyst removal	1 (1.5)	67 (98.5)		68 (2.4)	0 (0.0)	68 (100)		68 (2.1)
Salpingectomy (unilateral)	2 (25.0)	6 (75.0)		8 (0.3)	7 (70.0)	3 (30.0)		10 (0.3)

(Continues)

TABLE 1 (Continued)

Characteristics	OS counseled	OS not counseled	*p* value	Total	OS performed	OS not performed	*p* value	Total
Number of contacts with patient before surgery			<0.001				<0.001	
1	192 (12.5)	1349 (87.5)		1541 (53.7)	315 (18.7)	1372 (81.3)		1687 (52.5)
2	123 (15.2)	685 (84.8)		808 (28.1)	207 (22.8)	701 (77.2)		908 (28.3)
3	50 (18.8)	216 (81.2)		266 (9.3)	89 (28.9)	219 (71.1)		308 (9.6)
>3	75 (30.1)	174 (69.9)		249 (8.7)	124 (40.8)	180 (59.2)		304 (9.5)
Missing	0 (0.0)	7 (100)		7 (0.2)	0 (0.0)	7 (100)		7 (0.2)
Physician characteristics								
Position			<0.001				<0.001	
Gynecologist	342 (13.9)	2115 (86.1)		2457 (85.6)	597 (21.7)	2155 (78.3)		2752 (85.6)
Gynecological resident	98 (23.7)	316 (76.3)		414 (14.4)	138 (29.9)	324 (70.1)		462 (14.4)
Sub-specialism[a]								
Obstetrics	27 (6.8)	373 (93.3)	<0.001	400 (13.9)	41 (9.7)	381 (90.3)	<0.001	422 (13.1)
Reproductive medicine	32 (10.9)	262 (89.1)	0.022	294 (10.2)	58 (18.0)	265 (82.0)	0.02	323 (10.0)
Urogynecology	65 (7.1)	850 (92.9)	<0.001	915 (31.9)	142 (14.2)	860 (85.8)	<0.001	1002 (31.2)
Benign/minimally invasive surgery	205 (23.1)	684 (76.9)	<0.001	889 (31.0	318 (31.1)	705 (68.9)	<0.001	1023 (31.8)
(focus area) Oncology	181 (23.2)	598 (76.4)	<0.001	779 (27.1)	294 (32.4)	613 (67.6)	<0.001	907 (28.2)
None	107 (21.7)	320 (78.3)	<0.001	427 (14.9)	139 (29.8)	328 (70.2)	<0.001	467 (14.5)
Missing	8 (11.0)	65 (89.0)		73 (2.5)	9 (12.2)	65 (87.8)		74 (2.3)
Work experience as gynecologist			<0.001				<0.001	
None	98 (23.7)	316 (76.3)		414 (14.4)	138 (29.9)	324 (70.1)		462 (14.4)
0–5	108 (15.4)	595 (84.6)		703 (24.5)	143 (18.9)	612 (81.1)		755 (23.5)
6–10	84 (14.7)	489 (85.3)		573 (20.0)	150 (23.2)	497 (76.8)		647 (20.1)
>10	137 (13.1)	907 (86.9)		1044 (36.4)	272 (22.8)	919 (77.2)		1191 (37.1)
Missing	13 (9.5)	124 (90.5)		137 (4.8)	31 (19.6)	127 (80.4)		158 (4.9)

TABLE 1 (Continued)

Characteristics	OS counseled	OS not counseled	*p* value	Total	OS performed	OS not performed	*p* value	Total
Number of surgeries performed each year			<0.001				<0.001	
None	98 (23.7)	316 (76.3)		414 (14.4)	138 (29.9)	324 (70.1)		462 (14.4)
0–50	15 (6.6)	212 (93.4)		227 (7.9)	27 (11.3)	212 (88.7)		239 (7.4)
51–100	104 (17.2)	500 (82.8)		604 (21.0)	152 (22.7)	517 (77.2)		669 (20.8)
101–150	142 (18.4)	629 (81.6)		771 (26.9)	239 (27.1)	643 (72.9)		882 (27.4)
151–200	30 (12.6)	208 (87.4)		238 (8.3)	37 (15.0)	210 (85.0)		247 (7.7)
>200	13 (13.3)	85 (86.7)		98 (3.4)	35 (28.7)	87 (71.3)		122 (3.8)
Missing	38 (7.3)	481 (92.7)		519 (18.1)	107 (18.0)	486 (81.9)		593 (18.5)

Note: Data are median (interquartile range) or *n* (row %).Chi squared test or Mann–Whitney *U*-test was used for *p*-values. Column percentages are reported in the total columns.

[a]The percentages add to more than 100% because several physicians had more than one subspecialty. Chi-squared test was performed per row.

Our findings emphasize that every physician should counsel about OS in eligible patients, and document this. Considering that 96% of the patients in which OS was counseled opted for OS and in 93% OS was performed successfully, this study indicates that patients should be informed and be part of the decision-making process. Risks that should be discussed are the possibility of entering menopause slightly earlier and the fact that physicians can refrain from performing OS if the risks of complications are estimated to be higher during surgery due to adhesions or difficult accessibility of the fallopian tubes. With this information, women can decide for themselves what they should choose. A patient decision aid about OS could contribute to this decision process and its implementation.[27,31]

This study provides a solid foundation for further implementation and reduction of practice variation of OS using a tailored implementation strategy based on associated characteristics using implementation tools such as guidelines and decision aids. Additionally, awareness about OS and its evidence can be increased through education among gynecologists who specialize in gynecological surgery, as these physicians most often counsel eligible patients (62.9%). During implementation, the presence and extent of decision regret after OS should be investigated, as achieving a low decision regret is vital. Moreover, the implementation of and counseling for OS should consistently be updated regarding its intermediate and long-term consequences based on current ongoing trials such as HOPPSA (ClinicalTrials.gov; NCT03045965),[32] SALSTER (ClinicalTrials.gov; NCT0386080), and STOPOVCAyoung (ClinicalTrials.gov; NCT04757922).[33]

A major strength of our study is the determination of the implementation of OS in all abdominal gynecological surgeries, including both benign and oncological indications, in a certain timeframe in representative hospitals. Various national societies recommend discussing OS in women who will undergo abdominal surgery and not only during hysterectomy and sterilization. Especially before thinking about expanding the eligible population for OS beyond gynecology, insight is required into the characteristics associated with implementation of OS during all types of gynecological abdominal surgeries.

Our study population covers only a small proportion of the national eligible patient population. However, we have deliberately chosen this study design using EMRs to determine our primary outcomes and associated characteristics in more detail. Using EMRs we have critically assessed whether a patient was actually a candidate for OS taking into account their medical history and wish to conceive. Patients who were considered eligible for OS may have been slightly underestimated. First, we considered all patients aged under 30 years to be not eligible for OS because their risk of decision regret after sterilization is significantly higher.[17] Nevertheless, these patients could have been eligible for OS because they wished for sterilization or had an indication for hysterectomy, which makes spontaneous pregnancy impossible. Second, we excluded obstetric surgeries including patients who underwent sterilization during cesarean section due to the high level of uncertainty regarding completed childbearing and non-elective surgeries. However, recent studies recommend performing OS during cesarean section because it seems safe and feasible.[18,19]

TABLE 2 Univariable multilevel logistic regression analysis of hospital, patient, surgery, and physician characteristics regarding counseling and performance of opportunistic salpingectomy (OS)

	Counseling for OS	Performance of OS
	OR (95% CI)	OR (95% CI)
Hospital characteristics		
Type of hospital		
Academic	1	1
Teaching	0.5 (0.3–1.0)	0.8 (0.5–1.3)
Non-teaching	0.8 (0.4–1.5)	0.8 (0.5–1.4)
Patient characteristics		
Age (years)		
30–39	1	1
40–49	1.2 (0.9–1.5)	1.4 (1.1–1.7)
50–59	1.0 (0.7–1.5)	1.2 (0.9–1.6)
≥60	0.1 (0.3–0.2)	0.3 (0.2–0.5)
Pregnancy and/or childbirth		
Yes	1	1
No	0.7 (0.5–0.9)	0.7 (0.6–1.0)
History of intra-abdominal surgery		
None	1	1
1	0.7 (0.6–1.0)	0.7 (0.6–0.9)
2	1.0 (0.7–1.4)	0.9 (0.6–1.2)
3	1.1 (0.7–1.9)	1.2 (0.8–1.8)
>3	0.5 (0.2–1.1)	0.7 (0.4–1.2)
Oncological disease in history		
Yes	1	1
No	0.5 (0.3–0.8)	0.6 (0.4–0.9)
Surgery characteristics		
Surgical approach		
Laparotomic	1	1
Laparoscopic	0.9 (0.6–1.4)	0.7 (0.5–0.9)
Vaginal	0.1 (0.0–0.2)	0.0 (0.0–0.1)
Type of indication		
Benign	1	1
Oncological	2.4 (1.4–4.1)	4.5 (3.0–6.9)
Pelvic surgery		
No	1	1
Yes	0.1 (0.0–0.2)	0.3 (0.2–0.5)
Type of surgery		
Hysterectomy	1	1
Sterilization	0.6 (0.4–0.8)	0.3 (0.2–0.4)
Myomectomy	0.0 (0.0–0.0)	0.0 (0.0–0.0
Sacrospinous fixation	0.0 (0.0–0.0)	0.1 (0.0–0.2)
Diagnostic/Therapeutic laparoscopy	0.1 (0.0–0.2)	0.0 (0.0–0.1)
Oophorectomy (unilateral)	0.3 (0.2–0.5)	0.3 (0.2–0.4)
Ovarian cyst removal	0.0 (0.0–0.3)	0.0 (0.0–0.0)
Salpingectomy (unilateral)	1.6 (0.3–9.1)	1.0 (0.2–4.1)
Number of contacts with patient before surgery		
1	1	1
2	1.3 (1.0–1.8)	1.3 (1.1–1.6)
3	1.3 (0.9–2.0)	1.5 (1.1–2.0)
>3	2.3 (1.6–3.3)	2.2 (1.6–3.0)
Physician characteristics		
Position		
Gynecologist	1	1
Gynecological resident	2.1 (1.3–3.4)	1.7 (1.1–2.6)
Sub-specialism[a]		
Obstetrics	0.3 (0.2–0.9)	0.3 (0.2–0.7)
Reproductive medicine	0.6 (0.2–2.0)	0.7 (0.3–2.0)
Urogynecology	0.3 (0.2–0.6)	0.3 (0.2–0.6)
Benign/minimally invasive surgery	1.1 (0.5–2.3)	1.0 (0.6–1.9)
(focus area) Oncology	1.6 (0.9–3.1)	1.9 (1.1–3.3)
Work experience as gynecologist		
None	1	1
0–5	0.2 (0.0–0.4)	0.2 (0.1–0.3)
6–10	0.4 (0.2–0.8)	0.5 (0.3–1.0)
>10	0.9 (0.5–1.7)	1.1 (0.6–1.9)
Number of surgeries yearly performed		
None	1	1
0–50	4.1 (1.1–15.5)	2.1 (0.7–6.4)
51–100	3.8 (1.0–14.6)	2.9 (1.0–8.9)
101–150	3.6 (0.6–20.3)	1.7 (0.3–7.7)
151–200	2.6 (0.3–19.7)	2.6 (0.5–14.7)
>200	5.4 (1.6–18.0)	3.3 (1.2–8.7)

Note: Patient characteristic family history is not reported because more than 20% of such data was missing. Surgery characteristics, year of surgery is not reported due to clinical irrelevance.

[a]The percentages add to more than 100% as several physicians had more than one subspecialty. Univariable multilevel logistic regression was performed per row.

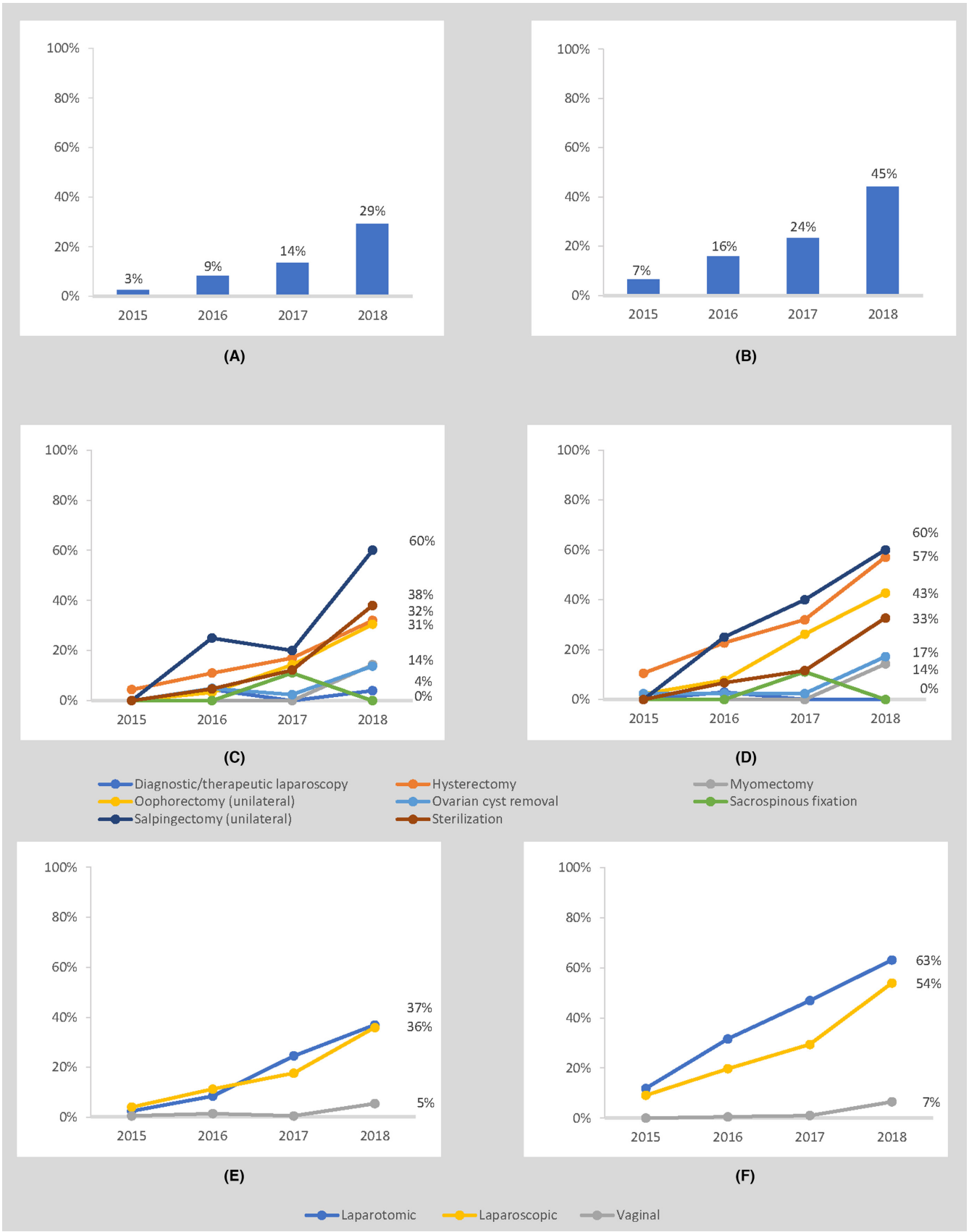

FIGURE 2 Proportion of counseling and performance of opportunistic salpingectomy (OS) within eligible women each year. (A) Total proportion of counseling of OS within eligible women each year; (B) total proportion of performance of OS within eligible women; (C) proportion of OS counseled by surgical type; (D) proportion of OS performed by type of surgery; (E) proportion of OS counseled by surgical approach; (F) proportion of OS performed by surgical approach.

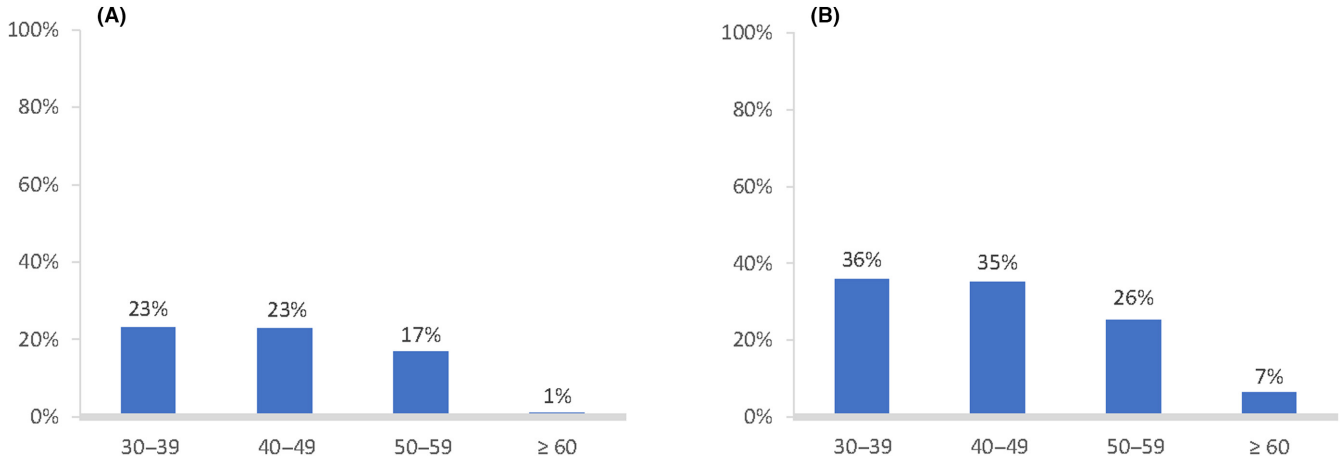

FIGURE 3 Proportion of counseling and performance of opportunistic salpingectomy (OS) in patients who underwent hysterectomy examined by age categories in years. (A) Total proportion of counseling of OS within patients who underwent hysterectomy; (B) total proportion of performance of OS within patients who underwent hysterectomy.

5 | CONCLUSION

The uptake of counseling and performance of OS increased over time. However, the majority of patients who were eligible for OS were not counseled nor did they undergo OS. Implementation of OS varies by patient, surgical, and physician characteristics. Therefore, an implementation strategy tailored to associated characteristics is recommended to improve equality of care for women undergoing gynecologic surgery. This implementation strategy should include national guidelines, counseling material that lists benefits and potential risk of OS, and education to increase awareness of OS and its evidence among physicians.

AUTHOR CONTRIBUTIONS

All authors contributed to the manuscript. MG, RH, JdeH, and JP contributed to the design of the study. MG and VJ conducted the data collection. Data analysis was performed by MG in collaboration with of RA and JiH. MG drafted and edited the manuscript based on revisions of VJ, RA, JiH, BS, AO, AvanG, HN, RH, JdeH, and JP. All authors contributed to the content and format of the manuscript, and have read and approved the final version of the manuscript being submitted for peer review.

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CONFLICT OF INTEREST

The authors have stated explicitly that there are no conflicts of interest in connection with this article.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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