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Influenza Infection Control Practices in Labor and Delivery Units During the 2009 H1N1 Influenza Pandemic

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Abstract

Objective—To assess the presence and usefulness of written policies and practices on infection control consistent with the Center for Disease Control and Prevention's (CDC) guidance in hospital labor and delivery (L&D) units during the 2009 H1N1 influenza pandemic.

Setting—Online survey.

Participants—Of 11,845 eligible nurses, 2,641 (22%) participated. This analysis includes a subset of 1,866 nurses who worked exclusively in L&D units.

Methods—A cross-sectional descriptive evaluation was sent to 12,612 members from the Association of Women's Health, Obstetric, and Neonatal Nurses (AWHONN) who reported working in labor, delivery, postpartum, or newborn care settings during the 2009 H1N1 influenza pandemic.

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Results—Respondents (73.8%) reported that CDC guidance was very useful for infection control in L&D settings during the pandemic. We assessed the presence of the following infection control written policies, consistent with CDC’s guidance in hospital L&D units, during the 2009 H1N1 influenza pandemic and their rate of implementation most of the time: questioning women upon arrival about recent flu-like symptoms (89.4%, 89.9%), immediate initiation of antiviral medicines if flu suspected or confirmed (65.2%, 49%), isolating ill women from healthy women immediately (90.7%, 84.7%), ask ill women to wear masks during L&D (67%, 57.7%), immediately separating healthy newborns from ill mothers (50.9%, 42.4%), and bathing healthy infants when stable (58.4%, 56.9%). Reported written policies for five of the six practices increased during the pandemic. Five of six written policies remained above baseline after the pandemic.

Conclusions—Respondents considered CDC guidance very useful. The presence of written policies is important for the implementation of infection control practices by L&D nurses.

Keywords

infection control; 2009 H1N1 pandemic; maternal and infant; precautions; AWHONN

In April 2009 a novel swine influenza strain emerged (Dawood et al., 2009). Fewer than 2 months later, on June 11, the World Health Organization (WHO) declared that the scientific criteria for an influenza pandemic had been met and raised the pandemic alert to Phase 6, which signified widespread human infection (Chan, 2009). This was the first pandemic of the 21st century; the world had not experienced a pandemic since 1968 (Kilbourne, 2006).

Influenza pandemics have been recorded throughout history with intervals between pandemics ranging from 10 to 50 years (Potter & Jennings, 2011; WHO, 2009). Published information available from past pandemics and from typical seasonal influenza epidemics has shown that certain segments of the population are especially vulnerable to influenza infection. Pregnant women are among those at increased risk of severe complications and death (Dodds et al., 2007; Freeman & Barno, 1959; Harris, 1919; Neuzil, Reed, Mitchel, Simonsen, & Griffin, 1998; Nuzum, Pilot, Stangl, & Bonar, 1918) due to changes in the cardiovascular, pulmonary, and immune systems during pregnancy (Mosby et al., 2011). In the pandemics of 1918 to 1919 and 1957 to 1958 the rate of infectivity among pregnant women (up to 50%), and the rates of developing pneumonia (50% of those women affected with influenza) and death (50% of those affected with pneumonia) were high. Additionally, high rates of premature delivery and pregnancy loss (52% in 1918–1919) have been noted (Dodds et al.). Despite this knowledge, little information is available on the direct effects of different strains of influenza infection and their treatment among pregnant women.

To help address these knowledge gaps, the Centers for Disease Control and Prevention (CDC) convened a panel of experts in April 2008 to examine the available science and develop a comprehensive public health approach for pregnant women in preparation for another influenza pandemic (Rasmussen et al., 2009). The main topics covered were prophylaxis and treatment of influenza with antiviral medicines, vaccine use, nonpharmaceutical interventions, health care planning, and communication with pregnant women and their health care providers. The prepandemic recommendations from the 2008 meeting were based on hypothetical scenarios of future pandemics. The proceedings from

this meeting were the foundation on which the CDC built its response efforts for pregnant women during the 2009 H1N1 pandemic.

The CDC activated a response to the emergence and rapid spread of the novel H1N1 influenza virus in April 2009. Within days, a national public health emergency was declared in the United States by the Secretary of Health and Human Services. The CDC published and rapidly disseminated the first guidance document, *Pregnant Women and Novel Influenza A (H1N1): Considerations for Clinicians*, 2 days after the declaration of emergency (Mosby et al., 2011). From that point, CDC response strategies for pregnant women included the timely development of guidance and dissemination to health care providers and the general public, education and public outreach activities, active surveillance, and 24/7 direct access to CDC subject matter experts for health care providers and state health departments.

One particular area of concern was how to address infection control practices in hospitals where obstetric services were provided. Because pregnant women traditionally experience L&D in hospital settings, emphasis on best practices to keep healthy pregnant and postpartum women and neonates from being exposed to individuals acutely ill with influenza in the hospital setting was paramount. On April 28, 2009, the CDC released the interim guidance titled *Considerations Regarding Novel H1N1 Flu Virus in Obstetric Settings* to address these concerns (Mosby et al., 2011). Because little was known at the time about virulence or infectivity of the 2009 H1N1 pandemic influenza virus (especially among pregnant women with pregnancy-altered immune function and their immunologically immature newborns who could not be immunized before age 6 months), and in the absence of definitive studies regarding risk, the guidance was a conservative approach to the management of ill pregnant women and their newborns. *Interim Guidance: Considerations Regarding 2009 H1N1 Influenza in Intrapartum and Postpartum Hospital Settings* was released in July 2009 by the CDC to clarify and expand on previous guidance issued for pregnant women and their newborns. This guidance addressed care of pregnant women who entered the hospital setting ill with suspected or confirmed influenza and covered clinical considerations for management of these patients during the antepartum, intrapartum, and postpartum periods, as well as newborn care and infant feeding considerations (CDC, 2009).

One part of the guidance was viewed by some as controversial: the immediate separation of healthy newborns from their mothers with suspected or confirmed influenza. Anecdotally, a number of professional organizations, public health, and health care institutions provided feedback and voiced concerns about restricted breastfeeding, poor mother/infant attachment, and the lack of information about the infectivity and severity of the 2009 H1N1 strain. Because of these concerns, some agencies modified this guideline. As more was learned about the characteristics of the H1N1 virus, the CDC incorporated the feedback from the professional organizations, public health, and health care institutions and further refined this guidance. In November 2009, the CDC revised the guidance to provide several options to consider when implementing mother/newborn separation based upon hospital configuration, staffing, and surge capacity (e.g., separation in the delivery room with the newborn at least 6 feet from the mother) (Gupta & Pursley, 2011). The revised guidance was based on the aforementioned feedback received from the professional organizations, public health, and health care institutions; a literature review of the potential burden of disease and routes of

transmission that affect newborns (Zapata et al., 2012); and new information from clinicians and researchers who reported actual effects of the 2009 H1N1 influenza on the prenatal, postpartum, and infant populations.

Over the course of the pandemic, the CDC received anecdotal reports that some institutions had experienced varying degrees of difficulty with implementation of and compliance with certain aspects of the guidance for labor, delivery, and postpartum settings. Little information was available on actual practice consistent with CDC recommendations. The CDC in partnership with the American Academy of Pediatrics (AAP) and the Association of Women's Health, Obstetric, and Neonatal Nurses (AWHONN) launched an evaluation effort that consisted of a series of surveys that targeted AWHONN nurses who planned or provided direct patient care in labor, delivery, and postpartum settings during April 2009 (when the 2009 influenza virus was first detected in the United States) through June 2010 (when the U.S. Public Health Emergency Response for 2009 H1N1 influenza expired). The purposes of the survey were to assess the presence and usefulness of infection control written policies consistent with CDC's guidance in hospital L&D units during the 2009 H1N1 influenza pandemic and to determine whether the policies were put into practice.

Methods

A cross-sectional, descriptive evaluation was used to examine nurses' perceptions of pandemic influenza policies and their implementation of recommended guidelines and was conducted among obstetric and neonatal nurses who worked in labor, delivery, postpartum, and newborn care settings. From March 2011 through April 2011 a link on SurveyMonkey was distributed via e-mail to a convenience sample of all active AWHONN members who had provided e-mail addresses. Nurses listed as working in academia, ambulatory care, home health care, public health, or who were identified as self-employed were excluded. Upon receipt of the questionnaire, nurses were asked if they planned for or provided inpatient care in obstetric or neonatal settings during the 2009 H1N1 pandemic (an inclusion criterion) defined as April 2009 through June 2010. Up to three subsequent invitations to participate were sent one week apart to nurses who had not responded. Incentive for participation consisted of the opportunity to enter a drawing for one of 20 registration waivers to the 2011 annual AWHONN national convention.

We restricted this analysis to nurses who worked in L&D settings only. Among nurses who returned a survey, those who self-identified as working in a L&D setting and who did not change institutions during the reporting period were eligible for inclusion in the analysis.

The survey was constructed to capture information on nurse and inpatient facility demographics and the existence of written policies for patients, staff, and visitors in labor, delivery, postpartum, and newborn care settings that aligned with CDC guidance (CDC, 2009). Perceived usefulness of the CDC guidance was examined by the characteristics of the respondents and their hospital settings. Questions also were asked to determine if and when administratively written policies were put into practice by nurses who worked directly with patients. The following six hospital policies, consistent with the CDC guidance on L&D practices, were examined in this analysis: questioning patients about recent flu-like

symptoms on arrival to the L&D unit, immediate initiation of antiviral treatment for patients with suspected influenza, isolating patients with suspected or confirmed influenza from healthy patients on arrival to the unit, asking patients with suspected or confirmed influenza to wear surgical masks during L&D, immediately separating healthy newborns from mothers with suspected or confirmed influenza to an open warmer by a distance of more than 6 feet, and bathing healthy infants of mothers with suspected and confirmed influenza as soon as the infants' temperature stabilized.

The presence of hospital policies consistent with CDC guidelines was determined by asking respondents whether a written policy was in existence at three different periods: before, during, and after the pandemic. Implementation of the hospital policies was assessed by how often (*most of the time, sometimes, rarely or never, or unsure*) the policies were put into practice.

Respondent and hospital characteristics associated with the implementation of the six practices *most of the time* also were examined. To gauge the level of difficulty experienced during implementation of hospital policies, respondents were queried on how difficult each policy was to implement (*very difficult, moderately difficult, somewhat difficult, not difficult or not applicable*). The level of difficulty implementing each L&D practice stratified by frequency of implementation was examined for respondents who reported implementing a practice at least at some point during the pandemic (e.g., *most of the time, sometimes, or rarely*). Because it would be inappropriate to ask respondents who did not implement policies about the level of difficulty with implementation, those who responded *never* or *unsure* when asked about the frequency of implementation were excluded.

To evaluate the presence of institutional policies over time, we restricted the analysis to only respondents who reported not changing institutions. We used statistical software to analyze the data. Descriptive data analysis consisted of simple frequencies, chi-squared tests, and paired *t* tests and excluded missing data. Statistical significance was established by $P < .05$. The purpose of the survey was to evaluate public health practice, and therefore the study was considered exempt from review by the Institutional Review Board (IRB).

Of the six practices evaluated, immediate separation of infants from mothers with suspected or confirmed influenza after delivery was implemented the least.

Results

From the original 12,612 nurses invited to participate, 767 were deemed not eligible and thus excluded, and 2,641 returned a survey for a response rate of 22%. Of these 2,641 nurses, 595 stated they worked exclusively in postpartum units and newborn nurseries and were not included. For this analysis, 1,866 nurses self-identified as working in a L&D setting and did not change institutions during the reporting period.

Characteristics of Respondents and Hospitals

Most of the respondents were female (99.7%, data not shown), had practiced 21 or more years (55.6%), had a bachelor of science in nursing (BSN) degree (62.8%), worked as a staff nurse (51.9%), and provided direct patient care (53.2%) during the pandemic. In addition,

23.2% of the nurses had advanced degrees, with some having additional licenses or certifications, such as certified nurse-midwife (1.9%), nurse practitioner (3.4%), clinical nurse specialist (6.1%), and certified lactation consultant (4.0%) (data not shown). One third of the nurses reported spending most of their time during the pandemic in administrative positions (Table 1).

Most respondents worked in community hospitals (58.3%) or not-for-profit hospitals (41.1%) and in hospitals with Level 2 (32.9%) or Level 3 (47.3%) neonatal intensive care units (NICU) (Table 1). Most nurses worked in small L&D facilities with 1 to 10 beds (40.6%) or medium-sized facilities with 11 to 20 beds (44.6%) (Table 1). Triage was typically performed in an obstetric triage unit (60.9%) or to a less extent in the labor room (32.8%) (data not shown). Hospital configurations most often included L&D rooms with separate mother and baby postpartum units with a separate normal newborn nursery. Almost all hospitals (90.4%) had certified lactation specialists available (data not shown).

Perceived Usefulness of Guidance

When queried about the general usefulness of CDC resources for infection control guidance in L&D settings during the pandemic, most respondents (73.8%) reported that CDC guidance was *very useful*. However, the perceived usefulness varied significantly by several respondent characteristics. Nurses with more years of clinical practice, more advanced levels of education, and those involved in administrative planning for patient care more often reported the guidance to be *very useful*. Staff nurses less often reported CDC guidance as *very useful* (62.8%) compared with nurse educators (84.3%) or nurse managers/executives (82.8%). Perceived usefulness of the CDC guidance did not vary by hospital characteristics with the exception of county/city hospitals, where nurses perceived it as less useful than did nurses from other hospital types (Table 1).

Hospital Written Policies

Table 2 represents participant responses to the presence of hospital written policies consistent with select CDC-recommended practices before, during, and after the pandemic. No statistically significant differences were found when stratifying by unit designation (labor, delivery, or combined units) for any of the six specific written policies (data not shown); therefore, findings were reported for the sample of L&D nurses combined. For all six practices, adoption of written policies increased dramatically during the pandemic. The two policies most frequently in place during the pandemic were to question patients about recent flu-like symptoms on arrival (89.4%) and to isolate patients with suspected or confirmed influenza (90.7%). The most controversial of these practices, immediate separation of infants from mothers with suspected or confirmed influenza after delivery, translated into fewer hospitals formally endorsing the practice through written policy. During the pandemic, only one half (50.9%) of the respondents reported this specific written policy at their institutions. However, the use of two written policies increased dramatically from before the pandemic to during the pandemic and remained above prepandemic levels after the pandemic: the immediate initiation of antiviral treatment (13.6% prepandemic, 65.2% during the pandemic, and 42.9% after the pandemic) and the immediate separation of

healthy newborns (14.4% prepandemic, 50.9% during the pandemic, and 36.9% after the pandemic).

The presence of a written hospital policy supported consistent implementation of infection control practices.

Implementation of Practices during the Pandemic

Table 3 summarizes the frequency with which practices were implemented during the pandemic. Participants stated that most of the time they questioned patients about recent flu-like symptoms (89.9%) and isolated patients with suspected or confirmed influenza (84.7%). Less frequently implemented were the following practices: immediate initiation of antiviral treatment for women with suspected influenza (49.0%), asking ill patients to wear masks during L&D (57.7%), and bathing healthy infants of ill mothers (56.9%). The least implemented policy was immediate separation of healthy newborns from mothers with suspected or confirmed influenza after delivery (42.4%). Almost 45% of the participants reported that they rarely or never separated infants from ill mothers (28.6%) or were unsure how often they implemented the practice (15.6%).

Table 4 reports respondent and hospital characteristics associated with the implementation of the six practices *most of the time*. In general, respondents who viewed the CDC guidance as *very useful* reported implementing the practices more often than those who did not. Staff nurses and those who provided direct patient care reported implementing the practices less frequently than those in managerial or administrative positions. The number of years in clinical practice and the primary unit that the nurses worked in during the pandemic were statistically significant for some but not all practices.

Overwhelmingly, the presence of a written hospital policy supported the implementation of practices *most of the time*. For most practices, the type of hospital and number of L&D beds did not affect the frequency of implementation of the selected practices. Only the immediate initiation of antiviral medications seemed to be different (less often implemented in for-profit hospitals and those with 1–10 beds). The highest acuity setting, that of institutions with Level 3 NICUs, implemented most practices more frequently, even the less popular practices, such as those of immediate initiation of antiviral therapy, asking patients to wear surgical masks during L&D, and immediate separation of healthy newborns from ill mothers.

Difficulty Implementing Practices

For each of the six practices, the perception that implementation was *very difficult* increased as the frequency of implementation decreased (Table 5). For example, immediate separation of healthy newborns from mothers with suspected or confirmed influenza to an open warmer by a distance of greater than 6 feet was reported as *very difficult* to implement by 9.2% of nurses who implemented the practice *most of the time*, 15.3% of those who implemented the practice *sometimes*, and 33.6% of those who implemented the practice *rarely*. Among those respondents who reported implementing the practices *most of the time*, for each practice except immediate separation, the majority (more than 63%) reported no difficulty. Immediate separation was the practice with the highest proportion of nurses reporting some

level of difficulty with implementation (51.3%). Respondents reported the least difficulty implementing the two following policies *most of the time*: questioning patients about recent flu-like symptoms (90.5%) and bathing healthy infants of mothers with suspected or confirmed influenza as soon as the infants' temperature stabilized (91.5%).

Sustained Labor and Delivery Infection Control Written Policies after the Pandemic

Respondents were asked about the retention of written policies after the pandemic that support the recommended CDC influenza infection control practices (Table 2). With the exception of asking patients with suspected or confirmed influenza to wear masks during L&D, respondents indicated that all written policies on recommended practices, although not present at levels seen during the pandemic, remained above prepandemic levels. Immediate initiation of antiviral treatment for patients with suspected influenza more than tripled (from 13.6%–42.9%) from prepandemic to after the pandemic. Even the least implemented practice of separation of healthy newborns from mothers with suspected or confirmed influenza, the presence of a written policy more than doubled from before versus after the pandemic (from 14.4%–36.9%).

Discussion

All of the participants in this survey were nurses, but degrees, certifications and licenses, positions, and responsibilities varied. Three fourths of all respondents surveyed perceived the CDC guidance as *very useful*, but there were some differences with regard to position, education, and experience. Although all nurses can be expected to know or be aware of most of the written policies of the hospitals in which they work, it is conceivable that nurses who plan for or implement policies might be more knowledgeable and recognize their utility. It should be noted that staff nurses in this survey who provided the bedside care reported less frequent implementation of policies than those who were in management positions. Nurses in management positions might not have to actively implement policies on a regular basis.

Written policies should be put into place before emergencies occur, and nurses should be made aware of these policies and their scientific bases.

Among the L&D practices examined in this survey, less than 15% of nurses reported that their hospitals had written policies before the pandemic that supported immediate initiation of antiviral treatment for patients with suspected influenza and the immediate separation of healthy newborns from their mothers. During the pandemic, the rate of the nurses who reported the presence of policies on these two practices increased to greater than 50%. However, asking hospitals to implement these practices represented a big departure from most prepandemic standards of care. The immediate separation of healthy newborns from their mothers with suspected or confirmed influenza during the pandemic was the least frequently implemented practice and deemed the most difficult to implement by most respondents. Physical organization of units for L&D services in some hospitals might not be conducive to easy adoption of this policy. Still others might have been resistant to interfere with initiation of breastfeeding and with the mother/child bond. Family-centered care has been the paradigm for the past 20 or more years in obstetric care (Jordan, 1972). Altering

generations of this practice philosophy overnight would be difficult under any circumstances.

As might be expected, an inverse relationship between level of difficulty and frequency of implementation (as difficulty increases, frequency of implementation decreases) was found. Among implementers, most reported no difficulty. However, the proportion of those who reported *moderate or somewhat difficult* or *very difficult* or did not respond at all, still represent a sizable number of our sample. For future public health responses, it might be advisable to explore barriers to implementation for those who implement less. For example, adoption of practices might be affected more by value judgments of the utility or applicability of specific practices to their perceived threat risk. Further exploration of this finding through multivariate analysis is warranted to uncover what facilitates or impedes adoption of certain practices.

It is encouraging to note that presence of most written influenza infection control policies concerning L&D increased during the pandemic and remained above baseline 9 to 10 months after the pandemic. The two policies representing triage, questioning patients about recent flu-like symptoms and isolating patients with suspected or confirmed flu, remain at high levels. This might represent heightened institutional vigilance and serves to make institutions more pandemic ready. Of note, even the least implemented policies (separation of healthy newborns from ill mothers and immediate initiation of antiviral treatment) have remained in place after the pandemic. Separation policies more than doubled, and treatment policies more than tripled. The retention of pandemic influenza policies indicates their utility in enhancing preparedness for future events.

These findings are not unique to nurses. A nationally representative survey among obstetrician/gynecologists (OB/GYNs) regarding practices during the 2009 H1N1 influenza pandemic had very similar results as found in this evaluation. Obstetrician/gynecologists questioned patients about flu-like symptoms and isolated ill patients from healthy patients *most of the time*, 79.4% and 91.6%, respectively (Rasmussen et al., 2012). However, there were some differences that might be attributed to the divergent roles OB/GYNs and nurses have in the L&D setting. Wearing a mask during L&D was implemented more frequently by physicians (73.9%) and might reflect that, even when written policies are not in place, OB/GYNs rely on their clinical judgment and implement the policy on an informal basis.

However, only one fourth of OB/GYNs separated ill mothers from healthy newborns. Given that the obstetrician's job is focused on the delivery, it stands to reason that this policy might be seen as outside the obstetrician's purview. It might be more likely that neonatologists rather than obstetricians would engage in this practice. The investigators in another study (Gupta & Pursley, 2011) confirmed this assumption by conducting a survey among directors of NICUs. In their research concerning infection control practices during the 2009 to 2010 pandemic, they found that 58% of neonatologist survey respondents restricted breastfeeding, and 90% maintained physical separation between a mother who had influenza-like illness and her newborn.

Strengths and Limitations

Before the pandemic, there was little information addressed in the 2008 expert's workgroup on infection control policies, practices, and barriers to implementation regarding pandemic influenza infection in the L&D setting (Rasmussen et al., 2009). Nurses provide the bulk of obstetric and neonatal care during hospitalization. The survey results reported herein reflect the experiences and perceptions of a national sample of obstetric and neonatal nurses, nurse practitioners, and nurse managers about selected infection control policies and practices and, therefore, add to the knowledge of bedside infection control practices.

The low response rate and nature of the convenience sample limit the generalizability of the findings. The survey did not capture the motivation for participation so the respondents might not accurately represent all obstetric and neonatal nurses, nurse practitioners, and nurse managers. Additionally, all nurse respondents were members of their professional organization, AWHONN, which might indicate a difference in responses compared with those who are not members of professional organizations. Potential respondents were able to determine whether they were eligible or not just from initial correspondence. This self-selection limited our ability to determine those who were truly ineligible from those who chose not to respond. As with any data based solely on self-report, recall bias is a limitation. The nurses were surveyed within 2 years of the beginning of the pandemic, and some might not have remembered when written policies were in place or the difficulty they had implementing them. The cohort tended to be older nurses, highly educated members of AWHONN, and might not reflect the potential responses from all nurses who work in hospital obstetric settings. Because the information about the specific institutions was not collected in the survey, it was not possible to calculate the number of unique institutions involved.

Conclusions

The 2009 H1N1 pandemic offered an opportunity to test feasibility and effectiveness of practices for pregnant women and their newborns in the L&D setting and has affected retention of infection control policies long term. Given that there was a paucity of data before the pandemic, this report can be helpful and timely for institutions in planning for future pandemics or influenza outbreaks and also can be applicable to other infection control practice situations or public health emergencies. For example, written policies can be put into place before emergencies occur. Nurses can be made aware of the policies and their scientific bases through mandatory in-service education and can be encouraged to practice those policies routinely. Looking at the physical structure of the units and making modifications in usage of existing structure or structural improvements before an emergency situation occurs also would be helpful. Further research is needed to determine barriers to and motivators for institution of infection control policies.

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Table 1

Characteristics of Respondents and Perceived Usefulness of CDC Guidance on Infection Control during the 2009 H1N1 Influenza Pandemic

	Total (<i>N</i> = 1,866)		Perceived CDC Guidance to be <i>Very Useful</i> (<i>n</i> = 1,354)	
	<i>n</i>	%	<i>n</i>	%
Respondent characteristics				
Perceived usefulness of CDC guidance				
Very useful	1,354	73.8	-	-
Somewhat useful	429	23.4	-	-
Not useful	19	1.0	-	-
Not used	33	1.8	-	-
Number of years in clinical practice				
1–10	379	20.4	235**	62.0
11–20	448	24.1	307**	68.5
21+	1,036	55.6	810**	78.2
Earned degree ^b				
Associate degree in nursing	590	31.6	161	70.9
Bachelor of science in nursing	1,154	62.8	850	73.7
Master of science in nursing	433	23.2	356**	82.2
Primary position during pandemic				
Staff nurse	962	51.9	604**	62.8
Nurse educator	197	10.6	166**	84.3
Nurse manager/executive	528	28.5	437**	82.8
Other ^c	168	9.0	147**	82.1
How spent majority of time during pandemic				
Administrative planning for patient care	595	32.0	507**	85.2
Providing direct patient care	988	53.2	617**	62.4
Time was equally split	275	14.8	225**	81.8
Primary unit during the pandemic				
Antepartum	100	5.4	84**	84.0
Intrapartum (LDR/LDRP and L&D)	1,006	53.9	688**	68.4
Combined units ^a	760	40.7	582**	76.6
Hospital characteristics				
Type of hospital ^b				
Community hospital	1,087	58.3	798	73.4
Not-for-profit hospital	767	41.1	571	74.4
University teaching hospital	248	13.3	180	72.6
County/city hospital	216	11.6	141*	65.3
For-profit hospital	200	10.7	137	68.5

	Total (N = 1,866)		Perceived CDC Guidance to be <i>Very Useful</i> (n = 1,354)	
	n	%	n	%
Highest NICU level designation				
Do not know	43	2.3	26	60.5
Level 1	326	17.5	252	77.3
Level 2	611	32.9	436	71.4
Level 3	878	47.3	637	72.6
Number of labor and delivery beds				
Do not know	5	0.3	2	40.0
1–10 beds	757	40.6	555	73.3
11–20 beds	830	44.6	600	72.3
21+ beds	270	14.5	193	71.5

Note. CDC = Centers for Disease Control and Prevention; LDR = labor, delivery, and recovery; LDRP = labor, delivery, recovery, and postpartum; NICU = neonatal intensive care unit.

^a Includes those who provided or planned for patient care in antepartum, intrapartum, postpartum, and newborn care settings.

^b Multiple responses were permitted.

^c Includes lactation consultants, nurse practitioners, nurse midwives, infection prevention specialists.

* Chi-squared test comparing the distribution of perceived CDC guidance to be *very useful* by characteristic significant at $P < .05$.

** $P < 0.001$.

Table 2
 Presence of Hospital Written Policies Consistent with Selected Labor and Delivery Practices Recommended by CDC (N = 1,866)

Selected Labor and Delivery Practices Recommended by CDC Guidance During the Pandemic	Had a Written Hospital Policy ^a					
	Before the Pandemic		During the Pandemic		After the Pandemic	
	n	%	n	%	n	%
1 Questioning patients about recent flu-like symptoms on arrival to the L&D unit	691	43.7	1,418	89.4	1,161	75.2
2 Immediate initiation of antiviral treatment for patients with suspected influenza (i.e., not delaying treatment pending diagnostic testing results)	212	13.6	1,030	65.2	658	42.9
3 Isolating patients with suspected or confirmed influenza from healthy patients on arrival to the unit	821	52.1	1,437	90.7	1,225	79.2
4 Asking patients with suspected or confirmed influenza to wear surgical masks during labor and delivery	388	24.7	1,058	67.0	804	52.1
5 Immediate separation of healthy newborns from mothers with suspected or confirmed influenza to an open warmer by a distance of more than 6 feet	226	14.4	806	50.9	568	36.9
6 Bathing healthy infants of mothers with suspected or confirmed influenza as soon as the infants' temperature stabilized.	761	48.4	918	58.4	841	54.8

Note. CDC=Centers for Disease Control and Prevention.

^a All paired *t* tests assessing differences in the presence of hospital written policies between time periods (e.g., before vs. during, during vs. after, and before vs. after) are statistically significant at *P* < .001.

Table 3
 Frequency of Implementation During the Pandemic of Selected Labor and Delivery Practices Recommended by CDC (*N* = 1866)

	<u>Most of the Time</u>		<u>Sometimes</u>		<u>Rarely or Never</u>		<u>Unsure</u>	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Questioning patients about recent flu-like symptoms on arrival to the labor and delivery unit	1,411	89.9	114	7.3	30	1.9	15	1.0
Immediate initiation of antiviral treatment for patients with suspected influenza (i.e., not delaying treatment pending diagnostic testing results)	767	49.0	334	21.3	288	18.4	176	11.2
Isolating patients with suspected or confirmed influenza from healthy patients on arrival to the unit	1,326	84.7	136	8.7	75	4.8	28	1.8
Asking patients with suspected or confirmed influenza to wear surgical masks during labor and delivery	903	57.7	211	13.5	363	23.2	87	5.6
Immediate separation of healthy newborns from mothers with suspected or confirmed influenza to an open warmer by a distance of more than 6 feet	663	42.4	210	13.4	448	28.6	244	15.6
Bathing healthy infants of mothers with suspected or confirmed influenza as soon as the infants' temperature stabilized.	890	56.9	164	10.5	208	13.3	301	19.3

Note. CDC = Centers for Disease Control and Prevention.

Table 4
 Proportion of Respondents Who Implemented Selected Labor and Delivery Practices Recommended by CDC

	Practice 1 ^a N = 1,570		Practice 2 ^a N = 1,565		Practice 3 ^a N = 1,565		Practice 4 ^a N = 1,564		Practice 5 ^a N = 1,565		Practice 6 ^d N = 1,563	
	n	%	n	%	n	%	n	%	n	%	n	%
OVERALL	1,411	89.9	767	49.0	1,326	84.7	903	57.7	663	42.4	890	56.9
Respondent Characteristics												
Perceived CDC guidance as <i>very useful</i>	*	*	*	*	*	*	*	*	*	*	*	*
Yes	1,052	91.2	615	53.6	1,026	89.2	704	61.3	551	47.9	705	61.5
No	345	85.8	144	35.7	288	71.8	188	46.8	105	26.2	179	44.5
Number of years in clinical practice	*	*	*	ns	ns	ns	ns	*	*	*	*	*
1–10	267	85.9	133	42.8	255	82.0	184	59.2	98	31.6	143	46.0
11–20	330	88.2	198	53.2	310	83.3	220	58.8	141	37.9	201	54.0
21+	812	92.0	421	47.8	759	86.3	497	56.7	423	48.0	544	62.0
Primary position during pandemic	*	*	*	*	*	*	*	*	*	*	*	*
Staff nurse	696	86.8	351	43.8	646	80.9	421	52.7	245	30.7	397	49.7
Nurse educator	156	92.9	83	49.4	146	86.9	107	64.1	90	3.6	110	65.5
Nurse manager/executive	411	93.6	237	54.2	389	88.6	276	63.2	238	54.5	285	65.4
Other ^b	148	91.9	96	60.8	145	91.2	99	61.5	90	55.9	98	61.3
How spent majority of time during pandemic	*	*	*	*	*	*	*	*	*	*	*	*
Administrative planning for patient care	479	94.3	276	54.8	461	90.9	327	64.6	291	57.5	338	66.9
Providing direct patient care	712	86.2	350	42.4	663	80.6	435	52.9	259	31.5	408	49.6
Time was equally split	214	93.0	138	60.0	196	85.6	135	59.0	111	48.3	141	61.3
Primary unit during the pandemic	*	*	*	ns	ns	ns	ns	*	*	*	*	*
Antepartum	75	83.3	57	63.3	77	86.5	51	57.3	45	50.0	52	57.8
Intrapartum	744	89.1	399	47.8	698	83.7	500	60.1	323	38.9	433	52.2
Combined units ^c	592	91.8	311	48.5	551	85.8	352	54.7	295	45.7	405	62.9
Hospital Characteristics												

	Practice 1 ^a N = 1,570		Practice 2 ^a N = 1,565		Practice 3 ^a N = 1,565		Practice 4 ^a N = 1,564		Practice 5 ^a N = 1,565		Practice 6 ^a N = 1,563	
	n	%	n	%	n	%	n	%	n	%	n	%
Presence of written policy supporting practice	*		*		*		*		*		*	
Yes	1,252	92.5	651	65.7	1,217	89.0	800	79.3	534	70.2	715	82.0
No/Unsure	105	64.8	83	16.1	63	44.7	64	12.9	99	13.2	134	21.4
Type of hospital ^d												
Community hospital	827	89.4	445	48.4	762	82.8*	510	55.4	380	41.3	525	57.1
Not-for-profit hospital	581	87.9*	329	49.9	571	86.5	382	57.9	279	42.3	374	56.9
For profit hospital	151	91.5	63	38.4*	129	79.6	89	53.9	68	41.2	98	59.4
University teaching hospital	195	92.4	138	65.4*	190	89.6*	148	70.8*	109	51.9*	121	57.6
County/city hospital	164	90.1	86	47.0	153	83.6	114	62.3	83	45.4	99	54.1
Highest NICU level designation	ns		*		*		*		*		*	
Do not know	31	91.2	8	23.5	24	70.6	14	41.2	7	21.2	14	41.2
Level 1	245	89.1	113	41.5	223	81.7	141	52.2	108	40.0	166	61.3
Level 2	452	88.8	216	42.4	411	80.7	273	53.8	190	37.3	290	57.1
Level 3	680	90.9	429	57.5	665	89.3	473	63.2	357	47.7	418	56.0
Number of labor and delivery beds at hospital	ns		*		ns		ns		ns		ns	
Do not know	3	100.0	1	33.3	2	66.7	2	66.7	1	33.3	2	66.7
1–10 beds	557	88.1	264	42.1	526	83.5	350	55.9	244	38.9	370	58.9
11–20 beds	643	91.1	377	53.4	598	84.7	417	59.1	313	44.3	400	56.9
21+ beds	204	90.7	121	53.8	196	88.3	130	57.8	101	44.9	115	51.1

Note. CDC = Centers for Disease Control and Prevention; LDR = labor, delivery and recovery; LDRP = labor, delivery, recovery and postpartum; NICU = neonatal intensive care unit.

^aPractice 1 = Questioning patients about recent flu-like symptoms on arrival to the labor and delivery unit. Practice 2 = Immediate initiation of antiviral treatment for patients with suspected influenza (i.e., not delaying treatment pending diagnostic testing results). Practice 3 = Isolating patients with suspected or confirmed influenza from healthy patients on arrival to the unit. Practice 4 = Asking patients with suspected or confirmed influenza to wear surgical masks during labor and delivery. Practice 5 = Immediate separation of healthy newborns from mothers with suspected or confirmed influenza to an open warmer by a distance of more than 6 feet

^bIncludes lactation consultants, nurse practitioners, nurse midwives, infection prevention specialists.

^cIncludes those who provided or planned for patient care in antepartum, intrapartum, postpartum, and newborn care settings.

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^dMultiple responses were permitted.

* Chi-square test (or Fischer's exact test where cell sizes are less than 5) comparing the distribution of implementing the practice *most of the time* by characteristic $P < .05$.

