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POSTPARTUM AND NEONATAL NURSING CARE DURING THE 2009 H1N1 INFLUENZA PANDEMIC

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Abstract

We describe select influenza infection control policies and practices related to postpartum and newborn care during the 2009 H1N1 pandemic. In an online survey of obstetric and neonatal nurses, significantly more nurses indicated a written hospital policy supporting each of the practices during versus before the pandemic. The two practices least oft en implemented were temporary separation of healthy newborns from ill mothers (37.7 percent) and testing newborns for influenza virus infection if signs of influenza were observed (31.4 percent). Presence of written hospital policies increased implementation of practices. Findings may be useful to guide planning for future pandemics or other public health emergencies.

Keywords

H1N1; influenza; newborn; pandemic; postpartum

The U.S. Department of Health and Human Services issued a national public health emergency declaration on April 26, 2009, in response to the emergence of a novel influenza A (H1N1) virus. Pregnant and early postpartum women were among those most severely affected by the novel flu virus, and this population experienced increased morbidity and mortality (Centers for Disease Control and Prevention [CDC], 2009a; Creanga et al., 2010;

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Supporting Information

Additional Supporting Information may be found online at: http://onlinelibrary.wiley.com/doi/10.1111/1751-486X.12047/suppinfo

Jamieson et al., 2009; Louie, Acosta, Jamieson, Honein, & California Pandemic Working Group, 2010; Siston et al., 2010). Some women gave birth while they were ill with suspected or confirmed pandemic (H1N1) 2009 influenza, and there were concerns about possible transmission to immunologically naive newborns.

The CDC, in collaboration with national maternal health partners and experts, developed and released guidance to support the management of suspected or confirmed maternal infection with pandemic (H1N1) 2009 influenza within hospital labor and delivery, postpartum and newborn care settings. The guidance was initially released in July 2009 and later updated in November 2009 to clarify clinical considerations (CDC, 2009b; Mosby et al., 2011). In addition to providing background information and defining key terms, the guidance addressed considerations for (1) labor/antepartum; (2) delivery/intrapartum; (3) recovery/postpartum; (4) newborn care/infant feeding; (5) visitation, hospital discharge and home care and (6) prevention. The guidance was based on proceedings from a meeting of experts convened by the CDC in April 2008 to develop a comprehensive public health approach for pregnant women in preparation for a future influenza pandemic (Rasmussen et al., 2009) and a literature review conducted early in the pandemic that considered the potential burden of disease and routes of transmission affecting newborns (Zapata et al., 2012). In general, the guidance recommended a cautious approach to the management of ill mothers and their newborns (e.g., temporary separation until specific criteria were met), but provided several options to consider on the basis of hospital configuration, staffing and surge capacity.

Given the urgent release of the CDC guidance to optimally protect maternal and infant health during the public health emergency, little information was available on the feasibility of implementing the CDC guidance before its release. During the pandemic, CDC received anecdotal reports that some hospitals were experiencing difficulty implementing aspects of the guidance, and that others disagreed with selected recommendations. To understand the degree to which the CDC-recommended practices were supported and implemented in hospitals during and after the pandemic, and to examine the level of difficulty nurses experienced implementing certain practices, a survey was conducted among a sample of obstetric and neonatal nurses from across the United States. This report summarizes influenza infection control policies and practices specifically related to postpartum and newborn care among a convenience sample of 1,173 postpartum and newborn care nurses who provided or planned for inpatient care during the 2009 H1N1 influenza pandemic.

METHODS

Data from this report were collected during March to April 2011 via a cross-sectional, online survey from a convenience sample of members of the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN). An invitation to participate in the survey was sent via e-mail to 12,612 AWHONN members with listed e-mail addresses. We wanted to sample nurses who worked in inpatient settings during the pandemic. Therefore, the following people were excluded: those who indicated on their membership profile that they worked in academia, ambulatory care, home health care or public health; those who were self-employed or not working and those who spent most of their time conducting research.

Upon accessing the online survey, potential respondents were asked if they provided or planned for inpatient care in obstetric or neonatal settings during the 2009 H1N1 pandemic. For the purposes of the survey, the time for the pandemic was defined as April 2009 through June 2010 (i.e., the month the 2009 H1N1 influenza virus was first detected in the United States through the month the U.S. Public Health Emergency for 2009 H1N1 influenza expired). Respondents who indicated that they were providing or planning for inpatient care in these settings during the pandemic were deemed eligible to participate and completed the online survey. Those who weren't eligible were thanked for their time.

As many as four invitations to participate in the survey were sent via e-mail, which offered the opportunity to enter a drawing for 1 of 20 registration waivers to the 2011 Annual AWHONN National Conference—an incentive to increase participation rates. Of the 12,612 nurses who received invitations to participate, 767 were identified as ineligible and excluded, and 2,641 eligible nurses completed the online survey for a final response rate of 22 percent (2,641/11,845). Because the primary purpose of the survey was to evaluate public health practice, the assessment was determined to be exempt from institutional review board review by the CDC, National Center for Birth Defects and Developmental Disabilities.

The survey instrument was developed collaboratively by representatives from the American Academy of Pediatrics, Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) and the CDC, and piloted before implementation. The following questions were asked about nurse and inpatient facility demographics: usefulness of various sources of infection control guidance during the pandemic; existence of hospital-written policies before, during and after the pandemic that aligned with the CDC guidance; implementation of selected CDC-recommended care practices during the pandemic and level of difficulty with implementation. For questions about the existence of hospital-written policies, implementation of selected practices and level of difficulty with implementation, the survey queried about labor and delivery practices, postpartum and newborn care practices and visitation and hospital discharge or other practices.

We summarize here the findings related to postpartum and newborn care practices among nurses who indicated that they worked in these settings during the pandemic, and who reported that they didn't change institutions during the period of interest (n = 1,173). Specifically, the following postpartum and newborn care practices were examined: temporary separation of healthy newborns from mothers with suspected or confirmed influenza (e.g., separate rooms, colocation in the same room with a barrier) until the mother received antiviral medication for at least 48 hours, was without fever for 24 hours without antipyretics and could control cough and respiratory secretions; testing newborns for influenza virus infection if signs of influenza were observed; provision of infant care (e.g., diapering, bathing) and feeding by a healthy family or staff member; and supporting mothers with suspected or confirmed influenza who wished to breastfeed to express milk/colostrum until criteria for close contact were met.

To assess the existence of hospital policies, respondents were asked if their hospital had a written policy supporting these practices before, during and after the pandemic. To assess practices of care, respondents were asked how oft en they implemented these practices (*most*

of the time, sometimes, rarely, never or *unsure*). Respondents were also asked how difficult it was to implement each practice (*very difficult, moderately difficult, somewhat difficult, not difficult* or *not applicable*).

Data analysis included describing characteristics of the analytic sample and perceived usefulness of various sources of information for infection control during the pandemic, including the CDC guidance. Sample characteristics were also described by the perception that CDC guidance was *very useful*, with chi-square tests computed to identify significant differences between subcategories. In addition, we examined the proportion of respondents indicating the presence of hospital-written policies supporting selected postpartum and newborn care practices recommended by the CDC guidance before, during and after the pandemic. Paired *t*-tests were computed to assess significant differences in the presence of hospital-written policies before versus during the pandemic, during versus after the pandemic and before versus after the pandemic. We also examined how frequently the practices were implemented during the pandemic and examined characteristics significantly associated with implementing each practice *most of the time* by using chi-square tests, or Fischer's exact tests where cell sizes were less than 5. For the practice of temporarily separating healthy newborns from mothers with suspected or confirmed influenza (until CDC-recommended criteria for close contact were met, which was measured by combining three individual separation questions, one for each criterion), respondents must have implemented all three individual separation practices *most of the time* for the combined separation variable to be coded as being implemented *most of the time*.

Lastly, among respondents who reported implementing the practices at least some during the pandemic (i.e., *most of the time, sometimes* or *rarely*), we described the level of difficulty implementing each practice, stratified by frequency of implementation. Those nurses who responded *never* or *unsure* when asked about the frequency of implementation were excluded because we felt they wouldn't be able to accurately answer questions about difficulty with implementation. Chi-square tests, or Fischer's exact tests where cell sizes were less than 5, were conducted to examine significant associations. For the practice on temporary separation, which was measured by combining three individual separation questions, we created a composite level of difficulty variable again. Specifically, if respondents indicated that any of the three separation practices were *very difficult* to implement, the composite variable was coded as *very difficult*. Of those remaining, if respondents indicated that any of the three separation practices were either *moderately difficult* or *somewhat difficult*, then the composite variable was coded accordingly. For the composite variables to be coded as *not difficult*, nurses must have indicated that all three separation practices were *not difficult*. In all data tables, percentages were estimated excluding missing data. All data were analyzed by using SPSS 18.

RESULTS

Characteristics of Respondents and Hospitals

Among the 1,173 respondents who worked in postpartum and newborn care settings during the pandemic and who reported not changing institutions since the beginning of the pandemic, most had worked in clinical practice for 21 years or more and had earned a

bachelor of science in nursing degree (see Table 1 in "Supporting Information"). During the pandemic, most respondents indicated that their primary position was either as staff nurse, or nurse manager or executive, and nearly half reported spending most of their time during the pandemic planning for patient care or providing direct patient care. When queried about the primary unit in which they worked during the pandemic, most respondents indicated combined units (i.e., antepartum, intrapartum, postpartum and newborn care settings).

Respondents worked in a variety of hospital types. The organization of care also varied, but most reported labor and delivery rooms with separate mother/baby postpartum units with a separate normal newborn nursery. Most facilities had 20 or fewer labor and delivery beds, and nearly all respondents indicated that a certified lactation specialist was available in their hospital.

Perceived Usefulness of Guidance

When asked about the usefulness of various sources of information about infection control guidance during the pandemic, most reported that the CDC guidance was *very useful* (see Table 1 in "Supporting Information"). When compared with other sources of information, the CDC guidance received the highest rating of usefulness. Specifically, the following sources of information were rated as *very useful* by respondents: hospital (65.3 percent), professional organization(s) (36.3 percent), state public health department (31.3 percent) and local public health department (29.3 percent) (data not shown).

The perceived usefulness of the CDC guidance on infection control during the pandemic significantly ($P < 0.05$) varied by several respondent and hospital characteristics, including number of years in clinical practice, earned degree, primary position, how most of time was spent, primary unit worked in during the pandemic and type of hospital. For example, the perception of the CDC guidance as *very useful* was significantly elevated and exceeded 80 percent for those who had earned a master of science in nursing degree, those whose primary position during the pandemic was nurse manager or executive or nurse educator and those who spent most of their time during the pandemic conducting administrative planning for patient care.

Hospital-Written Policies

For each of the postpartum and newborn care practices examined, a significantly ($P < 0.001$) higher proportion of respondents indicated the presence of a hospital-written policy supporting the practice during versus before the pandemic (see Table 2 in "Supporting Information"). In addition, a significantly ($P < 0.001$) lower proportion of respondents indicated the presence of a hospital-written policy supporting each practice after versus during the pandemic, although rates were still significantly ($P < 0.001$) higher than before the pandemic. The practices least oft en endorsed by hospitals via written policies during the pandemic included the temporary separation of healthy newborns from mothers with suspected or confirmed influenza until all three CDC-recommended criteria for close contact were met, and testing newborns for influenza virus infection if signs of influenza were observed.

Implementation of Practices During the Pandemic

The practices least oft en reported by nurses to have been implemented *most of the time* during the pandemic included temporary separation of healthy newborns from mothers with suspected or confirmed influenza until all three CDC-recommended criteria for close contact were met, and testing newborns for influenza virus infection if signs of influenza were observed (see Table 3 in "Supporting Information"). More than half of respondents indicated that *most of the time* infant care was provided by a healthy family or staff member, and nurses supported mothers who wished to breastfeed to express milk/colostrum until criteria for close contact were met. A significantly higher proportion of nurses reported implementing all four practices examined *most of the time*, if they perceived the CDC guidance to be very useful, and if their hospital had a written policy during the pandemic supporting the practices.

Other respondent and hospital characteristics significantly associated with frequency of implementing the practices *most of the time* are described in Table 3 (see "Supporting Information"). To highlight a few key findings, fewer staff nurses and those who spent most of their time during the pandemic providing direct patient care reported implementing the practices *most of the time*, compared with their counterparts. In addition, a higher proportion of respondents who worked during the pandemic in high-risk/transitional nurseries, neonatal intensive care units (NICUs) and university teaching hospitals reported testing newborns *most of the time* if signs of influenza were observed, compared with their counterparts. The practice of temporarily separating healthy newborns from their mothers who had suspected or confirmed influenza was more oft en implemented *most of time* by those who worked in hospitals with a higher number of labor and delivery beds. Organization of care was also an important hospital characteristic. Those nurses whose hospitals had labor, delivery and recovery rooms with separate mother and baby postpartum units and separate normal newborn nurseries reported the highest frequency of implementing temporary separation *most of time*, whereas those nurses whose hospitals had labor, delivery, recovery and postpartum care in a single room or unit without a separate normal newborn nursery reported the practice the least. Lastly, respondents who worked in a hospital where a certified lactation specialist was available significantly more oft en reported *most of the time* supporting mothers who wished to breastfeed to express milk/colostrum until criteria for close contact were met, compared with those without such a specialist available.

Difficulty Implementing Practices

For each of the practices, the perception that implementation was *very difficult* increased as the frequency of implementation decreased (see Table 4 in "Supporting Information"). When examining implementation difficulty among only those who reported implementing the practices *most of the time*, for each of the practices except temporary separation, the large majority (>80 percent) reported no difficulty; temporary separation was the practice with the highest proportion of nurses reporting some difficulty with implementation.

DISCUSSION

This analysis sought to summarize influenza infection control policies and practices related to postpartum and newborn care during the 2009 H1N1 influenza pandemic, and to understand the degree to which the CDC-recommended practices were supported and implemented by hospitals. Results showed that nearly three out of four postpartum and newborn care nurses rated the CDC guidance as a *very useful* source of information on infection control guidance during the pandemic, with fewer than 2 percent not using the guidance at all. In line with this finding, a significantly higher proportion of nurses reported that their hospital had a written policy supporting select postpartum and newborn care practices recommended by the CDC guidance during compared with before the pandemic, suggesting that hospitals used the CDC guidance to guide hospital-written policies during the pandemic. This isn't surprising given that CDC played a primary role in disseminating information about the pandemic to local and state health departments, the news media and the public; and guidance documents appeared to be accessible with reading levels appropriate for the intended audiences (Lagasse et al., 2011). In fact, the website containing the guidance on considerations regarding 2009 H1N1 influenza in intrapartum and postpartum hospital settings received 124,574 hits during the pandemic (Mosby et al., 2011). It's also worthwhile to note that the practices examined in this analysis (e.g., provision of infant care and feeding by a healthy family or staff member) were sustained, to some extent, after the pandemic because the proportion of hospitals with written policies supporting each of the practices was significantly higher than before the pandemic.

Nevertheless, two practices were reported by less than half of respondents to be supported via hospital-written policies—temporary separation of healthy newborns from mothers with suspected or confirmed influenza until all three CDC-recommended criteria for close contact were met, and testing newborns for influenza virus infection if signs of influenza were observed. Perhaps this is why only one in three respondents, overall, reported implementing these practices during the pandemic *most of the time*, especially since the presence of a hospital-written policy supporting these practices was significantly associated with frequency of implementation during the pandemic.

Related to separation of newborns and mothers, concerns were voiced from professional organizations that separating mothers and newborns may not be practical for hospitals given the configuration of care, staffing and surge capacity, nor optimal to promote mother-baby bonding and breastfeeding. However, findings from a descriptive study conducted among U.S. NICU directors during and shortly after the end of the pandemic documented high levels (90 percent) of physical separation between ill mothers and well newborns during the pandemic, although the degree of separation varied (e.g., 37 percent separated within the mother's room, 56 percent separated in a separate room and 6 percent separated either way) (Gupta & Pursley, 2011). No information was available about conditions needing to be met before allowing close contact, precluding direct comparison with our findings, nor were results stratified by the newborns' needs for separation from ill mothers for other noninfluenza-related medical reasons, given the NICU setting. As our analysis found that temporary separation was more oft en implemented *most of time* among nurses who worked in hospitals with a higher number of labor and delivery beds and among those who worked

in hospitals that had separate postpartum units and normal newborn nurseries, it appears that the practicality of recommendations influences the degree of translation into practice.

Although evidence on transmission risks to newborns during the pandemic was limited, transmission during or after birth via contact with infected respiratory droplets was a concern (Zapata et al., 2012). As a result, CDC recommended that infant care (e.g., diapering, bathing, feeding) be performed by a healthy family or staff member, and that support be provided to ill mothers wishing to breastfeed to express milk/colostrum until criteria for close contact were met. From our findings, both of these practices were largely (>65 percent) endorsed by hospitals via written policies during the pandemic, were largely (≥60 percent) sustained practices after the pandemic and implemented most of the time during the pandemic by the majority (≥60 percent) of respondents.

The survey of NICU directors described above also found high levels of hospital restrictions during the pandemic on direct breastfeeding between ill mothers and well newborns (Gupta & Pursley, 2011). Our finding that significantly more respondents who worked in a hospital where a certified lactation specialist was available reported supporting mothers who wished to breastfeed to express milk/colostrum is consistent with similar assessments, which have found positive effects of lactation consultants on newborn intake of human milk in NICU settings where mother and newborn are separated (Castrucci, Hoover, Lim, & Maus, 2007; Dweck et al., 2008).

Although many hospitals struggled with the implementation of the CDC guidance during the pandemic related to balancing family-centered care and support of breastfeeding while limiting the risk of infection transmission to well newborns (Gupta & Pursley, 2011), transmission to newborns via contact with infected respiratory droplets was a possibility, and cases of nosocomial infection in newborns during the pandemic were documented, including probable transmission by direct contact with ill family members or caregivers (Enstone et al., 2011; Fanella et al., 2011; Martic et al., 2011).

LIMITATIONS AND STRENGTHS

We considered limitations and strengths of our assessment. Perhaps the greatest limitation is the low response rate (22 percent), which threatens the validity and generalizability of findings. Unfortunately, the e-mail invitation sent to nurses requesting their participation included our eligibility criteria for the survey (i.e., must have provided or planned for inpatient care in obstetric or neonatal settings during the 2009 H1N1 pandemic). Therefore, nurses who determined that they were ineligible because of the content in the e-mail invitation may not have gone to the survey link to indicate their ineligibility. Therefore, it's possible that a proportion of nonrespondents were actually ineligible, reducing our response rate by not omitting these individuals from our denominator.

In addition, data weren't available to enable us to examine differences between respondents and nonrespondents. It's possible that those who responded may have systematically differed from those who didn't respond related to our outcomes of interest. For example, in the event that nurses more familiar with the CDC infection control recommendations were more likely to participate in the survey, our findings may overestimate certain outcomes

(e.g., perceived usefulness of the guidance). However, this situation isn't expected to have influenced queries about specific practices, such as the presence of hospital policies, implementation of practices and perceived difficulty with implementation. Nevertheless, although low, our response rate was within the range of other survey efforts conducted among U.S. clinicians during the pandemic (Gupta & Pursley, 2011; Kissin et al., 2011).

Although our survey instrument was piloted prior to implementation, it was developed specifically for this assessment and there are no psychometric data supporting its reliability or validity. For the information collected on the presence of hospital-written policies, those included in our assessment may not have been the most informative hospital staff to respond to such questions. Also, data were based on self-report and, therefore, subject to recall and social desirability bias.

Despite the limitations described above, our report provides valuable information about infection control policies and practices related to a wide range of postpartum and newborn care practices before, during and after the pandemic. To our knowledge, no other survey on this topic has been conducted about women's health with obstetric and neonatal nurses—those providing the bulk of postpartum and newborn care in hospital settings during the pandemic.

PRACTICAL IMPLICATIONS FOR CLINICIANS

Given the cyclical nature of influenza epidemics and the potential for other public health emergencies that may threaten the health and well-being of pregnant women and newborns, there are lessons to be learned from this assessment to inform future clinical practice during public health emergencies. Guidance documents from national public health authorities on recommended infection control practices that are released early in the emergency, readily accessible and developed in collaboration with professional organizations and other constituents are beneficial to clinicians and those planning for patient care. To maximize implementation of recommended practices during emergency situations, hospitals should consider instituting written policies to support the practices, particularly if they differ from usual standard of care.

For recommended practices that are controversial, addressing potential barriers upfront and offering solutions may improve implementation rates. For example, barriers to implementing temporary separation of healthy newborns from ill mothers during the 2009 H1N1 pandemic included hospital organization of care and concerns that separation would impede mother-newborn bonding and breastfeeding. Solutions from the pandemic to overcome these barriers included alternative approaches to achieving separation (e.g., rooming ill mothers and healthy newborns together, but using a physical barrier to reduce transmission risks or keeping the newborn at least six feet from the ill mother), and helping mothers to express milk/colostrum to be fed to the newborn by a healthy caregiver.

To assist with practice changes during influenza epidemics or other public health emergencies, collaborating with partner organizations is critical to widely disseminate recommendations via strategies such as infection control seminars, continuing education efforts and/or collaborative grand rounds.

CONCLUSION

The CDC's guidance on infection control practices in intrapartum and postpartum hospital settings was generally perceived as a useful source of information during the pandemic. Nevertheless, some recommended practices, including temporary separation of healthy newborns from mothers with suspected or confirmed influenza, were implemented during the pandemic by less than half of nurses responding to our survey. Findings did show that postpartum and newborn care practices were more oft en implemented frequently if they were supported by hospital-written policies. Other hospital characteristics significantly associated with implementing select CDC-recommended practices included a higher number of labor and delivery beds, organization of care that included a separate postpartum unit and newborn nursery and availability of a certified lactation specialist.

This survey offers a descriptive account of the management of postpartum and newborn care during the 2009 H1N1 influenza pandemic. Information learned may be useful to guide public health planning to protect immunologically naive newborns during future pandemics or influenza outbreaks, and may also be useful to guide planning for other public health emergency responses.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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