

# Vaccination and Perinatal Infection Prevention Practices Among Obstetrician–Gynecologists

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**OBJECTIVE:** To assist efforts to improve adult vaccination coverage by characterizing vaccination and infectious disease screening practices of obstetrician–gynecologists.

**METHODS:** A written survey of demographics, attitudes, and practices was mailed to 1063 American College of Obstetricians and Gynecologists Fellows, including the Collaborative Ambulatory Research Network ( $n = 413$ ) and 650 randomly sampled Fellows.

**RESULTS:** Seventy-four percent of Collaborative Ambulatory Research Network members and 44% of nonmembers responded. A majority (Collaborative Ambulatory Research Network members: 60%; nonmembers: 49%) considered themselves primary care providers. Fewer than 60% routinely obtained patient vaccination or infection histories. Most screened prenatal patients for hepatitis B surface antigen (89%) and rubella immunoglobulin G antibody (85%). Sixty-four percent worked in practices that offered at least one vaccine; the most common were rubella (52%) and influenza (50%). Ten percent worked in practices that offered all major vaccines recommended for pregnant or postpartum women. Despite recommendations to provide influenza vaccine to pregnant women during influenza season, only 44% did so; among those who did not, 14% reported a belief that pregnant women do not need influenza vaccine. Provision of vaccine was associated with working in a multispecialty practice (adjusted odds ratio [OR] 2.6, 95% confidence interval [CI] 1.6, 4.1) and identifying as a primary care provider (adjusted OR 1.9; 95% CI 1.3, 2.7). The most common reasons for not offering vaccines were cost (44%) and a belief that vaccines should be provided elsewhere (41%).

**CONCLUSION:** The high proportion of obstetrician–gynecologists who do not offer vaccines or screen for vaccine and infection histories suggests missed opportunities for prevention of maternal and neonatal infections.

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Infections remain a leading cause of preventable morbidity in pregnant women and newborns, despite the increasing availability of prenatal screening tests and interventions.<sup>1–3</sup> In particular, vaccine-preventable infections continue to contribute to the maternal and neonatal burden of disease. In the United States in the 1990s, approximately 20,000 newborns were born to hepatitis B virus-infected women annually<sup>4</sup>; an average of 25–40 infants per year were born with congenital rubella syndrome<sup>5</sup>; and among women in their third trimester of pregnancy, the rate of influenza-related hospitalization was approximately 25 per 10,000.<sup>6</sup>

A recent survey of obstetricians and gynecologists in Michigan found that a majority of providers considered screening for vaccine-preventable diseases an important responsibility. However, only 10% routinely assessed whether patients had indications for all of the vaccines recommended for use in pregnant or recently delivered women. Moreover, one quarter of providers in this survey did not administer any vaccines to obstetric patients.<sup>7</sup>

Delivering vaccines to the adult population, in which vaccine utilization is often low and opportunities are often missed, remains a challenge and a priority in the United States.<sup>8</sup> The difficulties of delivering vaccines to pregnant or postpartum women are distinct: obstetrician–gynecologists may view vaccination as the responsibility of primary care givers<sup>7</sup>; they may have concerns as to the safety or efficacy of vaccines administered during pregnancy; their patients may refuse vaccination because of concerns about risks to themselves or their fetuses or infants; and there may be heightened concerns about liability.<sup>7,9</sup>

On the other hand, obstetrician–gynecologists also

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*This study was funded in part by Grant MC-00105 from the United States Department of Health and Human Services, Bureau of Maternal and Child Health.*

*The authors thank M. Gamble for data management, and A. Benin, S. Bloom, K. Galil, and J. Seward for contributions to the survey and analysis.*

have unique opportunities to deliver vaccines to women of all ages. In addition to repeated contacts with pregnant women, many obstetrician–gynecologists serve as primary care providers for nonpregnant women who do not otherwise have a regular point of contact with the health care system.<sup>10,11</sup> A recent analysis of three national medical databases found that obstetrician–gynecologists provided more office-based, general medical examinations to women 15 years and older than either general-family practitioners or internists.<sup>11</sup>

Although campaigns to improve adult vaccination<sup>8</sup> and to sustain elimination of some vaccine-preventable diseases, such as congenital rubella syndrome, continue,<sup>12</sup> data on obstetrician–gynecologist attitudes and practices related to vaccine-preventable perinatal diseases are critical to determining how vaccine protection of pregnant women and newborns can be improved.

In this report, we surveyed a national sample of obstetrician–gynecologists to characterize current infectious disease screening practices, vaccine use, and perceived obstacles to vaccine delivery. We focused on prenatal screening practices for varicella and rubella susceptibility and hepatitis B infection, and on vaccination practices for the following vaccines: hepatitis B, measles/mumps/rubella, varicella, influenza, and pneumococcal polysaccharide vaccine. A summary of Advisory Committee on Immunization Practices recommendations for use of these vaccines in pregnant women can be obtained at [http://www.cdc.gov/nip/publications/preg\\_guide.pdf](http://www.cdc.gov/nip/publications/preg_guide.pdf).

## MATERIALS AND METHODS

In February 2001, anonymous questionnaires (available upon request) focusing on infectious disease screening, vaccination practices, and attitudes toward current and new vaccines were mailed to two groups of Fellows of the American College of Obstetricians and Gynecologists (ACOG), a professional organization with over 43,000 members. The first group, the Collaborative Ambulatory Research Network, consisted of ACOG Fellows who volunteer to participate regularly in surveys to help ACOG monitor prevailing clinical obstetric and gynecologic practices. The Collaborative Ambulatory Research Network currently consists of 413 members, who have been chosen to reflect the age and gender distribution of all ACOG Fellows. Because Collaborative Ambulatory Research Network Fellows are volunteers and thus may not be representative of all ACOG Fellows, questionnaires were also sent to a random sample of 650 ACOG Fellows who were not previously selected to participate in an ACOG survey. Question formats were primarily multiple choice or opinion questions requiring a scaled

response. Racial and ethnic distributions of patient populations were estimated by survey respondents. A second mailing was sent approximately 1 month after the first to people who had failed to respond. All survey respondents who reported having seen obstetric or gynecologic patients in the year 2000 were eligible for inclusion in our analysis. The study protocol was reviewed by an institutional review board of the Centers for Disease Control and Prevention and found exempt from human subjects review.

Survey responses were double-entered into an American Standard Code for Information Interchange (ASCII) file, corrected for data entry errors, and converted into an SAS 8 (SAS Institute, Cary, NC) database. Continuous variables were categorized as follows, based on clustering of the data. The percentage of patients in the practice with Medicaid was divided into low (0–10%), medium (11–40%) and high (more than 40%) categories. The racial and ethnic characteristics of the provider's patient population were dichotomized into the following categories, based on the distribution of responses: less than 70% white versus 70% or more white; less than 30% versus 30% or more black; less than 10% versus 10% or more Asian/Pacific Islander; less than 15% versus 15% or more Hispanic; less than 20% versus 20% or more foreign born (defined as born outside the United States or Canada).

Because the Collaborative Ambulatory Research Network member and nonmember groups responded similarly to a majority of questions on the survey, results are presented for the two groups combined, except for the few instances in which they differed importantly. Differences for categorical measures were assessed using the  $\chi^2$  test. The Kruskal–Wallis test was used to detect differences in continuous measures. Univariate associations with vaccine provision were evaluated using Mantel–Haenszel–Cochran summary odds ratios (ORs), controlling for Collaborative Ambulatory Research Network membership; logistic regression controlling for Collaborative Ambulatory Research Network membership was used for variables with more than two categories. Independent variables assessed included gender, age, practice type, practice location, percentage of patients with Medicaid, as well as questions regarding vaccine-specific knowledge and practices. The outcome variable was whether or not the respondent worked at a practice that offered at least one vaccine. All variables significant at  $P < .10$  in univariate analysis were evaluated in multivariable models. The final multivariable model contained all factors significant at  $P < .05$ .

## RESULTS

Completed surveys were received from 307 Collaborative Ambulatory Research Network members (74%) and 286 nonmembers (44%). Respondents who had not seen obstetric patients in 2000 (two Collaborative Ambulatory Research Network member respondents and eight nonmember respondents) were excluded. In both groups, a majority of respondents were male obstetrician–gynecologists, rather than specialists in either obstetrics or gynecology, and practiced in urban or suburban settings (Table 1). Although the two groups were similar for a majority of demographic characteristics, Collaborative Ambulatory Research Network members were more likely than nonmembers to consider themselves primary care providers (60% compared with 49%,  $P < .001$ ; Table 1).

Regarding screening for risk of vaccine-preventable infections, 89% of 593 respondents reported collecting medical histories from new patients on standardized forms. Among these, only a portion used forms that included information on history of rubella (61%), varicella (57%), or vaccinations (44%). Questions related to potential hepatitis B virus exposures were more commonly included: injection drug use (86%), history of blood transfusion (87%), or current health care occupation (71%).

A high proportion of respondents reported routine screening of obstetric patients for hepatitis B surface antigen (HBsAg) and for rubella immunoglobulin G (IgG) antibody (Table 2). Screening for varicella antibody was uncommon (Table 2), consistent with recommendations to screen only patients who do not report a history of infection.

Regarding vaccination practices among obstetrician–gynecologists, a majority of providers (64%) worked in practices that offered obstetric and/or postpartum or gynecologic patients at least one of the following vaccines: hepatitis B, influenza, pneumococcal polysaccharide vaccine, rubella-containing vaccine, tetanus-diphtheria, and varicella. Ten percent of respondents worked at practices that offered all of the above vaccines. Among practices that offered vaccines ( $n = 364$ ), the most common vaccines offered were rubella (79%), influenza (78%), and hepatitis B (54%); 41% of these practices offered one or two vaccine types. The proportion of survey respondents who offered obstetric and gynecologic patients specific vaccines or referred patients to receive specific vaccines is summarized in Table 3.

Among practices that offered influenza vaccine ( $n = 283$ ), vaccination of obstetric patients during the first trimester of pregnancy was less common than during the second or third trimesters (26% compared with 83%;  $P$

**Table 1.** Demographic and Practice Characteristics of Survey Respondents in the Collaborative Ambulatory Research Network (CARN) and Non-CARN Groups

Characteristic	CARN group ( $n = 413$ )	Non-CARN group ( $n = 650$ )
<b>Provider characteristics</b>		
Median age (y)	48 (298)	46 (269)
Male sex (%)	56 (304)	64 (277)
Race	(305)	(278)
White (%)	84	84
Black (%)	6	7
Asian/Pacific Islander (%)	4	3
Other (%)	6	6
Ethnicity	(305)	(278)
Hispanic (%)	2	3
Non-Hispanic (%)	92	90
Unknown (%)	6	7
Specialty	(305)	(278)
Obstetrics (%)	3	4
Gynecology (%)	11	16
Obstetrics and gynecology (%)	83	79
Other (%)	3	1
Primary care provider (%)	60 (301)	49 (276)*
<b>Practice characteristics</b>		
Practice structure	(303)	(278)
Group (%)	75	77
Practice type	(303)	(278)
Multispecialty group (%)	29	35
Practice location	(297)	(273)
Urban (%)	42	44
Suburban (%)	41	41
Rural (%)	17	15
Patients receiving medicaid (%)	(279)	(235)
Median	20	20
0–10%	38	37
11–40%	41	39
>40%	21	24
Racial/ethnic distribution of patients <sup>†</sup>	(290)	(265)
≥30% Black (%)	23	22
≥10% Asian (%)	13	17
≥15% Hispanic (%)	27	32
≥20% foreign <sup>‡</sup> born (%)	15	22 <sup>§</sup>

Values in parentheses are numbers of respondents.

\* Pearson  $\chi^2$ ,  $P < .001$ .

<sup>†</sup> Patient population race and ethnicity distributions were estimated by survey respondents.

<sup>‡</sup> Born outside the United States or Canada.

<sup>§</sup> Pearson  $\chi^2$ ,  $P = .03$ .

$< .001$ ). Only a small percentage of respondents offering influenza vaccine reported not offering influenza vaccine to pregnant women (5%). Overall, 44% of survey respondents offered influenza vaccine to pregnant patients.

Regardless of whether providers worked in practices that offered hepatitis B vaccine, 81% of respondents always recommended vaccination of household or sex

**Table 2.** Routine Screening of Patients for Vaccine-Preventable Diseases Among Survey Respondents

Screening test (number of respondents)	Obstetrics patients	Gynecology patients	Neither patient group
Hepatitis B surface antigen (549)	89	5	10
Rubella IgG antibody (535)	85	6	13
Rubella IgM antibody (404)	26	3	73
Varicella antibody (419)	22	3	77

IgG, IgM = immunoglobulin G, M.

Values are %.

contacts of HBsAg-positive patients, and 85% counseled HBsAg-positive patients on how to avoid transmission of hepatitis B virus to others. Most providers (89%) reported HBsAg-positive obstetric patients to the delivery hospital and pediatrician; reporting HBsAg-positive patients to health departments, which is not legally mandated in all states, was less common (52%). Among respondents who provided vaccinations, a majority (more than 80%) always or sometimes vaccinated persons with recognized risk factors for hepatitis B virus infection, such as use of illicit injection drugs, recent infection with a sexually transmitted disease, or a recent history of multiple sex partners.

Although 52% of all respondent's practices provided rubella vaccine, 91% of obstetric-care providers had a policy of vaccinating rubella antibody-negative obstetric patients before discharge from hospital after delivery. Only 2% relied on referral of postpartum patients for rubella vaccination.

Among survey respondents who worked in practices that provided no vaccines ( $n = 196$ ), the most common reasons for not providing vaccine were related to costs associated with vaccination (44%) and a belief that vaccines should be given by an internist, family practitioner, or health department rather than by an obstetrician-gynecologist (41%). Lack of adequate vaccine storage and handling facilities was the next most common reason (32%). Only six respondents whose practices currently did not provide vaccine planned to start in the near future.

Among providers who worked in practices that did not offer influenza vaccine ( $n = 300$ ), the most common barriers to using the vaccine were inadequate reimbursement (52%), lack of patient-oriented vaccine information (46%), and liability concerns (45%). Fewer respondents felt that ambiguity of guidelines for vaccine use (30%), problems with patient refusal (26%), concerns about vaccine efficacy (25%), lack of time during patient visits (20%), or vaccine safety (17%) were barriers to using influenza vaccine in pregnant women. Fourteen percent reported the belief that pregnant women do not need influenza vaccine.

The characteristics of vaccine providers were as follows. Controlling for whether or not respondents belonged to the Collaborative Ambulatory Research Network, providers who worked in practices that provided at least one vaccine were more likely to consider themselves primary care providers (OR 1.7; 95% confidence interval [CI] 1.2, 2.4), to work in group practices rather than solo practices (OR 1.7; 95% CI 1.1, 2.5), and to work in multispecialty practices rather than obstetrics and gynecology practices (OR 2.8; 95% CI 1.9, 4.3). They were also more likely to work in urban clinics rather than suburban clinics (OR 1.7; 95% CI 1.2, 2.5). Providers who served patient populations that were predominantly white were less likely to offer any vaccines than those whose patient populations were more diverse (OR 0.66; 95% CI 0.43, 0.99). In multivariable analysis, identification as a primary care provider (adjusted OR 1.9; 95% CI 1.3, 2.7) and working in a

**Table 3.** Provision of Vaccine to Obstetric and Gynecologic Patients

Vaccine type (Number of respondents)	Vaccine provided at respondent's practice	Vaccine offered to obstetric or postpartum patients	Vaccine offered to gynecologic patients	Patients referred elsewhere for vaccine	Vaccination not offered and patients not referred
Rubella (555)	52	45	27	25	25
Influenza (562)	50	44	39	28	24
Hepatitis B (558)	35	29	25	40	27
Tetanus-diphtheria (553)	32	25	30	40	29
Pneumococcal polysaccharide (547)	21	9	18	50	30
Varicella (537)	20	15	16	47	33

Values are %.

multispecialty practice (adjusted OR 2.6; 95% CI 1.6, 4.1) were the only two factors that remained in the final model.

Respondents who worked in practices that provided vaccines ( $n = 364$ ) were more likely than those who did not provide vaccines to ask patients about country of birth (OR 1.7; 95% CI 1.2, 2.6) and vaccination history (OR 1.9; 95% CI 1.3, 2.7) on new patient medical history forms. Providers in practices that offered vaccines were not more likely to perform prenatal screening for rubella or hepatitis B.

Regarding attitudes toward new vaccines, support was strongest overall for development of vaccines that prevent cervical cancer due to human papilloma virus and infections due to herpes simplex virus 2 (92% and 91%, respectively, were likely or very likely to use). With respect to conditions unique to pregnant women or newborns, providers were more receptive to vaccines targeting those groups than to vaccines aimed at adolescents or women of childbearing age. Regarding the decision of whether or not to use newly licensed vaccines, ACOG recommendations were viewed as either an important influence (75%) or of some influence (23%); more than 90% of respondents felt that ACOG should make development of educational tools related to vaccination of obstetric and gynecologic patients a moderate or high priority.

## DISCUSSION

Obstetrician–gynecologists can play a key role in protecting women and newborns from vaccine-preventable diseases.<sup>11</sup> Although internists, family physicians, and health departments have traditionally been viewed as the primary platform for delivering adult vaccinations, more than half of the ACOG members who responded to our survey considered themselves primary care providers. Only approximately two thirds, however, worked in practices that offered at least one vaccine type, and only 10% worked in practices that offered all six of the primary vaccines recommended for adults and/or pregnant women.

It is striking that, despite the perception that barriers to vaccination of pregnant women are unique,<sup>9</sup> the primary obstacles identified by ACOG Fellows did not stem from concerns linked to pregnancy. Consistent with the findings of a recent survey of obstetrician–gynecologists in Michigan,<sup>7</sup> ACOG Fellows identified costs of vaccination and a belief that vaccine administration was not the responsibility of obstetrician–gynecologists as the primary reasons for not offering vaccines. Although some of the barriers related to cost may be difficult to surmount, the perception that vaccination is not a primary

responsibility of obstetrician–gynecologists may be modifiable.<sup>10,11</sup> In our survey, obstetrician–gynecologists who identified themselves as primary care providers had an increased likelihood of vaccine provision. Those who worked at multispecialty practices as opposed to practices specializing in obstetrics and gynecology were also more likely to provide vaccine, suggesting that other barriers, such as adequate vaccine storage facilities or covering of vaccine costs, might be more easily overcome in this setting. The fact that more than 90% of survey respondents felt that ACOG should view the development of educational tools related to vaccination as a priority suggests some willingness among obstetrician–gynecologists to integrate vaccination more fully into their routine services.

Influenza and rubella were the two vaccines most commonly offered by ACOG Fellows. Influenza vaccination of all women who will be past their first trimester of pregnancy during the influenza season was added to the recommendations of the Advisory Committee on Immunization Practices in 1997<sup>13</sup>; initial compliance appears low.<sup>14</sup> Among influenza vaccine providers who responded to our survey, there was a high awareness of the importance of offering vaccine to women who would be pregnant during the influenza season, but many did not offer it. Although current Advisory Committee on Immunization Practices recommendations allow for vaccination of pregnant women during any stage of pregnancy,<sup>14</sup> a vast majority of providers delayed vaccination until the second or third trimester, perhaps reflecting some inconsistencies between Advisory Committee on Immunization Practices and other recommendations. Similar to respondents who worked in practices that provided no vaccines, respondents who worked in practices that did not provide influenza vaccine listed inadequate reimbursement as a primary barrier to vaccination of pregnant women. A substantial proportion of respondents, even among those who offered influenza vaccine, also listed lack of patient-oriented vaccine information as a barrier to offering influenza vaccine to pregnant women; development of such materials holds promise as a way to improve influenza vaccine coverage among this at-risk population. Such materials may also ameliorate liability concerns, as would further studies to confirm the safety of influenza vaccine during pregnancy.

Although the United States has more than 30 years of experience with rubella vaccine and set an elimination goal for indigenous rubella and congenital rubella syndrome in the early 1990s,<sup>12</sup> almost half of respondents' practices did not offer rubella vaccine to postpartum patients. However, in compliance with recommendations for the prevention of congenital rubella syndrome,<sup>5</sup> 85% of respondents reported that they routinely screen

obstetric patients for rubella IgG antibody. Interestingly, approximately one quarter of respondents also reported routinely screening obstetric patients for rubella IgM antibody, a test that is not recommended as a method of detecting susceptibility to rubella infection. This response may reflect a true misuse of the IgM test or a lack of knowledge regarding the type of rubella prenatal screening test used. Additionally, more than 90% of respondents reported that they had a policy of postpartum vaccination of rubella antibody-negative women before discharge after delivery. This suggests that the primary responsibility for vaccination of women at risk of vertical transmission of rubella falls to the delivery hospital. Hospital policies or standing orders for postpartum vaccination of rubella-susceptible women may help limit missed opportunities for postpartum rubella vaccination.

Prenatal screening, reporting, and vaccination practices for hepatitis B infection indicate that further advocacy and education is necessary to reduce the risk of perinatal and early childhood infection and hepatitis B virus transmission among sexual and household contacts. The proportion of survey respondents who indicated that they routinely screen all pregnant women for HBsAg has not increased since an earlier survey of the Collaborative Ambulatory Research Network group.<sup>15</sup> Universal screening of pregnant women was first recommended by the Advisory Committee on Immunization Practices<sup>16</sup> and ACOG more than 10 years ago.<sup>17</sup> Only half of providers indicated that they report HBsAg-positive pregnant women to the health department, and approximately 10% did not routinely inform labor and delivery hospitals of their HBsAg-positive patients. All states and large metropolitan areas now offer federally funded programs for case management of HBsAg-positive women and their infants to facilitate timely and complete immunoprophylaxis, vaccination of contacts, and postvaccination testing, but enrollment necessarily must begin with reporting of cases. Fewer than 50% of births to HBsAg-positive women are identified each year and entered into tracking systems<sup>18</sup> (Centers for Disease Control and Prevention, unpublished data), and the number of births to HBsAg-positive women has increased in the past 10 years.<sup>19</sup> Close contacts of HBsAg-positive patients, injection drug users, and persons with a recent sexually transmitted disease or multiple sex partners should routinely receive vaccination.<sup>20</sup>

Obstetrician-gynecologists are often the only point of contact with the health care system for a significant proportion of women. Although obstetrician-gynecologists routinely provide certain aspects of preventive care, such as breast and cervical cancer screening and sexually transmitted disease screening, vaccination has not tradi-

tionally been stressed, and this survey suggests that a significant proportion of ACOG Fellows work at practices that do not offer many of the vaccines recommended for adults and pregnant women. Because the most commonly listed barriers to vaccination do not appear to be related to the challenges of vaccinating pregnant women, interventions that have proven successful in improving adult vaccination coverage in other contexts may be effective in the obstetrics-gynecology setting.<sup>8</sup>

## REFERENCES

1. Hebert PR, Reed G, Entman SS, Mitchel EF, Berg C, Griffin MR. Serious maternal morbidity after childbirth: Prolonged hospital stays and readmissions. *Obstet Gynecol* 1999;94:942-7.
2. Andrews WW, Goldenberg RL, Hauth JC. Preterm labor: Emerging role of genital tract infections. *Infect Agents Dis* 1995;4:196-211.
3. Anderson RN. Deaths: Leading causes for 1999. *Natl Vital Stat Rep* 2001;49:1-87.
4. Centers for Disease Control and Prevention. Hepatitis B virus: A comprehensive strategy for eliminating transmission in the United States through universal childhood vaccination: Recommendations of the Immunization Practices Advisory Committee (ACIP). *MMWR Morb Mortal Wkly Rep* 1991;43(RR-13):4.
5. Centers for Disease Control and Prevention. Control and prevention of rubella: Evaluation and management of suspected outbreaks, rubella in pregnant women, and surveillance for congenital rubella syndrome. *MMWR Morb Mortal Wkly Rep* 2001;50(RR-12):1-29.
6. Neuzil K, Reed G, Mitchel E, Simonsen L, Griffin M. Impact of influenza on acute cardiopulmonary hospitalizations in pregnant women. *Am J Epidemiol* 1998;148:1094-102.
7. Gonik B, Jones T, Contreras D, Fasano N, Roberts C. The obstetrician-gynecologist's role in vaccine-preventable diseases and immunization. *Obstet Gynecol* 2000;96:81-4.
8. Centers for Disease Control and Prevention. Vaccine-preventable diseases: Improving vaccination coverage in children, adolescents, and adults. A report of the Task Force on Community Preventive Services. *MMWR Morb Mortal Wkly Rep* 1999;48(RR-8):1-15.
9. Muñoz FM, Englund JA. Vaccines in pregnancy. *Infect Dis Clin North Am* 2001;15:253-71.
10. Kirk EP, Santa J, Heckler T, Collins M. Obstetrician-gynecologists as primary care physicians: The Oregon experience—early perceptions regarding the effects of legislative action. *Am J Obstet Gynecol* 1998;178:1222-8.
11. Leader S, Perales PJ. Provision of primary-preventive health care services by obstetrician-gynecologists. *Obstet Gynecol* 1995;85:391-5.

12. Centers for Disease Control and Prevention. Measles, mumps and rubella—vaccine use and strategies for elimination of measles, rubella and congenital rubella syndrome and control of mumps: Recommendations of the Immunization Practices Advisory Committee (ACIP). *MMWR Morb Mortal Wkly Rep* 1998;47(RR-8):32–3.
13. Centers for Disease Control and Prevention. Prevention and control of influenza: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Morb Mortal Wkly Rep* 1997;46(RR-9):1–25.
14. Centers for Disease Control and Prevention. Prevention and control of influenza: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Morb Mortal Wkly Rep* 2001;50(RR-4):6.
15. Wilkins-Haug L, Horton JA, Cruess DF, Frigoletto FD. Antepartum screening in the office-based practice: Findings from the Collaborative Ambulatory Research Network. *Obstet Gynecol* 1996;88:483–9.
16. Centers for Disease Control and Prevention. Protection against viral hepatitis: Recommendations of the Immunization Practices Advisory Committee (ACIP). *MMWR Morb Mortal Wkly Rep* 1990;39(RR-2):1–26.
17. American Academy of Pediatrics, American College of Obstetricians and Gynecologists. Guidelines for perinatal care. 3rd ed. Elk Grove Village, Illinois: American Academy of Pediatrics, 1992.
18. Centers for Disease Control and Prevention. Program to prevent perinatal hepatitis B virus transmission in a health-maintenance organization—northern California, 1990–1995. *MMWR Morb Mortal Wkly Rep* 1997;46:378–80.
19. Armstrong GL, Mast EE, Wojcynski M, Margolis HS. Childhood hepatitis B virus infections in the United States before hepatitis B immunization. *Pediatrics* 2001;108:1123–8.
20. Centers for Disease Control and Prevention. Notice to readers update: Recommendations to prevent hepatitis B transmission—United States. *MMWR Morb Mortal Wkly Rep* 1999;48:33–4.

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*Received March 19, 2002. Received in revised form August 29, 2002. Accepted September 19, 2002.*