

# Obstetric Health Care Workers' Attitudes and Beliefs Regarding Influenza Vaccination in Pregnancy

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**OBJECTIVE:** To explore obstetric health care workers' attitudes and beliefs regarding influenza vaccination in pregnancy.

**METHODS:** A survey consisting of 16 multiple-choice questions was administered to nurses, medical and nursing assistants, receptionists, and clinical administrators in obstetric settings. Survey questions addressed general knowledge of influenza and recommendations for vaccination during pregnancy, as well as personal beliefs about the acceptability of the vaccine in the pregnant population. The study was conducted at two sites, Women & Infants Hospital in Providence, RI, and Magee-Women's Hospital in Pittsburgh, PA. Variables were compared by Fisher exact test.

**RESULTS:** Two hundred sixty-seven completed surveys were available for analysis, with a completion rate of 85%. Almost one third of health care workers surveyed

do not believe that vaccines are a safe and effective way to decrease infections (31%) and a minority believe that vaccines are safe in pregnancy (36%). Just over half of health care workers know that pregnant women are at increased risk of complications from the flu (56.6%). Only 46% were able to correctly identify influenza symptoms, and only 65% would recommend influenza vaccination to a pregnant woman if indicated. A small percentage would be willing to give an avian influenza vaccine to pregnant women during a pandemic if it had not been tested in pregnancy (12.3%).

**CONCLUSION:** Many obstetric health care workers lack knowledge regarding the safety and importance of influenza vaccination during pregnancy. Misinformed or inadequately informed health care workers may represent a barrier to influenza vaccine coverage of pregnant women. This lack of knowledge among the health care workforce takes on added importance in the setting of the H1N1 2009 swine-origin influenza pandemic.

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**LEVEL OF EVIDENCE: III**

In 2004, The Advisory Committee on Immunization Practices began recommending routine influenza vaccination for healthy pregnant women during the influenza season. However, in 2005, the United States achieved just 16% influenza vaccination coverage of pregnant women, and it is estimated that less than 10% of pregnant women who are at highest risk of influenza receive the vaccine.<sup>1,2</sup> There is no significant increase in adverse reactions in mothers or neonates related to the vaccine, and side effects are similar to those in the general population.<sup>1,2</sup>

Pregnancy is considered an independent risk factor for serious influenza infection.<sup>3</sup> Influenza contributes to excess hospital admission rates for pregnant women in all trimesters, especially those with comorbidities. Hospitalized pregnant women

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with respiratory distress have higher rates of preterm delivery, fetal distress, and cesarean delivery.<sup>4</sup> During previous influenza pandemics, the mortality rate among pregnant women was increased, approaching 50% among women who developed pneumonia in the setting of influenza.<sup>5,6</sup>

The emergence of the 2009 H1N1 strain of influenza A raises legitimate concern as to the consequences of a pandemic. The World Health Organization has indicated that a global pandemic is now underway ([www.cdc.gov/h1n1flu/](http://www.cdc.gov/h1n1flu/)). There are some data to suggest that the seasonal 2008–2009 influenza vaccine may provide some protection against the H1N1 strain.<sup>7,8</sup> The chronically low rates of vaccination during pregnancy could therefore represent missed opportunities for protection during the current pandemic.

The benefits of vaccination are twofold, reduced maternal morbidity and conferred immunity to the neonate. Vaccine-acquired maternal antibodies have high transplacental transfer rates, and passive maternal antibodies have been shown to delay the onset and decrease the severity of influenza if neonates become infected.<sup>1,2</sup> Recent studies show that for every five pregnant women vaccinated, one case of febrile respiratory illness is prevented in a mother or neonate.<sup>9</sup>

Knowledge about influenza informs health care worker decision-making. Studies show the vaccination rates of nurses to be significantly lower than physicians, and nurses who answer basic influenza knowledge questions correctly have higher vaccination rates than those who answer questions incorrectly.<sup>7</sup> There is evidence that health care worker attitudes influence patient vaccination decisions.<sup>10</sup>

Given the frequent and intricate nature of prenatal care visits, women spend considerable amounts of time in obstetrics and gynecology offices and have many interactions with obstetric clinic staff. The aim of our study was to estimate whether health care workers' attitudes could represent a possible barrier to vaccination coverage.

## MATERIALS AND METHODS

This cross-sectional study of the attitudes of health care workers toward influenza vaccination during pregnancy was carried out at two sites, Women & Infants Hospital, Alpert Medical School of Brown University, in Providence, RI, and Magee-Women's Hospital at the University of Pittsburgh Medical Center, Pittsburgh, PA. This study was approved by the institutional review boards at each institution. Health care workers eligible to complete the survey

included registered nurses, certified nursing assistants, medical assistant, receptionists, and clinical administrators. Nurse practitioners, nurse-midwives, and physicians were excluded. Data were collected at Magee-Women's Hospital from September 2006 to March 2007. Participants included health care workers at University of Pittsburgh Obstetric-Gynecology offices located on the main Magee-Women's Hospital campus and two affiliated private offices. Data from Women & Infants Hospital in Providence was collected from June 2008 to March 2009 after receipt of funding to continue the project. Participants included health care workers in the emergency department, the hospital antepartum unit, a hospital-based obstetrics and gynecology clinic, and nine private practice obstetrics and gynecology offices in the surrounding area all of whom deliver at Women & Infants.

The questionnaire was an anonymous written survey consisting of 16 multiple-choice questions. It was developed by a reproductive infectious disease expert (R.H.B.) in consultation with a survey design expert (G.E.S.). Of the 16 questions, four addressed demographic and occupation information, five addressed general beliefs about vaccines, and seven addressed knowledge about influenza and beliefs regarding influenza vaccination in pregnancy. Some questions from the questionnaire are provided in Box 1. At Magee-Women's Hospital, surveys were distributed at a morning meeting by nursing leadership, and health care workers completed them unobserved and returned them to a central box by the end of the day. At Women & Infants Hospital, a research assistant (D.E.B.) either handed out and collected surveys during staff meetings and shift changes or relied on nursing administration to administer the surveys. Unlimited time was given for completion.

Data analysis was performed with SAS 9.1 (SAS Institute, Cary, NC). Variables were compared by Fisher exact test. All *P* values presented were two-tailed. Responses to the questions about influenza and influenza vaccination in pregnancy were internally consistent (Cronbach's alpha 0.64 at Women & Infants and 0.65 at Magee-Women's). Responses were grouped as correct or incorrect and compared by job description using multivariable logistic regression. Odds ratios and 95% confidence intervals for correct answers were adjusted for race/ethnicity (Latina, White, non-White), years in current position (less than 5, 6–10, 11–15, more than 15), and location (Women & Infants, Magee-Women's). Standard errors were



### BOX 1. SAMPLE QUESTIONS FROM SURVEY TOOL

- Do you believe that vaccines are an effective way to decrease infections?
- Do you believe vaccines are safe in pregnancy?
- Would you recommend vaccination to a pregnant woman if it was indicated?
- Do you receive yearly flu vaccines?
- When you think of the “flu” which symptoms do you think of?
- Are pregnant women at an increased risk of complications from the flu?
- Is flu vaccination recommended for pregnant women during the flu season?
- If you were to get pregnant, would you take the flu vaccine if your OB provider recommended it?
- If there was an outbreak of “bird flu,” would you recommend giving a vaccine to a pregnant woman, even if it had not been tested in pregnancy?

calculated by Taylor series linearization to account for clustering of responses within clinics or offices. Eleven regression models had an acceptable goodness-of-fit based on inspection of the residuals.

### RESULTS

A total of 267 surveys were completed, 166 from Women & Infants Hospital and 101 from Magee-Women’s Hospital. At Women & Infants, 166 of 179 (92.7%) eligible staff were offered the survey and completed it; at Magee-Women’s all 135 eligible staff members were offered the survey, and 101 (75%) completed it (Table 1) shows the demographic data for each site. The majority of participants were white non-Hispanic, 71.7% at Women & Infants and 91% at Magee-Women’s. Latina participants constituted 20.5% of the Women & Infants sample, and black participants constituted 9% of the Magee-Women’s sample. Roughly a third of participants at Women & Infants and Magee-Women’s were medical or nursing assistants (33.7% and 35%, respectively). Nurses constituted 40.4% of the Women & Infants sample and 34% of the Magee-Women’s sample. At both sites, health care workers that had spent fewer than 5 years in their current position composed the largest group (39.2% at Women & Infants and 48.5% at Magee-Women’s). More than a third of health care workers surveyed do not receive a yearly influenza vaccine (Women & Infants 33.9%, Magee-Women’s 39%).

The survey included questions about general vaccine safety and efficacy, the results of which are presented in Table 2. Almost one third of health care workers at both sites failed to agree with the statement

**Table 1. Participant Demographics**

	Women & Infants Hospital		Magee-Women’s Hospital	
	n	Percentage (95% CI)	n	Percentage (95% CI)
Self-reported race				
Latina	34	20.5 (14.6–27.4)	0	0 (0–3.6)
White, non-Hispanic	119	71.7 (64.2–78.4)	91	91.0 (83.6–95.8)
Asian	3	1.8 (0.4–5.2)	0	0 (0–3.6)
American Indian/Alaskan Native	2	1.2 (0.2–4.3)	0	0 (0–3.6)
Hawaiian or Pacific Islander	2	1.2 (0.2–4.3)	0	0 (0–3.6)
Black	6	3.7 (1.3–7.7)	9	9.0 (4.2–16.4)
Job description				
Nurse	67	40.4 (32.8–48.2)	34	34.3 (25.1–44.6)
Certified nursing assistant/medical assistant	56	33.7 (26.6–41.5)	35	35.4 (26.0–45.6)
Receptionist	34	20.5 (14.6–27.4)	24	24.2 (16.2–33.9)
Administrator	9	5.4 (2.5–10.0)	6	6.1 (2.3–12.7)
Years in current position (y)				
Less than 5	65	39.2 (31.7–47.0)	49	48.5 (38.5–58.7)
6–10	36	21.7 (15.7–28.7)	24	23.8 (15.9–33.3)
11–15	23	13.9 (9.0–20.1)	10	9.9 (4.9–17.5)
More than 15	42	25.3 (18.9–32.6)	18	17.8 (10.9–26.7)
Currently give vaccines				
Yes	87	52.4 (44.5–60.2)	40	39.6 (30.0–49.8)
Receive yearly influenza vaccination				
Yes	109	66.1 (58.3–73.2)	63	63.0 (52.8–72.4)

CI, confidence interval.



**Table 2. General Beliefs About Vaccine Safety**

	Women & Infants Hospital		Magee-Women's Hospital		P
	n	Percentage (95% CI)	n	Percentage (95% CI)	
Do you believe vaccines are a safe and effective way to decrease infections?					
Yes	114	68.7 (61.0–75.6)	69	68.3 (58.3–77.2)	1.0
Maybe or No	52	31.3 (24.4–39.0)	32	31.7 (22.8–41.7)	
Do you believe vaccines are safe in pregnancy?					
Yes	59	35.8 (28.5–43.6)	34	33.7 (24.6–43.8)	0.8
Maybe or No	106	64.2 (56.4–71.5)	67	66.3 (56.3–75.4)	

CI, confidence interval.

that vaccines are a safe and effective way to decrease infections (31.3% at Women & Infants and 31.7% at Magee-Women's). A minority definitely believed that vaccines were safe in pregnancy (35.8% Women & Infants, 33.7% Magee-Women's).

The survey tool also explored health care worker knowledge of influenza as an illness and the possible impact on pregnant patients. Table 3 shows the frequency of correct or recommended answers to these questions and explores the influence of job position on responses. Interestingly, the more highly trained nurses were not consistently more likely to answer these knowledge questions correctly in the adjusted model. A high percentage of health care

workers knew that influenza vaccination is recommended for pregnant women at both sites (78.4%). Just over half (56.6%) of health care workers knew that pregnant women are at increased risk of complications from influenza. Registered nurses were, however, the most likely to be aware of this, whereas medical/nursing assistants were less likely to know (odds ratio 0.34, 95% confidence interval 0.16–0.72). Less than half of health care workers were able to correctly identify influenza symptoms (45.9%). Interestingly, medical/nursing assistants were more likely to choose correctly than nurses (53.3% vs. 50.0%), but this was not significant after adjusting for potential confounders ( $P=.2$ ). Health care workers would not

**Table 3. Knowledge About Influenza and Vaccine Recommendations**

Question	Frequency of Correct Answer		Job Title	Adjusted OR (95% CI)*†
	n	Percentage (95% CI)*		
Know influenza vaccination is recommended for pregnant women	207	78.4 (67.3–89.5)	Nurse	1.00
			Medical/nursing assistant	1.07 (0.46–2.48)
			Secretary	0.58 (0.27–1.25)
			Administrator	1.75 (0.48–6.43)
Know that pregnant women are at increased risk of complications from the flu	150	56.6 (48.1–65.1)	Nurse	1.00
			Medical/nursing assistant	0.34 (0.16–0.72)
			Secretary	0.20 (0.09–0.41)
			Administrator	0.72 (0.20–2.54)
Correctly identified influenza symptoms	122	45.9 (35.1–56.6)	Nurse	1.00
			Medical/nursing assistant	1.66 (0.84–3.29)
			Secretary	0.64 (0.32–1.30)
			Administrator	1.23 (0.37–4.15)
Would recommend influenza vaccination to pregnant woman if indicated	154	65.3 (57.4–73.2)	Nurse	1.00
			Medical/nursing assistant	0.56 (0.17–1.81)
			Secretary	0.26 (0.10–0.71)
			Administrator	0.55 (0.09–3.48)
Would receive vaccine if obstetrician provider recommended it	173	65.0 (60.4–69.7)	Nurse	1.00
			Medical/nursing assistant	0.61 (0.24–1.57)
			Secretary	0.58 (0.25–1.39)
			Administrator	1.61 (0.16–16.38)

\* Ninety-five percent confidence intervals were adjusted for within-clinic clustering.

† Adjusted for race/ethnicity (Latina, white, non-white), years in position (less than 5, 6–10, 11–15, more than 15), location (Women & Infants Hospital, Magee-Women's Hospital).



uniformly recommend vaccination to a pregnant woman if indicated; only 65.3% indicated they would be willing to do so. Nurses are the most likely to recommend vaccination, with other health care workers less likely (62.5% medical/nursing assistants, 47.7% secretaries, 64.3% clinical administrators). A similar percentage of health care workers (65.0%) would receive the influenza vaccine while pregnant if their obstetrician recommended it. Administrators and nurses were the most willing to be vaccinated (80.0% administrators, 72.3% nurses).

Table 4 displays responses to questions exploring the willingness of health care workers to recommend or receive a vaccine that had not been tested in pregnancy during an outbreak of avian influenza. Health care workers were similarly unwilling at both sites, with only 12.0% responding they would recommend an avian influenza vaccine during pregnancy. The willingness of health care workers to receive such a vaccine has previously been published from the Magee-Women's site.<sup>11</sup> At Women & Infants, the results are similarly concerning, with only 10.2% willing to receive the vaccine.

## DISCUSSION

The results of this study show an alarming lack of knowledge and confidence regarding the influenza vaccine in pregnancy among obstetric health care workers. Data suggest that we cannot rely on patients to be informed about vaccination during pregnancy. Numerous studies have documented a lack of education about the influenza vaccine in the pregnant population.<sup>12</sup> The task of educating patients thus belongs to the health care team. This presents a problem when so many are unaware of the risks of influenza to pregnant women and have misconceptions about vaccine safety and efficacy. Our findings are supported by previous studies demonstrating that

health care workers in the obstetric setting have limited knowledge about the epidemiology of influenza infection and many do not consider influenza a potentially serious disease.<sup>15</sup> Although this study is unique because it examines health care workers who care for pregnant women, we see this lack of knowledge reflected in our sample and nationally by the low percentage that personally choose to be vaccinated annually. Influenza vaccination is rarely mandatory in the health care setting, and health care worker influenza vaccination coverage reached only 38% in 2002.<sup>14</sup>

A direct correlation has been shown between provider knowledge and attitudes and their ability to discuss or recommend vaccination to their patients. Research demonstrates that maternity care providers with high levels of knowledge and positive attitudes consistently discuss and recommend the influenza vaccine at greater rates than other providers.<sup>2</sup> Similarly, providers aware of the national recommendation guidelines are more than twice as likely to discuss and recommend vaccination than those who are unaware.<sup>12</sup>

It is clear from our data that current educational efforts are insufficient, and the challenge faced by hospital and clinic administrators is larger than previously realized. However, educational campaigns have been noted to make significant improvements in vaccination rates among health care workers.<sup>14</sup> Health care workers are often positively influenced by educational seminars given by colleagues or pressures induced by a workplace in which most people choose to be vaccinated.<sup>14</sup> Our study demonstrates that attitudes and beliefs can vary by site and job position. Health care workers in a hospital setting may be more likely to be aware of complication risks in pregnancy, perhaps given their frequent interaction with patients possessing comorbidities. Because of this, it may be

**Table 4. Willingness to Recommend or Receive "Bird" Flu Vaccine in Pregnancy**

Question	Women & Infants Hospital		Magee-Women's Hospital		P
	n	Percentage (95% CI)	n	Percentage (95% CI)	
"If there was an outbreak of 'bird' flu, would you recommend giving a vaccine to a pregnant woman even if it had not been tested in pregnancy?"					
Yes	17	10.2 (6.1–15.9)	15	15.2 (8.7–23.8)	.2
Maybe or no	149	89.8 (84.1–93.9)	84	84.8 (76.2–91.3)	
"Would you take the same 'bird' flu vaccine if you were pregnant?"					
Yes	17	10.2 (6.1–15.9)	13	13.1 (7.2–21.4)	.5
Maybe or no	149	89.8 (84.1–93.9)	86	86.9 (78.6–92.8)	

CI, confidence interval.



more of a challenge to impart the importance of vaccination in the private practice setting. This has the potential to be confounded by a lack of structured educational programs and resources often provided in hospitals. However, the impact of any dedicated educational intervention is likely to be positive, and should be attempted. An effective educational strategy should focus on known misconceptions and knowledge gaps, many of which are evident in the results of this study. Our data suggest there may be significant cultural and community factors that affect health care workers' values and beliefs. A highly tailored and specific approach will likely be the most successful, and many researchers in the field support separate strategies for different populations of health care workers.<sup>14</sup>

In the setting of the current H1N1 swine-origin influenza pandemic, coverage of the pregnant population when a vaccine becomes available takes on even greater importance than it does during yearly epidemics. The Centers for Disease Control and Prevention predicts that the public health response must include considerations specific to pregnant women given the increased risk of severe complications.<sup>16</sup> Our data regarding a "bird" flu outbreak demonstrate that health care workers may be unwilling to support a new vaccine with limited safety data. This raises doubts as to whether the health care community will fully commit to a wide-scale vaccination effort for pregnant women in the near future.

Our study is limited by the fact that the surveys were conducted before the current pandemic began. It is possible that educational efforts and knowledge have been affected by recent events and this is not reflected in our data. The strengths of the study include the variety of clinic settings sampled (hospital outpatient clinics, antepartum/emergency units, private practice clinics) and the breadth of job positions and ethnic backgrounds represented, as well as it being a multisite study.

The influence of health care workers on patient vaccination coverage should not be underestimated. It has been shown that health care workers' recommendations have positive effects on the likelihood of patients to be vaccinated.<sup>9</sup> Women whose maternity care provider has recommended the vaccine are much more likely to receive it than those whose providers did not.<sup>13</sup> Similarly, only 21.5% of parents say the decision to vaccinate their children was not influenced by a health care provider. Parents who think their providers were influential are twice as likely to believe vaccines are safe, and their children have high rates of coverage. Interestingly, parents

who did not believe vaccines were safe were more likely to vaccinate their children if their decision was strongly influenced by a health care provider.<sup>10</sup> Quality improvement measures in health care stress the importance of a patient-centered team approach. Support staff are vital contributors to complete and quality patient care, and their influence on patient decision-making should continue to be an area of exploration. Physicians often delegate counseling on such "routine" topics as vaccination to their nonphysician colleagues. The actual administration of vaccines is rarely provided by the physician themselves. The impact that such members of the team have on patients' acceptance of vaccination cannot be overstated.

The current environment in developed countries is one of relatively low incidence of previously widespread infectious diseases due to the availability of numerous vaccines and other public health measures. As a consequence, the health care community is facing increased concerns from patients about vaccine safety and efficacy. Given this, health care workers play a central role in trying to achieve high vaccination coverage rates. Intervention at the level of the obstetric health care worker might remove a previously unrecognized barrier.

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