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Obstetrician-Gynecologist Views of Pregnancy-Related Medication Safety

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Abstract

Background: Medication use among pregnant women is widespread, despite limited evidence about the teratogenicity of most medications. Improved physician-patient communication about pregnancy-related medication safety has been identified as a strategy to address this critical issue; however, little is known about physicians' knowledge, attitudes, and practices that could inform tools for information access and sharing to support such communication. The primary objective of this study is to address gaps in what is known about obstetrician-gynecologist views, practices, and needs related to accessing and sharing pregnancy-related medication safety information with patients.

Materials and Methods: The basis for this study is a nationally representative, randomized survey of 506 practicing obstetrician-gynecologists. The survey was completed by mail or online between October 26, 2015 and May 8, 2016 with a 52% response rate. Data were weighted to population parameters to reduce the risk of potential nonresponse biases. Analyses included univariate distributions and comparisons between physicians in different residency cohorts using all-pairs dependent *t*-tests.

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Disclaimer

All authors acted in a personal capacity. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention (CDC), any other portion of the Government of the United States, National Public Health Information Coalition (NPHIC), Harvard T.H. Chan School of Public Health (HSPH), or SSRS.

Author Disclosure Statement

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Results: Findings point to critical features of obstetrician-gynecologist access and sharing of medication safety information. Obstetrician-gynecologists often retrieve medication safety information during a clinical visit. There is widespread provision of potentially problematic "safe lists" to patients, particularly by younger cohorts, and limited counseling for reproductive-aged patients not actively planning a pregnancy.

Conclusions: To improve clinical care, physician-patient communication may be enhanced with technical and policy solutions, including improved digital information tools for retrieving and discussing information in the clinical setting; evidence-based, written information for physicians to share with patients; and encouragement for counseling all women of reproductive age receiving teratogenic medications.

Keywords

obstetrics and gynecology; medication safety; pregnancy

Introduction

WHILE MEDICATION USE among pregnant women has grown sizably in recent decades,[1–3] little is known about the teratogenic effects of most medications taken by women during pregnancy.[2–5] Ethical and legal challenges related to including pregnant women in drug trials,[6] alongside difficulties in conducting studies that reliably predict teratogenic effects in humans,[6,7] have resulted in a limited evidence base. In turn, this presents challenges for clinical care.[2,8]

While there is certainly need for an improved evidence base, there have been calls to develop strategies that improve clinical decision making in the interim. Tools to support communication between physicians and patients are often recommended in this context.[9–14] Informed physician-patient communication has been found to improve patient understanding of medication safety issues and promote appropriate use of medications during pregnancy.[15] Such communications are important because many patients otherwise rely on the internet and other potentially flawed sources for pregnancy-related medication safety information.[15–18]

To design tools and policies that effectively support communications about pregnancy-related medication safety, there is a need for research concerning physicians' knowledge, attitudes, practices, and needs.[11–13] There are at least three important gaps in what is known.

First, there are not yet data about the context in which physicians seek pregnancy-related safety information. We lack the detailed perspectives of physicians about the circumstances in which relevant information needs arise—including whether they are related to patient requests and how they connect to the patient visit. Such data would give us a picture of when and how physicians need to access pregnancy-related safety information most and how it relates to patient conversations. We also lack a clear picture of which sources physicians rely on for this information and the modes by which they access it. Evidence suggests physicians are increasingly using aggregated online resources to guide clinical decision making in general and are accessing information *via* mobile devices,[19–23] but there is limited evidence

on information-seeking related to pregnancy-related medication safety, specifically, or even medication information more generally.[8,24]

Second, there may be critical gaps in current patient counseling on medication safety. Though some research has found most obstetrician-gynecologists ("OB/GYNs") are counseling their pregnant patients when prescribing medications,[8] it is unclear whether counseling frequency varies across stages of pregnancy or pregnancy planning, and thus whether there are missed opportunities to reach the full spectrum of patients at risk of taking medications during pregnancy who could benefit from counseling.[25]

Third, little is known about whether such counseling routinely involves provision of written materials and what kinds of written materials are utilized. In particular, it is important to explore the use of "safe lists," meaning lists of medications provided or accessible to patients that present certain medications as safe during pregnancy.[26] These have come under criticism as not necessarily evidence-based,[4,9,26] which is concerning—especially if deeming a medication "safe" may encourage its use during pregnancy even if not necessary.[4,9,26]

To provide direction for enhanced information tools and related policy, we analyze data from a nationally representative survey of practicing OB/GYNs. We address questions related to each of the gaps identified above: (1) At what point in the care process do physicians access pregnancy-related medication safety information and to what extent is that prompted by patient requests? (2) What resources are OB/ GYNs using? (3) How often do OB/GYNs counsel patients on medication safety at various stages of pregnancy? (4) How often do OB/GYNs provide safe lists and other related written materials? Because information and communication-related needs and practices in other specialties have been shown to differ across physicians in different age and training cohorts—with younger physicians using more online resources, for example—we examine results to these research questions by cohort and across the population as a whole.[27–30]

Materials and Methods

This study used data from a nationally representative survey of practicing OB/GYNs, conducted by researchers at Harvard T.H. Chan School of Public Health (HSPH, Boston, MA). SSRS (Glen Mills, PA), an independent company, coordinated data collection. A random sample of physicians was obtained from Redi-Data, an official American Medical Association (AMA) database licensee. The sample included those listed as specializing in Obstetrics and Gynecology. For completeness, we also included physicians in the following subspecialties who care for pregnant women or women actively considering getting pregnant: Obstetrics, Gynecology, Maternal and Fetal Medicine, or Reproductive Endocrinology and Infertility. All respondents were screened to ensure they were involved in direct patient care and cared for pregnant women or those actively considering getting pregnant.

All respondents were mailed an initial invitation and were asked to participate in the survey in the mode most comfortable for them: returning a print survey by mail or completing a

parallel electronic online version through a secure website, accessible only *via* a unique password for each respondent. Offering both modes for survey completion facilitated responses and helped to ensure the results were not skewed toward physicians who generally preferred communication through traditional print or digital channels.[31] Survey participation was encouraged through a $20 incentive, noncontingent on participation, and extensive recruitment procedures based upon previous studies with high response rates, particularly among physicians.[32,33] Physicians were randomly assigned to receive a check or cash as part of a methodological experiment within this study (results reported separately).

The survey was conducted from October 26, 2015 to May 8, 2016 and yielded a response rate of 52%. Evidence suggests that the risks of nonresponse bias can be mitigated with weighting to population demographics, and we therefore weighted the data to match distributions of key demographics among the OB/GYN population.[34,35] Demographics included age, gender, race/ethnicity, and geographic region (Appendix Table A1). OB/GYN population parameters were obtained from the 2015 edition of the AMA's Physician Characteristics and Distribution in the United States.[36] In addition, data were weighted to account for survey design characteristics and to account for modes of invitation to ensure that physicians who were able to be contacted by email and thus received additional reminders were not overrepresented. Similarly, data were weighted to ensure no systematic overrepresentation of physicians who were provided different incentive forms (check or cash).

The survey included 46 questions and took ~15 minutes to complete. Questions were designed based on an extensive review of surveys among physicians on related topics and a review of psychometric properties of proposed questions. The draft instrument, including both the online and hardcopy versions, was pretested among OB/GYNs and feedback was incorporated in the final questionnaire. Wording of analyzed questions is in the tables.

Univariate results are grouped in response to four research questions: (1) At what point in the care process do physicians access pregnancy-related medication safety information and to what extent is that prompted by patient requests? (2) What resources are OB/GYNs using? (3) How often do OB/GYNs counsel patients on medication safety at various stages of pregnancy? (4) How often do OB/GYNs provide safe lists and other related written materials? Comparisons of responses between OB/GYNs in different residency cohorts were made using all-pairs dependent *t*-tests that account for the design effect of weighted data. Results with a *p*-value of less than 0.05 were considered statistically significant. All statistics were calculated using survey software Mentor 3.0 (Survox, Inc., San Francisco, CA).

Researchers at HSPH led the study design, questionnaire design, and analysis of de-identified data. Staff at NPHIC and CDC contributed to questionnaire design and provided subject matter expertise. None of these organizations had a direct role in data collection. Given the role of HSPH researchers in working with de-identified data, this study was deemed nonhuman subjects research by the Office of Human Research Administration at HSPH.

Results

Demographics

There were 506 OB/GYNs who responded to the survey. Half were under age 50, including 35% age 40–49 and 15% age 30–39 (Table 1). Nearly a quarter (24%) were 50–59, and a quarter (25%) were over age 60. OB/GYNs were nearly equally men (47%) and women (53%). The majority (70%) were white (non-Hispanic), while 13% were Asian, 10% were black non-Hispanic, 4% were Hispanic, and 1% were American Indian/Alaska Native. A majority (56%) completed residency between 1986 and 2005, over a quarter (26%) from 2006 to 2015, and 17% before 1986. The vast majority (95%) were obstetrician/gynecologists, while the remainder practiced in the other subspecialties.

Points for accessing information during the care process

The vast majority of OB/GYNs (84%) reported looking up pregnancy-related medication safety information during the clinical visit rather than before or after (Table 2). The most common prompts related to immediate clinical concerns, such as a patient who was taking medications becoming pregnant (57%), the need to prescribe a medication the provider has not prescribed before (55%), learning a patient has already taken medication with an insufficient or inconclusive safety profile (53%), or the need to prescribe a medication with an insufficient or inconclusive safety profile (47%). Only 28% of OB/ GYNs said a common reason is that a patient requests such information. There was no difference across OB/GYNs in different residency cohorts with respect to the frequency with which patient requests prompted information seeking.

Approximately 4 in 10 (39%) OB/GYNs said that, when working with patients actively planning a pregnancy, they more commonly raise the subject of pregnancy-related medication safety than these patients, while roughly the same number (44%) said patients and they raise the subject equally often. Just 13% said patients more commonly raise the subject. Findings were similar when asked about working with pregnant patients.

Four in 10 OB/GYNs (42%) said patients were less concerned than they need to be about over-the-counter (OTC) medicines, and more than two-thirds (69%) said patients were less concerned than they need to be about dietary supplements. By contrast, less than a fifth (18%) of OB/GYNs felt patients were less concerned than they need to be about prescription medicines. This general pattern was true across residency cohorts, though the oldest cohort (completed residency before 1986) were more likely to think their patients were insufficiently concerned about prescription medications compared to those who completed residency 1986–2005 (27% vs. 16%), and were more likely to think their patients were insufficiently concerned about OTC medications compared to both younger cohorts (completed residency 1986–2005 or 2006–2015) (52% vs. 42% and 33%).

Information resources used by physicians

OB/GYNs reported seeking pregnancy-related medication safety information largely through online resources that aggregate clinical information and guidelines (Table 2). A majority (64%) named UpToDate as one of their most commonly used resources and 51%

cited the online Physicians' Desk Reference (PDR). Less than a quarter named any other option. Information was largely accessed through mobile technology, with 64% using a mobile app or optimized mobile website. OB/GYNs who completed residency more recently (2006–2015) were more likely than older cohorts (1986–2005 or before 1986) to rely on UpToDate (78% vs. 64% and 43%, respectively) and to access safety information *via* a mobile app or optimized mobile website (78% vs. 61% and 53%, respectively).

Counseling patients at different stages of pregnancy

Most OB/GYNs said they discussed pregnancy-related medication safety with all or most of their patients who were pregnant (88% discussed with patients in the first trimester; 64% with patients in the second or third trimester) or actively planning a pregnancy (79%) (Table 3). OB/GYNs who completed residency more recently (2006–2015) were more likely than older cohorts (1986–2005 or before 1986) to say they discussed pregnancy-related medication safety with all or most of their patients in the second or third trimester (76% vs. 60% each, respectively). Only 28% of all OB/GYNs reported discussing this with all or most patients who were of reproductive age but not pregnant or actively planning a pregnancy.

OB/GYNs reported concern about having enough pregnancy-related medication safety information across all stages of pregnancy. Concern was highest for patients in their first trimester (58% of physicians had "a lot" or "some" concern), and more than 4 in 10 said the same about patients actively planning a pregnancy (47%) or in their second or third trimester (43% each). Roughly a quarter (26%) had "a lot" or "some" concern about this issue for their patients not actively planning a pregnancy but of reproductive age. OB/GYNs who completed residency before 1986 were more likely than younger cohorts (1986–2005 or 2006–2015) to say they had "a lot" or "some" concern about this issue for their patients who were not yet pregnant—both those who were actively planning a pregnancy (62% vs. 45% and 42%, respectively) and those who were not actively planning a pregnancy but of reproductive age (40% vs. 22% and 22%, respectively).

Provision of written materials to patients

Nearly three-quarters (74%) of OB/GYNs indicated their practices distributed or recommended a medication safe list to patients (Table 3). Few provided additional written resources to a majority of their patients: 4 in 10 (39%) said they do not provide or recommend additional written resources to any of their patients and 45% said they do so only for a few or some patients. OB/GYNs who completed residency more recently (2006–2015) were more likely than older cohorts (1986–2005 or before 1986) to use a safe list (86% vs. 75% and 52%, respectively), and were more likely to recommend or provide additional written information beyond safe lists to some/a few patients (56% vs. 44% and 35%, respectively).

Discussion

Findings from this survey provide insights into how OB/ GYNs access and utilize information on pregnancy-related medication safety in working with patients, including how they share such information directly. Results identify opportunities to improve available

resources and information sharing, which could foster enhanced communication with patients and ultimately improve clinical care.

First, findings suggest physicians need resources that allow them to respond to issues in a clinical context and provide time-saving advantages. Results show information on pregnancy-related medication safety is most often retrieved amid the time-limited environment of the clinical visit, and many OB/GYNs use mobile resources. Such findings are understandable in the current environment that encourages many shorter patient visits per day. These findings may also help explain the results showing OB/GYNs, and particularly those in younger cohorts, most commonly turn to aggregated online resources including UpToDate or PDR. Plausibly, such tools eliminate the time needed to check and cross-reference multiple sources. Going forward, it may be important to build or enhance mobile tools that provide time-saving advantages and other features that support retrieval and use of information in the clinical interaction. Additional research may be needed to better understand the preference for and use of these resources to inform refinements.

Second, findings suggest physicians would benefit from improved written materials they could provide to patients as part of their counseling. OB/GYNs reported widespread use of “safe lists”—often as the sole source of written information. Given time constraints, the appeal of safe lists is understandable from both the physician and patient side as a time-saving tool; however, recent research questioning the accuracy and completeness of these lists raises concerns about their use.[4,9,20] Promotion or development of alternative information tools that do not present the same concerns about accuracy and completeness would allow physicians to efficiently share simple, high-quality, information with patients. It may be possible to develop such tools at a national level so the burden does not fall to individual practices. Given that provision of safe lists and other written material was particularly common among OB/GYNs in the youngest cohort, additional research to understand the perspective of these physicians may be important in developing related materials.

Third, because many OB/GYNs felt patients were less concerned than they ought to be about OTC medications and dietary supplements, this may be an area where patients need more information—particularly because use of these medications and dietary supplements during pregnancy is common and can be initiated without physician knowledge.[4,5,6,37] It may be therefore useful for written materials that physicians provide to patients to include information about OTC medications and dietary supplements.

Fourth, findings suggest the need to reiterate the importance of counseling for women of reproductive age who receive teratogenic medications. While OB/GYNs were less concerned overall about patients who are not pregnant or actively looking to become pregnant, advising these patients about medication risks can be important given estimates that nearly half of pregnancies are unplanned.[38] Furthermore, research suggests half of women who receive a teratogenic medication from a health care provider do not receive counseling.[39–42] If many of these women are not receiving counseling from providers who prescribe them, visits with an OB/GYN may be an important opportunity to provide needed counseling. Additional research may be needed to determine whether cues in electronic

medical records or similar approaches are helpful for physicians and increase counseling rates in this population.

Across these findings, differences between younger and older cohorts are notable, including more active use of online resources for younger cohorts, greater reliance on safe lists, and more encouragement of patients to utilize additional information sources. These findings are consistent with other studies about online usage,[27,28,29] and may also reflect the evolving information dynamic between physicians and patients. These findings serve to add emphasis on the recommendations herein.

The study has limitations. First, although the response rate was more than 50% and there was care to weight the data according to best practices, bias is still possible if nonresponders differed in meaningful ways from responders and in ways uncorrelated with standard demographics. In general, one may expect that participants in surveys are more enthusiastic about the topic than nonresponders. Thus, we might consider self-reported estimates of patient counseling to be at their upper bounds. Second, all data were self-reported and may be subject to social desirability bias. The risk of this bias is in the same direction, and thus reinforces the idea that outcomes such as the frequency of counseling patients may be at their upper bounds or overreported. These considerations serve to underscore the conclusions about the need for more counseling in this article. Finally, time has passed between data collection and analysis. While this is unlikely to have affected the overall patterns of physician and patient engagement, it may be that certain trends, such as increases in online usage, for example, are not fully captured. We are unaware of any more recent peer-reviewed articles documenting such trends, and thus this may nonetheless be the best available information. It may also be appropriate to consider online usage estimates as a lower bound and to lean more heavily on findings here related to the younger cohorts in making recommendations for policy and tool development going forward.

Conclusions

Notwithstanding these limitations, this study points to improvements in information access and sharing that can be made to foster enhanced communications about pregnancy-related medication safety information between physicians and patients. Recommendations derived from these results include the following: enhancing digital tools fit for use in the clinical setting, with features that support conversation; promoting, enhancing or developing alternative, high-quality written information tools to provide to patients; addressing information needs around OTC medications and supplements; and encouraging counseling of all women of reproductive age receiving teratogenic medications. These improvements could promote appropriate use of medications during pregnancy and improve outcomes for patients and their infants. Further, they are well-designed to meet the styles of younger physicians particularly, and thus help to anticipate the evolving information landscape and dynamic between physicians and patients. Future research will be needed to develop these recommended tools and policies to ensure the details dovetail with physician and patient preferences.

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Appendix

APPENDIX TABLE A1.

COMPARISON OF WEIGHTED SURVEY RESPONDENT DEMOGRAPHICS TO AMERICAN MEDICAL ASSOCIATION ESTIMATES OF PHYSICIAN DEMOGRAPHICS, OBSTETRICIAN-GYNECOLOGIST SURVEY ON PREGNANCY-RELATED MEDICATION SAFETY INFORMATION, 2015–2016

	Survey respondents, %	AMA, %
Age by gender		
Male, <45	8.2	8.5
Male 45–64	26.7	26.6
Male 65+	11.8	11.5
Female <45	29.8	29.8
Female 45+	23.5	23.6
Race and ethnicity		
White, non-Hispanic	69.8	69.6
Black, non-Hispanic	9.6	9.8
Asian, non-Hispanic	11.4	11.6
Other (including Hispanic)	9.0	9.0
Region		
Northeast	21.9	21.9
North-Central	19.8	19.7
South	36.2	36.3
West	22.2	22.1

AMA, American Medical Association.

References

1. Mitchell AA, Gilboa SM, Werler MM, et al. Medication use during pregnancy, with particular focus on prescription drugs: 1976–2008. Am J Obstet Gynecol 2011;205: 51.e1–e8.
2. Lo WY, Friedman JM. Teratogenicity of recently introduced medications in human pregnancy. Obstet Gynecol 2002;100:465–473. [PubMed: 12220765]
3. Adam MP, Polifka JE, Friedman JM. Evolving knowledge of the teratogenicity of medications in human pregnancy. Am J Med Genet C Semin Med Genet 2011;157:175–182.
4. Werler MM, Mitchell AA, Hernandez-Diaz S, Honein MA. Use of over-the-counter medications during pregnancy. Am J Obstet Gynecol 2005;193:771–777. [PubMed: 16150273]
5. Broussard CS, Louik C, Honein MA, Mitchell AA. Herbaluse before and during pregnancy. Am J Obstet Gynecol 2010;202:441.e1–443.e6.
6. Mitchell AA. Studies of drug-induced birth defects. In: Strom BL, Kimmel SE, Hennessy S, eds. Pharmacoepidemiology, 5th ed. New York: Wiley-Blackwell, 2012:487–504.

7. Mitchell AA. Research challenges for drug-induced birthdefects. Clin Pharmacol Ther 2016;100:26–28. [PubMed: 27037730]
8. Morgan MA, Cragan JD, Goldenberg RL, Rasmussen SA,Schulkin J. Obstetrician–gynaecologist knowledge of and access to information about the risks of medication use during pregnancy. J Matern Fetal Neonatal Med 2010;23: 1143–1150. [PubMed: 20218819]
9. Honein MA, Gilboa SM, Broussard CS. The need for safermedication use in pregnancy. Expert Rev Clin Pharmacol 2013;6:453–455. [PubMed: 23971869]
10. Lagoy CT, Joshi N, Cragan JD, Rasmussen SA. Medication use during pregnancy and lactation: An urgent call for public health action. J Womens Health (Larchmt) 2005;14: 104–109. [PubMed: 15775727]
11. Broussard CS, Frey MT, Hernandez-Diaz S, et al. Developing a systematic approach to safer medication use during pregnancy: Summary of a Centers for Disease Control and Prevention–convened meeting. Am J Obstet Gynecol 2014; 211:208–214.e1. [PubMed: 24881821]
12. Lynch MM, Amoozegar JB, McClure EM, et al. Improving safe use of medications during pregnancy: The roles of patients, physicians, and pharmacists. Qual Health Res 2017;27:2071–2080. [PubMed: 28974142]
13. Lynch MM, Squiers LB, Kosa KM, et al. Making decisions about medication use during pregnancy: Implications for communication strategies. Matern Child Health J 2018;22: 92–100.
14. Riley LE, Cahill AG, Beigi R, Savich R, Saade G. Improving safe and effective use of drugs in pregnancy and lactation: Workshop summary. Am J Perinatol 2017; 34:826–832. [PubMed: 28142152]
15. Koren G, Pastuszak A, Ito S. Drugs in pregnancy. N Engl JMed 1998;338:1128–1137. [PubMed: 9545362]
16. Sayakhot P, Carolan-Olah M. Internet use by pregnant women seeking pregnancy-related information: A systematic review. BMC Pregnancy Childbirth 2016;16:65. [PubMed: 27021727]
17. Bakhireva LN, Young BN, Dalen J, Phelan ST, Rayburn WF. Patient utilization of information sources about safety of medications during pregnancy. J Reprod Med 2011;56:339–343. [PubMed: 21838165]
18. Barnes LAJ, Barclay L, McCaffery K, Aslani P. Complementary medicine products used in pregnancy and lactation and an examination of the information sources accessed pertaining to maternal health literacy: A systematic review of qualitative studies. BMC Complement Altern Med 201831;18:229.
19. Brassil E, Gunn B, Shenoy AM, Blanchard R. Unanswered clinical questions: A survey of specialists and primary care providers. J Med Libr Assoc 2017;105:4–11. [PubMed: 28096740]
20. Clarke MA, Belden JL, Koopman RJ, et al. Information needs and information-seeking behaviour analysis of primary care physicians and nurses: A literature review. Health Inf Libr J 2013;30:178–190.
21. Duran-Nelson A, Gladding S, Beattie J, Nixon LJ. Should we Google it? resource use by internal medicine residents for point-of-care clinical decision making. Acad Med 2013; 88:788–794. [PubMed: 23619072]
22. Egle JP, Smeenge DM, Kassem KM, Mittal VK. The internet school of medicine: Use of electronic resources by medical trainees and the reliability of those resources. J Surg Educ 2015;72:316–320. [PubMed: 25487347]
23. Ellsworth MA, Homan JM, Cimino JJ, Peters SG, Pickering BW, Herasevich V. Point-of-care knowledge-based resource needs of clinicians: A survey from a large academic medical center. Appl Clin Inf 2015;6:305–317.
24. Hughes GJ, Patel P, Mason C. Medical resident choices of electronic drug information resources. J Pharm Pract 2015; 28:280–283. [PubMed: 25134883]
25. Interrante JD, Flores AL. Discussing appropriate medication use and multivitamin intake with a healthcare provider: An examination of two elements of preconception care among Latinas. J Womens Health (Larchmt) 2018;27:348–358. [PubMed: 29077512]
26. Peters SL, Lind JN, Humphrey JR, et al. Safe lists for medications in pregnancy: Inadequate evidence base and inconsistent guidance from web-based information, 2011. Pharmacoepidemiology Drug Saf 2013;22:324–328.

27. Le JV, Pedersen LB, Riisgaard H, et al. Variation in general practitioners' information-seeking behaviour – a cross-sectional study on the influence of gender, age and practice form. Scand J Prim Health Care 2016;34:327–335. [PubMed: 27804315]
28. Bernard E, Arnould M, Saint-Lary O, Duhot D, Hebbrecht G. Internet use for information seeking in clinical practice: A cross-sectional survey among French general practitioners. Int J Med Inform 2012;81:493–499. [PubMed: 22425281]
29. Bynum SA, Malo TL, Lee J, Guiliano AR, Vadaprampil ST. HPV vaccine information-seeking behaviors among US physicians: Government, media, or colleagues? Vaccine 2011;29:5090–5093. [PubMed: 21619906]
30. Brennan N, Edwards S, Kelly N, Miller A, Harrower L, Mattick K. Qualified doctor and medical students' use of resources for accessing information: What is used and why? Health Info Libr J 2014;31:204–214. [PubMed: 25041386]
31. Beebe TJ, Jacobson RM, Jenkins SM, Lackore KA, Rutten LJF. Testing the impact of mixed-mode designs (mail and web) and multiple contact attempts within mode (mail or web) on clinician survey response. Health Serv Res 2018; 53(Suppl 1):3070–3083. [PubMed: 29355920]
32. Tilburt JC, Wynia MK, Sheeler RD, et al. Views of US physicians about controlling health care costs. JAMA 2013; 310:380–388. [PubMed: 23917288]
33. Dillman DA, Smyth JD, Christian LM. Internet, phone, mail, and mixed mode surveys: The tailored design method, 4th ed. Hoboken, NJ: John Wiley & Sons, Inc., 2014.
34. Keeter S, Kennedy C, Dimock M, Best J, Craighill P. Gauging the impact of growing nonresponse on estimates from a national RDD telephone survey. Public Opin Q 2006;70:759–779.
35. Keeter S, Hatley N, Kennedy C, Lau A. What low response rates mean for telephone surveys [Internet]. Washington (DC): Pew Research Center; 2017 May 15 [cited December 6, 2018]. 15 p. Available at: www.pewresearch.org/methods/2017/05/15/what-low-response-rates-mean-for-telephone-surveys Accessed December 6, 2018.
36. American Medical Association. Physician characteristics and distribution in the U.S. 2015 ed. Chicago: American Medical Association, 2015.
37. Louik C, Gardiner P, Kelley K, Mitchell AA. Use of herbal treatments in pregnancy. Am J Obstet Gynecol 2010;202: 439.e1–e10.
38. Finer LB, Zolna MR. Declines in unintended pregnancy in the United States, 2008–2011. N Engl J Med 2016;374: 843–852. [PubMed: 26962904]
39. Schwarz EB, Longo LS, Zhao X, Stone RA, Cunningham F, Good CB. Provision of potentially teratogenic medications to female veterans of childbearing age. Med Care 2010;48:834–842. [PubMed: 20706159]
40. Schwarz EB, Mattocks K, Brandt C, et al. Counseling of female veterans about risks of medication-induced birth defects. J Gen Intern Med 2013;28(Suppl 2):S598–S603. [PubMed: 23807071]
41. Shroff S, McNeil M, Borrero S. An innovative framework to improve teratogenic medication risk counseling. J Midwifery Womens Health 2017;62:353–357. [PubMed: 28485536]
42. Mody SK, Wu J, Ornelas M, et al. Using the electronic medical record to refer women taking category D or X medications for teratogen and contraceptive counseling. Birth Defects Res A Clin Mol Teratol 2015;103:644–647. [PubMed: 26100297]

TABLE 1.

RESPONDENT DEMOGRAPHICS (*N*=506), OBSTETRICIAN-GYNECOLOGIST SURVEY ON PREGNANCY-RELATED MEDICATION SAFETY INFORMATION, 2015–2016

	Proportion, %
Age	
30–39	15
40–49	35
50–59	24
60–69	17
70+	8
Sex	
Male	47
Female	53
Race and ethnicity	
White non-Hispanic	70
Black non-Hispanic	10
Hispanic	4
Asian	13
American Indian/Alaska Native	1
Other	3
Specialty	
Obstetrics and gynecology	95
Gynecology	2
Maternal and fetal medicine	2
Reproductive endocrinology and infertility	1
Obstetrics	<1
Year obstetrics-gynecology residency completed	
Before 1986	17
1986–2005	56
2006–2015	26

TABLE 2.

POINTS FOR ACCESSING INFORMATION DURING THE CARE PROCESS AND INFORMATION RESOURCES USED BY PHYSICIANS, OBSTETRICIAN-GYNECOLOGIST SURVEY ON PREGNANCY-RELATED MEDICATION SAFETY INFORMATION, 2015–2016

		Year obstetrics-gynecology residency completed		
Question and responses	**Total, %**	**(b) Before 1986, %**	**(c) 1986–2005, %**	**(d) 2006–2015, %**
At what point during your interactions with patients do you most often seek out such information?[a]				
While a patient is in the waiting room	5	7	4	5
During a clinical visit	84	81	84	86
After a patient visit	9	7	10	8
Which of the following are the most common reasons you were prompted to look at pregnancy-related safety information?[a]				
A patient taking a medication becomes pregnant	57	50	57	59
You need to prescribe a medication that you have not prescribed frequently before	55	44	59[b]	51
You learn a patient has already taken a medication with insufficient or inconclusive evidence about its safety profile	53	64[cd]	52	50
You need to prescribe a medication with insufficient or inconclusive evidence about its safety profile	47	47	44	55
A patient requests such information	28	26	31	25
You routinely review safety information about drugs you prescribe	15	15	11	22[c]
You learn from colleagues or journals there is new pregnancy-related safety information, such as research or guidelines	15	12	14	19
You need to prescribe a medication new to the market or licensed for a new indication	9	13[d]	10	4
When you are working with patients actively planning a pregnancy, would you say...?[e]				
Your patients more commonly raise subject of pregnancy-related medication safety	13	8	14	14
You more commonly raise subject of pregnancy-related medication safety	39	43	48	40
Both raise subject equally often	44	41	44	46
When working with pregnant patients, would you say...?[e]				
Your patients more commonly raise subject of pregnancy-related medication safety	16	9	18[b]	14
You more commonly raise subject of pregnancy-related medication safety	36	41	33	41
Both raise subject equally often	44	40	45	44
In general, how concerned are your patients about the pregnancy-related safety risks of...?[a]				
Prescription medications				
More concerned than they need to be	35	26	34	41[b]

Question and responses	Total, %	Year obstetrics-gynecology residency completed		
		(b) Before 1986, %	(c) 1986–2005, %	(d) 2006–2015, %
About as concerned as they need to be	46	44	49	41
Less concerned than they need to be	18	27[c]	16	18
Over-the-counter medications				
More concerned than they need to be	30	15	30[b]	38[b]
About as concerned as they need to be	28	30	27	29
Less concerned than they need to be	42	52[d]	42	33
Dietary supplements (*e.g.*, vitamins, herbal supplements)				
More concerned than they need to be	10	8	11	9
About as concerned as they need to be	20	24	20	18
Less concerned than they need to be	69	66	68	73
When you need to find pregnancy-related medication safety information, which of the following sources do you most commonly go to?[af]				
UpToDate	64	43	64[b]	78[bc]
Online drug reference manual (Physicians' Desk Reference/PDR)	51	48	52	50
Books	23	23	24	21
Pharmaceutical websites	17	16	17	16
Published literature in journals	16	26[cd]	16	11
FDA website	14	15	15	12
Pharmacists	13	12	15	8
Physician colleagues	13	16	12	12
CDC	13	14	11	13
Professional organizations	10	7	8	18
Are you getting information from any of these sources *via*…?[a]				
...mobile app or optimized mobile website?	64	53	61	78[bc]

Responses were weighted to account for survey design characteristics and poststratified to match population distributions of age, gender, race/ethnicity, and geographic region.

[a]Responses not shown: never looked at pregnancy-related medication safety information in the past (<4%); refused/no answer (<3%).

[bcd]Corresponds to columns b, c, and d. bcd Percentage is statistically greater than the group(s) noted in superscript.

[e]Responses not shown: do not discuss pregnancy-related medication safety information with these patients (<3%); not applicable (<5%); refused/no answer (<5%).

[f] Sources mentioned by <10% of total respondents not shown here.

CDC, Centers for Disease Control and Prevention; FDA, Food and Drug Administration.

TABLE 3.

COUNSELING PATIENTS AT DIFFERENT STAGES OF PREGNANCY AND PROVISION OF WRITTEN MATERIALS TO PATIENTS, OBSTETRICIAN-GYNECOLOGIST SURVEY ON PREGNANCY-RELATED MEDICATION SAFETY INFORMATION, 2015–2016

		Year obstetrics-gynecology residency completed		
Question and responses	**Total, %**	**(a) Before 1986, %**	**(b) 1986–2005, %**	**(c) 2006–2015, %**
For what fraction of your patients who are in each of the following categories do you discuss pregnancy-related medication safety? [All/Most]				
Not actively planning a pregnancy, but of reproductive age	28	31	28	36
Actively planning a pregnancy	79	81	79	78
In the first trimester	88	82	88	94[a]
In the second or third trimester	64	60	60	76[ab]
How concerned are you personally about not having enough pregnancy-related medication safety information for your patients who are...? [A lot/Some]				
Not actively planning a pregnancy, but of reproductive age	26	40[bc]	22	22
Actively planning a pregnancy	47	62[bc]	45	42
In the first trimester	58	68[b]	55	57
In the second or third trimester	43	49	41	43
Does your practice provide pregnant patients with a written “safe list” for medications or refer them to a specific “safe lists” online?[d]				
Uses safe list	74	52	75[a]	86[ab]
Does not use safe list	22	42[bc]	19	12
For what fraction of your patients do you recommend or provide additional written information about pregnancy-related medication safety (beyond “safe lists”)?[d]				
All/Most	15	17	14	17
Some/Few	45	35	44	56[ab]
None	39	46[c]	42[c]	27

Responses were weighted to account for survey design characteristics and poststratified to match population distributions of age, gender, race/ethnicity, and geographic region.

[abc]Corresponds to columns a, b, and c. [abc]Percentage is statistically greater than the group(s) noted in superscript.

[d]Responses not shown: Don’t know (<6%); refused/no answer (<4%).