Published in final edited form as:

Fertil Steril. 2012 May ; 97(5): . doi:10.1016/j.fertnstert.2012.02.026.

How members of the Society for Reproductive Endocrinology and Infertility and Society of Reproductive Surgeons evaluate, define, and manage hydrosalpinges

Kenan Omurtag, M.D.^a, Natalia M. Grindler, M.D.^c, Kimberly A. Roehl, M.P.H.^b, Gordon Wright Bates Jr, M.D.^d, Angeline N. Beltsos, M.D.^e, Randall R. Odem, M.D.^a, and Emily S. Jungheim, M.D., M.S.C.I.^a

^aDivision of Reproductive Endocrinology and Infertility, Washington University School of Medicine, St. Louis, Missouri

^bDivision of Clinical Research, Department of Obstetrics and Gynecology, Washington University School of Medicine, St. Louis, Missouri

^cDepartment of Obstetrics and Gynecology, Washington University School of Medicine, St. Louis, Missouri

^dDivision of Reproductive Endocrinology and Infertility, Department of Obstetrics and Gynecology, University of Alabama School of Medicine, Birmingham, Alabama

^eFertility Centers of Illinois, Chicago, Illinois

Abstract

Objective—To describe the management of hydrosalpinges among Society for Reproduction Endocrinology and Infertility (SREI)/Society of Reproductive Surgeons (SRS) members.

Design—Cross-sectional survey of SREI/SRS members.

Setting—Academic and private practice-based reproductive medicine physicians.

Participant(s)—A total of 442 SREI and/or SRS members.

Intervention(s)—Internet-based survey.

Main Outcome Measure(s)—To understand how respondents evaluate, define, and manage hydrosalpinges.

Result(s)—Of 1,070 SREI and SRS members surveyed, 442 responded to all items, for a 41% response rate. Respondents represented both academic and private practice settings, and differences existed in the evaluation and management of hydrosalpinges. More than one-half (57%) perform their own hysterosalpingograms (HSGs), and 54.5% involve radiologists in their interpretation of tubal disease. Most respondents thought that a clinically significant hydrosalpinx on HSG is one that is distally occluded (80.4%) or visible on ultrasound (60%). Approximately one in four respondents remove a unilateral hydrosalpinx before controlled ovarian hyperstimulation (COH)/intrauterine insemination (IUI) and clomiphene citrate (CC)/IUI (29.3%

Copyright ©2012 American Society for Reproductive Medicine, Published by Elsevier Inc.

Reprint requests: Kenan Omurtag, M.D., 4444 Forest Park Ave. Suite 3100, Washington University, St. Louis, MO 63108 (omurtagk@wudosis.wustl.edu).

K.O. has nothing to disclose. N.M.G. has nothing to disclose. K.A.R. has nothing to disclose. G.W.B. has nothing to disclose. A.N.B. is a member of the Speakers Bureaus for Ferring, Merck, and EMD Serono. R.R.O. has nothing to disclose. E.S.J. has nothing to disclose.

and 22.8%, respectively), and physicians in private practice were more likely to intervene (COH: risk ratio [RR] 1.81, 95% confidence interval [CI] 1.31–2.51; CC: RR 1.98, 95% CI 1.33–2.95). Although laparoscopic salpingectomy was the preferred method of surgical management, nearly one-half responded that hysteroscopic tubal occlusion should have a role as a primary method of intervention.

Conclusion(s)—SREI/SRS members define a “clinically significant hydrosalpinx” consistently, and actual practice among members reflects American Society for Reproductive Medicine/SRS recommendations, with variation attributed to individual patient needs. Additionally, one in four members intervene before other infertility treatments when there is a unilateral hydrosalpinx present.

Keywords

Hydrosalpinx; salpingectomy; tubal disease; hysteroscopic tubal occlusion; SREI; ASRM; in vitro fertilization

Although the proposed toxic mechanisms of hydrosalpinges on fertility are not well understood (1), the deleterious effects of hydrosalpinges diagnosed by HSG, ultrasound, or laparoscopy on various IVF outcomes have been documented in several observational studies (2–12) and subsequent meta-analyses (13, 14). The American Society for Reproductive Medicine (ASRM), along with the Society of Reproductive Surgeons (SRS), citing three randomized controlled trials (15–17), recommends salpingectomy or proximal tubal occlusion (PTO) before in vitro fertilization (IVF) in patients with hydrosalpinges to improve pregnancy and live birth rates (18). These studies show that the ongoing pregnancy rate for patients with hydrosalpinges that are managed by laparoscopic salpingectomy or PTO is more than twofold higher than in the nonintervention controls (34% vs. 17%) (18, 19).

Hysterosalpingography (HSG), first described in 1910, is the most common tool used for the evaluation of tubal patency and typically provides the first sign of existing tubal pathology, such as a hydrosalpinx (20, 21). Despite its interobserver variability and sensitivity/specificity regarding interpretation and screening, HSG remains a staple of the initial infertility workup (22–27). Detection of hydrosalpinx by HSG was first described in 1931 and refers to two classifications of hydrosalpinx: “hydrops tubae fallopiae occlusae (distal and proximal occlusion)” and “hydrops tubae fallopiae apertae (only distal occlusion)” (28). Hydrosalpinx, literally “water/swollen tube,” has been defined as “accumulation of serous fluid in the fallopian tube” (29, 30). Another definition of hydrosalpinx refers specifically to the “dilation of the ampullary segment of the tube that accompanies distal obstruction” usually from sequelae of pelvic infection by gonorrhea and/or *Chlamydia* (31).

Much progress has been made in the evaluation, management, and treatment of hydrosalpinges, but some questions remain: “Is a hydrosalpinx that is distally patent clinically significant, warranting removal before any infertility treatment?” “Does ovarian response and pregnancy rate/live birth rate change when salpingectomy is performed, and does the surgical instrument type matter?” “Does hysteroscopic tubal occlusion have a role as a primary method of occlusion in patients with hydrosalpinges?”

To better understand the individual approach to hydrosalpinges by reproductive physicians, we sought to assess current evaluation, definition, and management of hydrosalpinges by surveying practicing Society for Reproduction Endocrinology and Infertility (SREI) and SRS members. We also aimed to compare responses from participants who identify themselves as being in “private” or “academic” practice.

MATERIALS AND METHODS

Participants

This cross-sectional survey (Supplemental Material) was approved by the Washington University Institutional Review Board (IRB). We used the SREI member directory (www.socrei.org)—which links to the ASRM member directory—to identify survey participants. We identified 896 SREI members who described their practice as: “gynecology,” “gynecology/infertility,” “infertility only,” “obstetrics and gynecology,” or “reproductive endocrinology and fertility.” We identified 476 SRS members with the use of the same filters and then manually checked for duplicates, because many SREI members are also SRS members.

We excluded those who did not have an email address listed and SRS members who identified themselves as “urologists.” We excluded 17 members who had nonfunctional - email addresses after a test e-mail. After completion of the survey, respondents were eligible for four \$15 iTunes (Apple) gift cards. Computer-generated randomization of those who had completed the survey was used to pick the winners.

Survey Content

Through expert opinion and literature review, the authors developed a 30-item questionnaire that was piloted at the Midwest Reproductive Symposium meeting held in Chicago, Illinois, in June 2011. The questionnaire focused on four areas: 1) demographics; and 2) evaluation; 3) definition; and 4) management of hydrosalpinges (Supplemental Material).

Survey Distribution

An initial e-mail invitation containing a link to an anonymous Web based survey was sent on October 25, 2011. Reminders were sent on October 31, November 4, and November 8, after which time, we checked for any delivery failures and sent a fourth reminder, using available alternative e-mail addresses, on November 16. E-mails that generated an “out of office” reply were also sent a fourth reminder. The investigators were able to track whether a survey was completed but did not have access to individual participant responses to the survey, therefore protecting respondent anonymity.

Data Analysis

The survey was constructed and implemented using DatStat. Student *t* test and χ^2 analysis were used to compare the continuous variables and differences in proportions. Relative risks were estimated using contingency tables (SPSS v16.1; IBM).

RESULTS

Demographics

Our survey went to 1,070 SREI and SRS members, of which 462 clicked on the survey link (43%) and 442 completed it, for a response rate of 41%. Nearly all respondents were SREI members from the United States (Table 1). We received responses from all but four of the 50 states. Respondents represented both academic (43.2%) and private practice (53%) settings (Table 2).

Evaluation of Tubal Disease

If not done previously, 77% of respondents indicated that they pursue a tubal evaluation at the first infertility visit, with 89.9% using HSG as the primary method of tubal evaluation. Six percent use saline-infusion sonohysterography (SIS) to evaluate tubal patency. Waiting

until the patient was committed to intrauterine insemination (IUI) before proceeding with tubal evaluation was preferred by 11% of the respondents. Overall, 88.3% of respondents performed an HSG before initiating any infertility treatment.

The majority (57.5%) of respondents routinely perform their own HSGs: 62% in a hospital radiology suite and 34.4% in an office and/or ambulatory center. Of those that perform their own HSGs, 38.6% are solely responsible for the interpretation, and a radiologist is involved in the final interpretation 61.4% of the time. When asked “how often do you consult a radiologist regarding HSG findings,” 55.5% of all respondents selected “sometimes” or “always” and 45.5% said “never.”

When asked how to proceed if tubal status was inconclusive on HSG, 61.1% opted to perform a diagnostic laparoscopy (LSC) with chromopertubation, 12.9% would repeat the HSG, 2.7% performed SIS, and 23.3% selected “other.” When examining the comments from those who selected “other” (n = 93), 19% would consider proceeding with infertility treatment, 29% would pursue further imaging (most electing to repeat HSG), and 42% would pursue LSC or tubal cannulation.

Defining “Clinically Significant” Hydrosalpinges

When asked to “select all that apply,” a clinically defined hydrosalpinx, i.e., one that should be removed before IVF, was defined as “on HSG, dilated tube that is distally occluded” by 80.4% of respondents. Similarly, 70% of respondents also selected “on laparoscopy, dilated tube that is distally occluded” as another acceptable definition (Table 3). More than 20% of respondents who defined clinically significant hydrosalpinges in these manners also selected “on HSG, dilated tube with spill” (20.7%) and “on laparoscopy, dilated tube with spill” (26.4%) as part of the defining criteria for hydrosalpinges.

The majority of respondents (62.4%) used transvaginal ultrasound (TVUS) to define a clinically significant hydrosalpinx. Similarly, 60% of respondents defined a “clinically significant” hydrosalpinx as “on TVUS or SIS, visibly dilated tube.” One in five respondents (21.1%) measured the diameter of the hydrosalpinx on TVUS, whereas 78.9% selected “if hydrosalpinx of any size visualized on TVUS, then clinically significant.” Respondents who measured were asked to specify a “clinically significant measurement in millimeters,” and the median diameter reported was 10 mm.

Management of Hydrosalpinges

The majority of respondents (75.3%) reported that their practice did not have a protocol for defining the evaluation and management of hydrosalpinges, whereas 26.5% of respondents reported use of a protocol. When asked to select all of the clinical scenarios in which they would pursue surgical intervention of hydrosalpinges before infertility treatments, 89.3% pursued LSC salpingectomy or PTO before IVF. If a patient has a unilateral hydrosalpinx, 29.3% of respondents perform salpingectomy or LSC PTO before treatment with controlled ovarian hyperstimulation (COH)/IUI and 22.8% before clomiphene citrate (CC)/IUI. Alternatively, 90.5% of respondents selected “no” when asked if they would perform a unilateral salpingectomy or PTO and then recommend timed intercourse (for a short period).

The most common method of managing hydrosalpinges was LSC salpingectomy (80%) or LSC PTO (14%), with the majority of respondents using bipolar energy (Table 4). Many respondents (70.1%) reserved PTO for high risk patients such as those with a history of multiple surgeries, severe adhesive disease, Crohn's disease, or similar pathology. Although 1.9% of respondents selected hysteroscopic tubal occlusion as their primary method of managing hydrosalpinges, 33.1% of respondents used it on high-risk patients. When asked, “Do you think that hysteroscopic tubal occlusion has a role as a primary method of

management for hydrosalpinges regardless of whether the patient is high risk or not,” 53.1% said “No” and 46.9% said “Yes.” Finally, 77.3% of respondents said “Yes” when asked if “potential damage to ovarian collateral blood flow influences your surgical approach/instrument selection when managing hydrosalpinges.”

Differences in practice setting may also play a role in the management of hydrosalpinges. Bivariate analyses revealed that respondents who perform their own HSGs and describe their setting as “private practice” are more likely to perform HSGs either in their office or in an ambulatory center/imaging center than those who identified their practice setting as “academic” (RR 2.68, 95% CI 1.77–4.06; $P < .01$). Respondents who described their setting as “private practice” and who performed their own HSGs were less likely to rely on radiologists for HSG interpretation than those who identified themselves as academic providers (RR 0.55, 95% CI 0.44–0.67; $P < .01$). However, there was no difference in the utilization of radiology consultation when interpreting HSGs among our survey respondents (RR 1.18, 95% CI 0.96–1.46; $P = .1$).

Private practitioners were twice as likely to define a hydrosalpinx as a distally occluded tube on HSG than academic-based providers (RR 1.90, 95% CI 1.14–3.17; $P < .01$). Furthermore, they were more likely to respond that they would remove a hydrosalpinx before COH or CC/IUI than their academic counterparts (RR 1.81, 95% CI 1.31–2.51; $P < .01$; RR 1.98, 1.33–2.95; $P < .01$; respectively). Private practitioners were also more likely to respond that they remove unilateral hydrosalpinges and allow a period of timed intercourse before starting any treatments in certain patients (RR 1.96 95% CI 1.03–3.75; $P = .03$).

DISCUSSION

Our survey identified variations in the evaluation, interpretation, and management of hydrosalpinges among SREI/SRS members. Although ASRM/SRS Practice Committee guidelines “are not intended to dictate an exclusive course of treatment,” surveying the membership provides insight into current practice. Furthermore, potential ambiguities in Practice Committee guidelines can be identified, providing opportunities for future clarity.

Fifteen years ago, 96% of reproductive endocrinologists in the United States used HSG in the evaluation of primary infertility (21). Presently, although the overwhelming majority of SREI members use HSG, other techniques, such as SIS, are being incorporated. More than one-half of the SREI/SRS membership routinely perform their own HSG, but still involve a radiologist in the final interpretation of the study; this is likely due to the majority of participants performing HSGs in hospital radiology suites, where radiologists are responsible for formally interpreting all studies performed. Even among members who do not perform their own HSGs, more than one-half consult a radiologist “sometimes” or “always.” Differences in HSG interpretation between radiologists and reproductive endocrinologists was frequently commented on by survey respondents, and although we did not survey radiologists, the literature suggests that differences do exist (23). Ultimately, these findings highlight the role that radiologists have in the performance and interpretation of these studies.

This discrepancy raises two obvious, yet perhaps overlooked, issues in ensuring quality control in the infertility evaluation: 1) Clinicians, whether or not they perform the HSG, should review each patient's films; and 2) clinicians should discuss critical elements of the HSG with the radiologists that perform and/or interpret the majority of referral studies to optimize consistency in interpretation and improve quality of imaging and patient care (31–33). These elements include instrumentation, cavity evaluation, side labeling, and different fill/spill views.

Many patients are referred to infertility clinics with a clear infertility diagnosis (e.g., anovulatory cycles or male factor) without a tubal evaluation. Additionally, many patients may not have insurance coverage for an HSG and preferentially spend resources on treatment. Individualization of management with consideration of patient history, finances, and overall treatment goals was a recurring theme among respondents regarding dealing with inconclusive HSG findings. Although the majority of respondents would either repeat imaging or surgically evaluate the tubes, one in five opted for empiric treatment, emphasizing the highly individualized approach to infertility patients.

The respondents overwhelmingly agreed that a distally occluded hydrosalpinx warrants intervention when evaluated by HSG or LSC. Interestingly, one in four respondents also thought that the mere presence of a hydrosalpinx regardless of patency warrants surgical intervention. No prospective trial has been performed with the aim of clarifying the optimal management of patients with patent hydrosalpinges, and such a study could better guide clinical management.

It is possible, however, that the studies cited above included patients with patent hydrosalpinges. A review of the inclusion criteria in the studies cited by the ASRM/SRS Practice Committee suggests several points worth noting when defining a “clinically significant hydrosalpinx,” defined here as one that warrants surgical intervention prior to IVF. First, the studies that evaluate the effect of hydrosalpinges on outcomes after IVF vary in their inclusion criteria. Six retrospective studies (2, 5, 8, 12, 15, 16) and two randomized controlled trials (RCTs) (15, 16) use the “presence of hydrosalpinx on laparoscopy or HSG” without specifically defining a hydrosalpinx as a distally occluded dilated tube, while four retrospective studies (4, 9, 11, 17) and one RCT (34) defined it as such. Many of these studies also evaluated the outcome when the hydrosalpinx was seen on ultrasound.

An accurate consistent definition of hydrosalpinx is highly clinically significant, and including the presence or absence of spill on HSG during chromopertubation is essential in future studies. Although inclusion criteria were not specific to presence of spill in several of the studies cited above, it remains unknown whether surgical intervention in patients with patent dilated tubes improves pregnancy outcomes before IVF. Recommendations for surgical intervention of a hydrosalpinx are highly individualized, but presence on ultrasound warrants strong consideration for surgical intervention, and concurrent distal tubal occlusion represents the strongest recommendation for intervention before IVF.

If there was ambiguity regarding the presence of a clinically significant hydrosalpinx, some respondents commented that salpingectomy or PTO could be withheld before the first IVF cycle and performed afterward if there was no ongoing pregnancy, assuming embryo quality was normal. Although this is unlikely to be a routine practice, one can understand that a patient with insurance coverage for IVF whose insurance does not cover a surgical intervention might opt for this treatment plan. Ultimately, discerning whether a dilated patent tube is compromising one's ability to conceive remains challenging, and current data do not completely answer this question. Patients should be counseled on all options, based on a variety of factors, including patient history and treatment goals.

Another area of interest is the effect of hydrosalpinges on pregnancy rates after spontaneous conception or IUI. The detrimental effects of hydrosalpingeal fluid on implantation (e.g., flushing embryos out of the cavity or toxins within the fluid disrupting endometrial receptivity) are likely not unique to patients undergoing IVF (1, 35). Not surprisingly, many respondents remove hydrosalpinges before IUI and occasionally before any treatment permitting timed intercourse after unilateral salpingectomy.

Another concern raised in our survey was the effect of salpingectomy on ovarian response. The majority of respondents answered “yes” when asked if this concern would influence operative plans. A recent report and review of the literature shows mixed results on the effect of salpingectomy on ovarian response (36, 37). Although some studies show an effect on ovarian response, most do not examine pregnancy or live birth rate, likely owing to the large number of patients needed to detect a statistically significant difference. Regardless, respondents are concerned about damage to collateral blood flow, which may influence their surgical approach and/or instrument selection when managing hydrosalpinges.

Almost one-half of the respondents thought that there was a role for hysteroscopic tubal occlusion as a primary intervention for hydrosalpinges. Assuming equal efficacy, we think that cost-effectiveness analysis would favor it over other surgical interventions, owing to its low cost and need for minimal anesthesia; however, the 3–6-month wait time for occlusion to occur and the need for follow-up imaging to confirm occlusion may be impediments for some. Although respondents reserve this treatment for patients with severe adhesive disease that might complicate laparoscopy, momentum toward a noninferiority trial continues to build (38–45). Most experience with hysteroscopic tubal occlusion before IVF is with nickel-titanium microinsert coils that are noninflammatory, and although fewer are recommended to be left exposed when embryo transfer is planned (46), concerns about a potential detrimental effect on implantation and embryo growth remain. Tissue encapsulation of coils begins soon after placement but is rarely complete within 1 year (41, 46). A new silicone microinsert is now available, but experience in this setting is currently limited.

There are some limitations to this study. Although our response rate was low (41%), this is higher than a recent survey of reproductive endocrinologists (47). We identified 17 incorrect e-mail addresses, and it is impossible to know how many messages went to “junk” or “spam” and/or were never seen by the intended recipient, thus increasing the response rate. Finally, qualifying the 1,070 individuals beyond their SREI/SRS status would better determine the adequacy of our sample population. Specifically, asking about board certification status and surgical volume may have better qualified the cohort and should be included with future questionnaires. Nonetheless, we think that our responses represent a diverse group of providers, practicing throughout the United States in a variety of settings (academic, private, volume, etc.), and that our respondents are a reasonable cross-section of the SREI and SRS membership. Finally, the present study aimed to describe common practice patterns in the management of hydrosalpinges by reproductive endocrinologists; however, it a recent protocol using laparoscopic neosalpingostomy for management of mild cases of hydrosalpinx merits acknowledgment, because 3% of survey respondents described the use of such an intervention (48).

Ultimately, our survey brings attention to the management of hydrosalpinges by SREI/SRS members across the United States and interestingly, our responses on the management of hydrosalpinges do not differ from our colleagues abroad (49). Our findings elucidate how members evaluate, define, and manage hydrosalpinges and offer new areas for study. The use of hysteroscopic tubal occlusion may offer reduced cost and convenience, but further study is needed to determine its utility in this setting and its cost-effectiveness. The benefit of surgical intervention for a dilated distally occluded fallopian tube is well supported. When a hydrosalpinx is present in the setting of tubal patency, the benefits are not as clear, and future studies should account for patency when studying the effects of hydrosalpinges. Finally, clinicians should personally review any tubal imaging before determining management, and recommendations for intervention should be based on patient treatment goals and individual patient history.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

The authors thank Barry Behr, Ph.D., and William Kearns, Ph.D., co-chairs of the 2011 Midwest Reproductive Symposium, for allowing us to pilot our survey among the attendees. The authors also thank the attendees of the conference who filled out the survey and provided valuable feedback.

Supported by grants 5T32HD040135-10 (K.O.) and K12HD063086 (E.S.J.) from the National Institutes of Health (NIH), Bethesda, Maryland. The contents of this work are the responsibility of the authors and do not necessarily represent the official views of the NIH.

REFERENCES

1. Strandell A. Treatment of hydrosalpinx in the patient undergoing assisted reproduction. *Curr Opin Obstet Gynecol.* 2007; 19:360–365. [PubMed: 17625419]
2. Akman MA, Garcia JE, Damewood MD, Watts LD, Katz E. Hydrosalpinx affects the implantation of previously cryopreserved embryos. *Hum Reprod.* 1996; 11:1013–1014. [PubMed: 8671381]
3. Andersen AN, Yue Z, Meng FJ, Petersen K. Low implantation rate after in-vitro fertilization in patients with hydrosalpinges diagnosed by ultrasonography. *Hum Reprod.* 1994; 9:1935–1938. [PubMed: 7844229]
4. Blazar AS, Hogan JW, Seifer DB, Frishman GN, Wheeler CA, Haning RV. The impact of hydrosalpinx on successful pregnancy in tubal factor infertility treated by in vitro fertilization. *Fertil Steril.* 1997; 67:517–520. [PubMed: 9091340]
5. de Wit W, Gowrising CJ, Kuik DJ, Lens JW, Schats R. Only hydrosalpinges visible on ultrasound are associated with reduced implantation and pregnancy rates after in-vitro fertilization. *Hum Reprod.* 1998; 13:1696–1701. [PubMed: 9688415]
6. Fleming C, Hull MG. Impaired implantation after in vitro fertilisation treatment associated with hydrosalpinx. *Br J Obstet Gynaecol.* 1996; 103:268–272. [PubMed: 8630313]
7. Kassabji M, Sims JA, Butler L, Muasher SJ. Reduced pregnancy outcome in patients with unilateral or bilateral hydrosalpinx after in vitro fertilization. *Eur J Obstet Gynecol Reprod Biol.* 1994; 56:129–132. [PubMed: 7805964]
8. Katz E, Akman MA, Damewood MD, Garcia JE. Deleterious effect of the presence of hydrosalpinx on implantation and pregnancy rates with in vitro fertilization. *Fertil Steril.* 1996; 66:122–125. [PubMed: 8752622]
9. Sharara FI, Scott RT Jr, Marut EL, Queenan JT Jr. In-vitro fertilization outcome in women with hydrosalpinx. *Hum Reprod.* 1996; 11:526–530. [PubMed: 8671259]
10. Shelton KE, Butler L, Toner JP, Oehninger S, Muasher SJ. Salpingectomy improves the pregnancy rate in in-vitro fertilization patients with hydrosalpinx. *Hum Reprod.* 1996; 11:523–525. [PubMed: 8671258]
11. Vandromme J, Chasse E, Lejeune B, van Rysselberge M, Delvigne A, Leroy F. Hydrosalpinges in in-vitro fertilization: an unfavourable prognostic feature. *Hum Reprod.* 1995; 10:576–579. [PubMed: 7782435]
12. Wainer R, Camus E, Camier B, Martin C, Vasseur C, Merlet F. Does hydrosalpinx reduce the pregnancy rate after in vitro fertilization? *Fertil Steril.* 1997; 68:1022–1026. [PubMed: 9418691]
13. Camus E, Poncelet C, Goffinet F, Wainer B, Merlet F, Nisand I, Philippe HJ, et al. Pregnancy rates after in-vitro fertilization in cases of tubal infertility with and without hydrosalpinx: a meta-analysis of published comparative studies. *Hum Reprod.* 1999; 14:1243–1249. [PubMed: 10325271]
14. Zeyneloglu HB, Arici A, Olive DL. Adverse effects of hydrosalpinx on pregnancy rates after in vitro fertilization–embryo transfer. *Fertil Steril.* 1998; 70:492–499. [PubMed: 9757878]
15. Dechaud H, Daures JP, Arnal F, Humeau C, Hedon B. Does previous salpingectomy improve implantation and pregnancy rates in patients with severe tubal factor infertility who are undergoing

- in vitro fertilization? A pilot prospective randomized study. *Fertil Steril*. 1998; 69:1020–1025. [PubMed: 9627287]
16. Kontoravdis A, Makrakis E, Pantos K, Botsis D, Deligeoroglou E, Creatsas G. Proximal tubal occlusion and salpingectomy result in similar improvement in in vitro fertilization outcome in patients with hydrosalpinx. *Fertil Steril*. 2006; 86:1642–1649. [PubMed: 17069813]
 17. Strandell A, Waldenstrom U, Nilsson L, Hamberger L. Hydrosalpinx reduces in-vitro fertilization/embryo transfer pregnancy rates. *Hum Reprod*. 1994; 9:861–863. [PubMed: 7929732]
 18. Practice Committee of the American Society of Reproductive Medicine in collaboration with the Society of Reproductive Surgeons. Salpingectomy for hydrosalpinx prior to in-vitro fertilization. *Fertil Steril*. 2008; 90:S66–S68. [PubMed: 19007649]
 19. Johnson N, Van Voorst S, Sowter MC, Strandell A, Mol BW. Surgical treatment for tubal disease in women due to undergo in vitro fertilisation. *Cochrane Database Syst Rev*. 2010 CD002125.
 20. Sanfilippo JS, Yussman MA, Smith O. Hysterosalpingography in the evaluation of infertility: a six-year review. *Fertil Steril*. 1978; 30:636–643. [PubMed: 729824]
 21. Glatstein IZ, Harlow BL, Hornstein MD. Practice patterns among reproductive endocrinologists: the infertility evaluation. *Fertil Steril*. 1997; 67:443–451. [PubMed: 9091328]
 22. Glatstein IZ, Sleeper LA, Lavy Y, Simon A, Amiram A, Palti Z, et al. Observer variability in the diagnosis and management of the hysterosalpingogram. *Fertil Steril*. 1997; 67:233–237. [PubMed: 9022595]
 23. Renbaum L, Ufberg D, Sammel M, Zhou L, Jabara S, Barnhart K. Reliability of clinicians versus radiologists for detecting abnormalities on hysterosalpingogram films. *Fertil Steril*. 2002; 78:614–618. [PubMed: 12215342]
 24. Swart P, Mol BW, van der Veen F, van Beurden M, Redekop WK, Bossuyt PM. The accuracy of hysterosalpingography in the diagnosis of tubal pathology: a meta-analysis. *Fertil Steril*. 1995; 64:486–491. [PubMed: 7641899]
 25. Saunders RD, Shwayder JM, Nakajima ST. Current methods of tubal patency assessment. *Fertil Steril*. 2011; 95:2171–2179. [PubMed: 21457959]
 26. Broeze KA, Opmeer BC, van Geloven N, Coppus SF, Collins JA, den Hartog JE, et al. Are patient characteristics associated with the accuracy of hysterosalpingography in diagnosing tubal pathology? An individual patient data meta-analysis. *Hum Reprod Update*. 2011; 17:293–300. [PubMed: 21147835]
 27. Practice Committee of the American Society of Reproductive Medicine. The role of tubal reconstructive surgery in the era of assisted reproductive technologies. *Fertil Steril*. 2008; 90:S250–S253. [PubMed: 19007640]
 28. Mathieu A. Hydrosalpinx—its visualization by hysterosalpingography. *Cal West Med*. 1931; 35:73–78. [PubMed: 18741851]
 29. Mosby's medical dictionary. 8th ed.. St. Louis, Missouri: Elsevier; 2009.
 30. American Heritage medical dictionary. Boston, Massachusetts: Houghton Mifflin; 2007.
 31. Yoder IC, Hall DA. Hysterosalpingography in the 1990s. *AJR Am J Roentgenol*. 1991; 157:675–683. [PubMed: 1892018]
 32. Baramki TA. Hysterosalpingography. *Fertil Steril*. 2005; 83:1595–1606. [PubMed: 15950625]
 33. Siegler AM. Hysterosalpingography. *Fertil Steril*. 1983; 40:139–158. [PubMed: 6347722]
 34. Strandell A, Lindhard A, Waldenstrom U, Thorburn J, Janson PO, Hamberger L. Hydrosalpinx and IVF outcome: a prospective, randomized multicentre trial in Scandinavia on salpingectomy prior to IVF. *Hum Reprod*. 1999; 14:2762–2769. [PubMed: 10548619]
 35. Mukherjee T, Copperman AB, McCaffrey C, Cook CA, Bustillo M, Obasaju MF. Hydrosalpinx fluid has embryotoxic effects on murine embryogenesis: a case for prophylactic salpingectomy. *Fertil Steril*. 1996; 66:851–853. [PubMed: 8893701]
 36. Orvieto R, Saar-Ryss B, Morgante G, Gemer O, Anteby EY, Meltzer S. Does salpingectomy affect the ipsilateral ovarian response to gonadotropin during in vitro fertilization–embryo transfer cycles? *Fertil Steril*. 2011; 95:1842–1844. [PubMed: 21185019]

37. Almog B, Wagman I, Bibi G, Raz Y, Azem F, Groutz A, et al. Effects of salpingectomy on ovarian response in controlled ovarian hyperstimulation for in vitro fertilization: a reappraisal. *Fertil Steril.* 2011; 95:2474–2476. [PubMed: 21474129]
38. Moses AW, Burgis JT, Bacon JL, Risinger J. Pregnancy after Essure placement: report of two cases. *Fertil Steril.* 2008; 89:724.e9–724.e11. [PubMed: 17543963]
39. Rosenfield RB, Stones RE, Coates A, Matteri RK, Hesla JS. Proximal occlusion of hydrosalpinx by hysteroscopic placement of microinsert before in vitro fertilization– embryo transfer. *Fertil Steril.* 2005; 83:1547–1550. [PubMed: 15866598]
40. Hitkari JA, Singh SS, Shapiro HM, Leyland N. Essure treatment of hydrosalpinges. *Fertil Steril.* 2007; 88:1663–1666. [PubMed: 17490660]
41. Kerin JF, Cattanach S. Successful pregnancy outcome with the use of in vitro fertilization after Essure hysteroscopic sterilization. *Fertil Steril.* 2007; 87:1212.e1–1212.e4. [PubMed: 17343857]
42. Galen DI, Khan N, Richter KS. Essure multicenter off-label treatment for hydrosalpinx before in vitro fertilization. *J Minim Invasive Gynecol.* 2011; 18:338–342. [PubMed: 21420911]
43. Darwish AM, El Saman AM. Is there a role for hysteroscopic tubal occlusion of functionless hydrosalpinges prior to IVF/ICSI in modern practice? *Acta Obstet Gynecol Scand.* 2007; 86:1484–1489. [PubMed: 18027115]
44. Mijatovic V, Veersema S, Emanuel MH, Schats R, Hompes PG. Essure hysteroscopic tubal occlusion device for the treatment of hydrosalpinx prior to in vitro fertilization–embryo transfer in patients with a contraindication for laparoscopy. *Fertil Steril.* 2010; 93:1338–1342. [PubMed: 19147140]
45. Omurtag K, Pauli S, Session D. Spontaneous intrauterine pregnancy after unilateral placement of tubal occlusive microinsert. *Fertil Steril.* 2009; 92:393.e15–393.e7. [PubMed: 19403129]
46. Kerin JF, Munday D, Ritossa M, Rosen D. Tissue encapsulation of the proximal Essure microinsert from the uterine cavity following hysteroscopic sterilization. *J Minim Invasive Gynecol.* 2007; 14:202–204. [PubMed: 17368257]
47. Jungheim ES, Ryan GL, Levens ED, et al. Embryo transfer practices in the United States: a survey of clinics registered with the Society for Assisted Reproductive Technology. *Fertil Steril.* 2009; 94:1432–1436. [PubMed: 19748089]
48. Chanelles O, Ducarme G, Sifer C, hugues JN, Touboul C, Poncelet C. What about conservative surgical management? *Eur J Obstet Gynecol Reprod Biol.* 2011; 159:122–126. [PubMed: 21824716]
49. Hammadieh N, Afnan M, Evans J, Sharif K, Amso N, Olufowobi O. A postal survey of hydrosalpinx management prior to IVF in the United Kingdom. *Hum Reprod.* 2004; 19:1009–1012. [PubMed: 15016787]

TABLE 1

Demographics of survey respondents.

Characteristic	n (%)
Sex	
Male	274 (62.8)
Female	155 (35.6)
Prefer not to answer	7 (1.6)
Country	
USA	413 (94.7)
Practice setting	
In training	21 (4.8)
Private practice	231 (53.0)
Academic/public	82 (18.8)
Academic/private	90 (20.6)
Other	12 (2.8)
Membership	
SREI	245 (56.3)
SREI + SRS	142 (32.6)
SRS	40 (9.2)
Neither	8 (1.8)
Age, y (mean, SD)	50.0 (10.2)
IVF cycles/y, median (range)	300 (10–5,390)
Years in practice (mean, SD)	17.1 (10.6)

Omurtag. How SREI/SRS members manage hydrosalpinges. *Fertil Steril* 2012.

TABLE 2

Geographic distribution of respondents.

Location	n (%)	Location	n (%)
California	45 (10.9)	Missouri	11 (2.7)
New York	38 (9.2)	Ohio	11 (2.7)
Texas	30 (7.3)	Connecticut	10 (2.4)
Florida	24 (5.4)	Colorado	10 (2.4)
Pennsylvania	22 (5.3)	Tennessee	9 (2.0)
Massachusetts	22 (5.3)	Washington	9 (2.0)
Illinois	18 (4.4)	South Carolina	5 (1.2)
Maryland	16 (3.9)	Alabama	4 (1.0)
North Carolina	16 (3.9)	Arizona	4 (1.0)
Michigan	16 (3.8)	Rhode Island	4 (1.0)
New Jersey	15 (3.6)	Washington DC	4 (1.0)
Virginia	14 (3.4)	Oklahoma	4 (1.0)
Georgia	13 (3.2)	Oregon	4 (1.0)

Note: States with <1% of total respondents each: IN, IA, HI, ID, LA, WI, AR, KS, DE, KY, MS, MT, NE, NV, NH, ND, SD, UT, VT, WV.

Omurtag. How SREI/SRS members manage hydrosalpinges. Fertil Steril 2012.

TABLE 3

Defining hydrosalpinges.

Category	Yes		No	
	n	%	n	%
On HSG, dilated tube with spill	354	18.2	79	81.2
On HSG, dilated tube that is distally occluded	348	80.4	85	19.6
On Laparoscopy, dilated tube with spill	84	19.4	349	80.6
On Laparoscopy, dilated tube that is distally occluded	303	70.0	130	30.0
Other	19	4.4	414	95.6

Note: HSG = hysterosalpingography; SUS = saline-infusion sonohysterography; TVUS = transvaginal ultrasound.

Omurtag. How SREI/SRS members manage hydrosalpinges. *Fertil Steril* 2012.

TABLE 4

Instrument choice during surgical intervention of hydrosalpinges.

Instrument	Salpingectomy	PTO
Unipolar	1.6%	2.6%
Bipolar (e.g., Ligasure or Kleppinger)	62.7%	64.4%
High-frequency vibration instrument (e.g., harmonic scalpel)	25.6%	9.6%
Mechanical removal or occlusion (e.g., suture, Endoloop, Filshie clips)	6.5%	16.9%
Other	3.5%	6.6%

Note: PTO = proximal tubal occlusion.

Omurtag. How SREI/SRS members manage hydrosalpinges. *Fertil Steril* 2012.