Low Postpartum Rubella Vaccination Rates in High-Risk Women, Miami, Florida, 2001

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Objective: To evaluate adherence to the Advisory Committee on Immunization Practices’ recommendations on postpartum rubella vaccination in hospitals with a high proportion of foreign-born Latina mothers, the highest risk group for congenital rubella syndrome.

Methods: In four large hospitals in Miami–Dade County, maternal medical records for births in 2001 were randomly selected. Using demographic information from birth certificates, vaccination information from medical records, and policy information from a hospital survey, postpartum rubella vaccination rates were characterized among women eligible for vaccination (non-immune and not screened) through univariate and multivariable analyses. Data collection was performed in 2002–2003 and the analysis was completed in 2004–2005.

Results: Among 1991 women, 1209 (61%) were foreign born. Overall, 410 (21%) were eligible for vaccination, and of these 44 (11%) were vaccinated. Vaccination rates were not associated with maternal race/ethnicity or the existence of institutional standing-order vaccination policies. A vaccination order was recorded for 59% (240/410), but even in the presence of an order, only 17% (31/240) of those women were vaccinated.

Conclusions: Despite policies and standing orders to vaccinate, postpartum rubella vaccination rates were very low among all racial/ethnic subgroups in a sample of hospitals caring for high-risk, foreign-born women. These findings suggest that additional system-level interventions, such as comprehensive operational guidelines, must accompany standing orders to vaccinate rubella non-immune women postpartum.

Introduction

The U.S. rubella vaccination program began in 1969 with the intent of preventing congenital rubella infections, including congenital rubella syndrome (CRS), a constellation of birth defects that includes blindness, deafness, heart defects, and developmental delay. The U.S. public health goal of rubella elimination by 2010 has been recently achieved, a credit to high population immunity resulting from long-standing high rates of childhood vaccination.

However, one in five births in the U.S. is to foreign-born women who have not been immunized as children. Until the late 1990s, few countries outside the developed world had childhood rubella vaccination programs, and for over 2 decades, foreign-born Hispanic women have accounted for the majority of CRS cases in the United States.

Since the late 1970s, the Advisory Committee on Immunization Practices (ACIP) and the American College of Obstetricians and Gynecologists (ACOG) have recommended postpartum rubella vaccination before hospital discharge for women lacking acceptable evidence of rubella immunity, a strategy that could prevent up to one third to one half of future CRS cases.

National vaccination surveys are performed, and coverage levels are carefully monitored for children and the elderly, but not for women of childbearing age. Only two published studies in the past 20 years have measured adherence to ACOG and ACIP recommendations on prenatal screening and in-hospital postpartum rubella vaccination in the U.S. These studies found rubella immunity screening rates of 97% to
Methods

Site Selection

In 2001, 13 hospitals provided birthing services in Miami–Dade County. Five hospitals with the highest proportion of foreign-born Hispanic and Haitian mothers were invited to participate, and four agreed. These four hospitals (public and private) had a total of 15,714 births in 2001, corresponding to 49% of the county’s births and 53% of the county’s births to foreign-born mothers.

Sample Size Calculation

To estimate postpartum vaccination rates within ten percentage points with 95% confidence intervals, a sample of 2000 records was needed, on the assumption of 10% rubella non-immunity and 60% postpartum vaccination. A 33% non-ascertainment rate was estimated based on pilot efforts to link birth certificate information to medical records, and thus an initial sample of 3000 birth certificates was sought.

Subject Selection

To obtain a retrospective cross-sectional sample of medical records from the participating hospitals, Florida’s electronic birth certificate registry for year 2001 births was used. A software program was developed to randomly select maternal names for participating hospitals with a probability of a selection proportional to the size of each hospital’s birth cohorts. Demographic data available for mothers with missing records were compared to those of the final study sample using chi-square or Fisher’s exact test when appropriate for categorical variables and Wilcoxon rank sum for continuous variables.

Data Collection

Data from electronic birth certificates were downloaded into a study database into which data were entered from the abstraction of medical records. Birth certificate data included: maternal age, race/ethnicity, maternal education, U.S.- or foreign-born status, prenatal care information, and gravidity. Trained abstractors reviewed medical records for the following: evidence of rubella immunity; signed (pre-printed or handwritten) physician’s order for postpartum vaccination; receipt of vaccination (per medication administration records); reasons for non-vaccination (if documented in chart); type of delivery payment; and length of time between delivery and hospital discharge (>48 hours or <48 hours). To evaluate whether errors of rubella immune status transcription contributed to missed opportunities for vaccination, rubella status documentation was tracked in each section of the maternal medical record. Abstractions were initially and periodically supervised by physician investigators who re-abstracted all records with conflicting or unclear rubella immune status.

To obtain information about institutional policies on standing orders to vaccinate postpartum, a separate mailed survey of the infection control practitioners in the study hospitals was conducted; these practitioners were instructed to consult their labor and delivery nurse colleagues regarding policies in 2001. Information from prenatal providers was not collected, assuming that hospital providers act on information present in the medical record at the time of delivery. Likewise, vaccination data from outpatient clinic postpartum records were not collected, because women are rarely vaccinated after hospital discharge.

Definitions

Rubella “screened” was defined as a rubella immunoglobulin G (IgG) result documented in the hospital medical record(s), whereas “not screened” for rubella was defined as the lack of such documentation (i.e., immune status unknown). Rubella immune status was determined according to the most recent (in order of priority) laboratory report, prenatal clinic note, or hospital provider note. Rubella “non-immune” was defined as having documented negative or equivocal rubella immunity test results, whereas “immune” was a documented positive result. Women eligible for postpartum vaccination according to ACIP guidelines are those who were either rubella non-immune or not screened, and who had no documentation of previous rubella vaccination. Prenatal care was defined as “adequate,” “intermediate,” or “inadequate,” based on the Kessner index, which assesses trimester of first prenatal care visit, number of visits, and gestation at delivery. Race/ethnicity classifications were obtained from birth certificate data, with Haitian ethnicity added through medical records data.

Data Analysis

Study outcomes were rates of rubella immunity screening and rates of postpartum vaccination. For each, associations with the following maternal demographic attributes were evaluated: age, race/ethnicity, country of birth, marital status, maternal education, and gravidity. For postpartum vaccination, factors related to hospital policies and practices were also examined, including the presence of an institutional standing order policy for postpartum vaccination, presence of written or preprinted standing order in the chart, time in hospital after delivery, and specific hospital. Any risk factor associated with the outcome in the bivariable analysis at a \( p \leq 0.1 \) was considered as a candidate for multivariable analysis in a multiple logistic regression model. Backward elimination of variables with default \( p \leq 0.05 \) for entry into the analysis was performed to determine which variables remained significant in the final model. All analyses were conducted using SAS, version 8.02 (SAS Institute, Cary NC, 1999). The human subjects review councils of the Centers for Disease Control and Prevention (CDC) and Florida Department of Health approved the study protocol. Data collection
was performed in 2002–2003, and the analysis was completed in 2004–2005.

Results

Study Population

For the four study hospitals, a total of 3041 electronic birth certificates were sampled, for which either entire records (1041) or key demographic data (9) were missing, providing a final study population of 1991. In the two hospitals with electronic medical record systems, >90% of records could be located through searches using maternal name, birth date, and social security number. In the two hospitals with paper-based medical record departments, locating the paper chart required a medical record number; such numbers were obtained by querying a hospital patient list using maternal name and birth date only. Due to mismatches on maternal name (likely due to spelling errors, pseudonyms used by foreign-born aliens, or surname changes among women who married after delivery), the medical record number could not be found for almost one third of selected names. Once the medical record number was found, maternal records could be located for about 80%.

The study population was 61% foreign born, and 87% Hispanic, black, or Haitian. Half were unmarried, and the median age was 28 years. The study population closely resembled the population of mothers giving birth in Miami–Dade County for the same year. Mothers for whom records were missing were significantly more likely to be foreign born (76% vs. 61%), Haitian (16% vs. 6%), married (63% vs. 50%), and older (median age 29 vs 28 years) (data not shown).

Rubella Screening Rates

Overall, 1771 (89%) of the 1991 study population records had documentation of screening for rubella immunity (Table 1), and 220 women were not screened. Approximately 80% of the not-screened women were from Hospitals A and B; these women

<table>
<thead>
<tr>
<th>Maternal characteristics</th>
<th>Total</th>
<th>Rubella immune status screened</th>
<th>Unadjusted OR (95% CI)</th>
<th>Adjusted OR (95% CI)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>n (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1991</td>
<td>1771 (89)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10–19</td>
<td>226</td>
<td>185 (81.9) Ref</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20–24</td>
<td>451</td>
<td>398 (88.3)</td>
<td>1.7 (1.1–2.6)*</td>
<td></td>
</tr>
<tr>
<td>25–29</td>
<td>487</td>
<td>442 (90.8)</td>
<td>2.2 (1.4–3.4)*</td>
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</tr>
<tr>
<td>30–34</td>
<td>493</td>
<td>452 (91.7)</td>
<td>2.4 (1.5–3.9)*</td>
<td></td>
</tr>
<tr>
<td>≥35</td>
<td>334</td>
<td>294 (88.0)</td>
<td>1.6 (1.0–2.6)</td>
<td></td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haitian</td>
<td>124</td>
<td>87 (70.2) Ref</td>
<td></td>
<td></td>
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<tr>
<td>Non-Hispanic black</td>
<td>352</td>
<td>279 (79.3)</td>
<td>1.3 (1.0–2.6)</td>
<td>1.6 (1.0–2.6)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1261</td>
<td>1163 (92.2)</td>
<td>3.7 (2.4–5.8)</td>
<td>3.7 (2.4–5.8)</td>
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<tr>
<td>Non-Hispanic white/other</td>
<td>254</td>
<td>242 (95.3)</td>
<td>8.6 (4.3–17.2)</td>
<td>4.9 (2.2–9.8)</td>
</tr>
<tr>
<td>Country of birth</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign born</td>
<td>1206</td>
<td>1065 (88.3) Ref</td>
<td></td>
<td></td>
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<tr>
<td>U.S. born</td>
<td>785</td>
<td>706 (89.9)</td>
<td>1.2 (0.9–1.6)</td>
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<tr>
<td>Maternal education</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>0–11th grade</td>
<td>419</td>
<td>346 (82.6) Ref</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12th grade</td>
<td>731</td>
<td>632 (86.5)</td>
<td>1.3 (1.1–1.9)</td>
<td>1.2 (0.8–1.6)</td>
</tr>
<tr>
<td>Some college or more</td>
<td>841</td>
<td>793 (94.3)</td>
<td>3.5 (2.4–5.1)*</td>
<td>1.8 (1.2–2.9)</td>
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<tr>
<td>Marital status</td>
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<td></td>
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<tr>
<td>Unmarried</td>
<td>993</td>
<td>843 (84.9) Ref</td>
<td></td>
<td></td>
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<tr>
<td>Married</td>
<td>998</td>
<td>928 (93.0)</td>
<td>2.4 (1.8–3.2)*</td>
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<td>Labor and delivery payment type</td>
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<td></td>
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<tr>
<td>Self-pay</td>
<td>61</td>
<td>47 (77.0) Ref</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indigent/other public assistance</td>
<td>618</td>
<td>530 (85.8)</td>
<td>1.8 (0.9–3.4)</td>
<td>2.0 (1.0–3.8)</td>
</tr>
<tr>
<td>Medicaid</td>
<td>420</td>
<td>370 (88.1)</td>
<td>2.2 (1.1–4.3)*</td>
<td>2.6 (1.3–5.1)*</td>
</tr>
<tr>
<td>Private</td>
<td>769</td>
<td>734 (95.4)</td>
<td>6.2 (3.1–12.4)*</td>
<td>3.8 (1.8–7.9)</td>
</tr>
<tr>
<td>Unknown</td>
<td>123</td>
<td>90 (73.2)</td>
<td>0.8 (0.4–1.7)</td>
<td>1.0 (0.5–2.1)</td>
</tr>
<tr>
<td>Prenatal care</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermediate/inadequate</td>
<td>258</td>
<td>209 (81.0) Ref</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate</td>
<td>1733</td>
<td>1562 (90.1)</td>
<td>2.1 (1.5–3.0)*</td>
<td></td>
</tr>
</tbody>
</table>

*p < 0.05 compared to referent group (bolded). CI, confidence interval; OR, odds ratio; Ref, referent.

In this column, the variables gravidity and country of birth were included in the adjustment of odds ratios. The gravidity variable excludes 13 women missing gravidity data.

Using the Kessner index, which is based on trimester of first prenatal care visit, number of visits, and gestation at delivery.

CI, confidence interval; OR, odds ratio; Ref, referent.

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had received prenatal care from over two dozen predominantly public-sector clinics, although a handful came directly from Caribbean and Latin American countries. Screening rates were equivalently high for U.S.-born and foreign-born women (90% vs 88%), and for non-Hispanic white women as compared to Hispanic women (95% vs 92%). Factors significantly associated with relatively low rates of screening in the multivariable analysis included Haitian (70%) or black (72%) race/ethnicity, less than high school education (83%), and self-pay (77%) delivery insurance type.

Postpartum Rubella Vaccination Rates

Among women screened for rubella immunity (n = 1771), 190 (11%) were non-immune. Of the total 410 women eligible for vaccination, 11% (44/410) were vaccinated postpartum (Table 2) (21% of the 190 non-immune women and 2% of the 220 presumably not-screened women). In multivariable analysis, those variables significantly associated with vaccination were hospital characteristics (i.e., hospital, presence of orders in chart), not patient characteristics (e.g., gravidity, race/ethnicity, education...
level, delivery insurance type, country of birth). The existence of a standing-order policy in the hospital was not associated with increased vaccination rates. Hospitals varied almost 20-fold in rates of vaccination of all women eligible for vaccination, but no hospital vaccinated more than one third. (Even among documented non-immune women, no hospital vaccinated more than half.)

An order to vaccinate was present in the chart for 59% (240/410) of all vaccine-eligible women (and 56% [107/190] of documented non-immune women). The presence of a preprinted or handwritten vaccination order in the chart increased vaccination rates among all vaccine-eligible women, yet even in the presence of an order, only 17% (41/240) of women were vaccinated. Handwritten orders, though rare, were more effective than preprinted orders (46% [11/24] vs 14% [30/216], p <0.05).

The most common transcription errors were when hospital doctors or nurses wrote “immune” where the laboratory report or prenatal note indicated non-immunity. Twenty instances of such transcription errors contributed to the non-receipt of vaccination for 20 of the 190 (11%) known rubella non-immune women. More than half (12/20) of these errors occurred in the presence of the original prenatal laboratory test reports. Among all women eligible for vaccination, only two charts documented patient refusal as the reason for nonvaccination.

Discussion

The observed rubella immunity screening rates of this study are roughly comparable to those found in non-high-risk U.S. populations (89% vs 97% to 99%, respectively) but the postpartum vaccination rates among documented non-immune women are far lower (21% vs 66% to 76%, respectively). Despite the elimination of indigenous rubella transmission, rubella exposure during pregnancy remains a risk in the United States. In 2003, an infant affected with congenital rubella was born in New York City to an immigrant Hispanic mother who had not left the country during her pregnancy (CDC, unpublished data); unfortunately, this mother had not been vaccinated after a previous delivery when she was found to be rubella non-immune. Because postpartum rubella vaccination is rarely provided in the outpatient setting, continued attention to hospital-based postpartum vaccination is needed to protect future pregnancies, particularly among foreign-born women.

While institutional policies for standing orders to vaccinate against rubella postpartum have been encouraged, this study found that the mere existence of policies was not sufficient to ensure high vaccination coverage. This is consistent with studies of in-hospital influenza and pneumococcal vaccination, suggesting that acute care facilities are difficult environments to provide vaccinations. Our data suggest that when present, preprinted orders improve vaccination coverage, and hospital provider practices (not patient-level characteristics) account for lower rates.

Suboptimal vaccination rates observed in Hospitals A and B may be related to vaguely worded standing orders (indications to vaccinate failed to specify women with an equivocal or unknown immune status). Hospital interventions to raise compliance with standing orders should include comprehensive operational guidelines developed collaboratively by obstetrics, nursing, pharmacy, infection control, and medical records departments. Guidelines should standardize how providers exchange, interpret, and transcribe rubella immunity results; likewise, guidance should be provided for hospital pharmacists who reportedly call ordering physicians to remind them (and effectively discourage them) of vaccine product labeling that rubella virus is potentially excreted in breast milk, despite no evidence showing that neonatal vaccine virus harms breast-fed infants. Where in-hospital screening results are not returned before discharge, women without evidence of rubella immunity should generally be vaccinated with measles-mumps-rubella vaccine without serologic testing.

This study has a number of limitations. First, despite their delivering more than half of the county’s births to foreign-born mothers, study hospitals may not be representative of the county’s high-risk hospitals. Second, due in part to record-keeping practices, medical records for almost one third of the original sample of birth certificates could not be obtained, and foreign-born and Haitian ethnic women were over-represented among missing records. Third, the use of electronic birth certificate data did not permit an evaluation of screening and vaccination practices among women with miscarriages and abortions—important yet overlooked populations for rubella prevention. Last, while data collection from prenatal clinics might have resulted in higher rates of screening, particularly for black and Haitian women with lower education levels, the abstracted medical records were presumably all that hospital providers worked with. None of these limitations are likely to have affected the finding of suboptimal postpartum vaccination rates among documented non-immune women in all hospitals in the sample.

The Miami hospitals participating in this study should be commended for agreeing to examine the issue of in-hospital postpartum vaccination. Other U.S. hospitals, particularly in areas with a high proportion of foreign-born women, should follow this example.
Despite the elimination of indigenous rubella transmission, one in five births in the United States is to foreign-born women who may not have received childhood rubella vaccination.

This article reports the results of a medical record review to evaluate prenatal rubella screening and postpartum vaccination in four Miami birthing hospitals, where most mothers are foreign born.

Despite the presence of standing orders to vaccinate, postpartum vaccination rates were very low and could benefit from supportive institutional guidelines.

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What This Study Adds...

References


