Evaluating Facility Infrastructure for Prevention of Mother-to-Child Transmission of HIV—A 2015 Assessment of Major Delivery Hospitals in Atlanta, Georgia

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Objective. Our goal was to evaluate the infrastructure of programs for the prevention of mother-to-child transmission (PMTCT) of human immunodeficiency virus (HIV) in major delivery units in the Atlanta, Georgia, metropolitan statistical area and to assess the knowledge, attitude, and practice of providers in these facilities around PMTCT.

Methods. Hospital assessments and individual knowledge and practices were surveyed among 71 healthcare providers from March 2015 to March 2016 in 11 hospitals that deliver 40,000 infants annually, which represents 70% of all deliveries in the Atlanta metropolitan statistical area. Included were questions about HIV testing for mother–infant pairs, test result turnaround times, policies and procedures for PMTCT, opt-out versus opt-in testing, availability of rapid point-of-care testing on labor and delivery units, and postnatal prophylaxis.

Results. Seventy-three percent (8 of 11) of the hospitals had limitations in their PMTCT infrastructure, and 36% (4 of 11) reported no standardized policies for care of HIV-infected women. Three labor and delivery units used opt-in HIV testing of women. Only 27% (3 of 11) of the hospitals reported nucleic acid testing of HIV-exposed infants. Oral zidovudine for infant prophylaxis was available in all the hospitals, but 64% (7 of 11) of them did not stock nevirapine. Fifty-nine percent (24 of 44) of the obstetricians did not routinely offer rapid testing at delivery without a third-trimester HIV test, and 78% (n = 32 of 41) of them did not offer testing at delivery if the woman declined antenatal testing. The facility with the most annual births in Georgia did not offer rapid testing at delivery for women with an unknown HIV status.

Conclusion. We identified several limitations in PMTCT infrastructure that might have contributed to perinatal HIV transmissions. The need to address these healthcare gaps to eliminate mother-to-child transmission of HIV in the United States is urgent.

Keywords. epidemiology; HIV; infrastructure; mother-to-child transmission; pediatrics; perinatal HIV.

The elimination of mother-to-child transmission (MTCT) of human immunodeficiency virus (HIV) is achievable if each step of the perinatal HIV-prevention cascade is followed. After publication of the 1994 landmark Pediatric AIDS Clinical Trials Group 076 study [1], rates of perinatal HIV transmission have continued to decline in the United States [2]. To reach the elimination goal, the Centers for Disease Control and Prevention (CDC) has called for standardization of medical interventions and policies across all major delivery units [3].

Georgia ranked fifth nationally in the total number of new diagnoses of HIV infection in 2014, and approximately 25% of these diagnoses occurred in females [4, 5]. Applying birth rates to the number of women living with HIV in Georgia, the Georgia Department of Public Health estimates that 250 to 300 HIV-infected women give birth annually (personal communication with GADPH). Thirty-four infants born in Georgia were diagnosed with HIV infection between the years 2010 and 2015, which reflects missed opportunities for PMTCT. Camacho-Gonzalez et al [6] previously highlighted system failures in Georgia in the PMTCT-of-HIV cascade by retrospective chart review of antenatal and postnatal records of HIV-infected infants born between 2005 and 2012. A limitation of this retrospective study was the missing information on a number of key determinants that affect transmission, which limited the assessment of
PMTCT guideline uptake by referring institutions. Taylor et al [7] reported 42 perinatal HIV transmissions in Georgia between 2010 and 2013, which ranks Georgia (at an estimated rate of >4%) second in the United States for perinatal HIV transmissions.

In 2015, the Georgia Department of Public Health, in collaboration with Emory University, developed the Perinatal HIV Services Coordination (PHSC) program, the goal of which is to identify gaps in the perinatal HIV-care continuum by working directly with delivery hospitals and providers. During the same year, the Georgia HIV/Syphilis Pregnancy Screening Act of 2015, which requires healthcare providers to provide opt-out HIV and syphilis testing of pregnant women during both the first and third trimesters, except when the woman refuses, was adopted [8]. The PHSC program sought to determine the uptake of these testing practices at delivery hospitals. The program included (1) on-site interview assessments of major delivery units in the Atlanta, Georgia, metropolitan statistical area (MSA), which has an estimated population of 5.7 million people, to evaluate institutional infrastructure for compliance with US PMTCT guidelines, and (2) disseminated a survey to provide data for an evaluation of the knowledge and practices of healthcare providers [9]. In this follow-up article, we describe the significant deficits in infrastructure that might have contributed to perinatal HIV-transmission events.

METHODS

Data obtained from the Georgia Department of Public Health were used to identify 11 labor and delivery hospitals in the Atlanta MSA with the highest number of annual deliveries. The study period was from March 2015 to March 2016. The PHSC team leader (S. L. S.) approached each hospital to conduct onsite and telephone interviews with department representatives from the labor and delivery and pharmacy departments and the microbiology laboratory. These 11 hospitals (2 university affiliated and 9 private) deliver 40,000 infants annually, which represents 70% of deliveries in the Atlanta MSA [5]. The interviews assessed department-specific information recommended by US PMTCT guidelines, including the types of HIV testing used for mothers and their infant, test result turnaround times, access to current policies and procedures for PMTCT, order sets for PMTCT, opt-out versus opt-in testing, availability of rapid point-of-care testing on labor and delivery units, and availability of oral zidovudine (AZT) and nevirapine (NVP) suspensions [9].

A knowledge- and practice-based survey was disseminated among a convenience sample of healthcare providers (n = 71) (one survey per provider) from each hospital to assess their knowledge of PMTCT and related hospital policies. Approximately 150 key personnel from obstetrics and gynecology (Ob/Gyn), neonatology, pharmacy, nursing, and the microbiology laboratory and fellows and residents from these specialties were approached at each hospital to complete the survey. We received 71 completed surveys, the majority (n = 44) of which were from Ob/Gyn providers and residents. The survey contained questions about the following: HIV testing at the time of delivery, HIV treatment during labor and delivery, and treatment of HIV-exposed infants. The institutional review boards of Emory University approved this study. Consent to interview the hospitals was not required because of the anonymous reporting of the hospitals and oversight by the Georgia Department of Public Health. Survey respondents also remained anonymous, and consent was not required for them to participate in the survey.

RESULTS

Potential risk factors for MTCT of HIV identified through the hospital assessment and questionnaire are presented in Table 1 and Figure 1.

Table 1. Hospital Demographics and Infrastructure for PMTCT of HIV

<table>
<thead>
<tr>
<th>Hospital</th>
<th>No. of HIV-Infected Infants Born (2005–2013)</th>
<th>Policies and Procedures for PMTCT</th>
<th>Point-of-Care Testing Available in Labor and Delivery Unit</th>
<th>Expeditied Fourth-Generation Ag/Ab Combination Testing (Results in 1–2 h)*</th>
<th>Expeditied Third-Generation Ab Testing (Results in 1–2 h)*</th>
<th>Uses Opt-Out HIV Screening</th>
<th>NAT for HIV-Exposed Infantsa</th>
<th>Stocks Liquid AZT</th>
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Abbreviations: Ab, antibody; Ag, antigen; AZT, zidovudine; HIV, human immunodeficiency virus; NAT, nucleic acid testing; NVP, nevirapine; PMTCT, prevention of mother-to-child transmission.

*aTest availability at each institution.*
Hospital Assessment Results
A deficit in PMTCT uptake was defined as missing one of seven national recommendations for the PMTCT care continuum: standardized policies and procedures for PMTCT; rapid HIV testing available at delivery; providing opt-out HIV screening of women at delivery; obtaining HIV test results within 2 hours (regardless of whether third or fourth generation test is used); on site virologic testing, by DNA or RNA PCR, of HIV exposed infants; and availability of oral AZT and NVP formulations as prophylaxis for HIV exposed infants. Results from department interviews revealed that 9 of the 11 hospitals had deficits in their PMTCT infrastructure and were not following 1 or more national PMTCT recommendations (Table 1).

Three hospitals had adopted a policy to use opt-in HIV testing for the screening of pregnant women at delivery, whereas 8 hospitals adopted the recommended opt-out HIV screening [10]. Rapid point-of-care testing was available in the labor and delivery units of 2 of the 11 hospitals. The majority (n = 8 of 11) of the hospitals screened pregnant women for HIV using the third-generation HIV antibody laboratory test, which provides results in 1 to 2 hours. Two hospitals were using expedited fourth-generation HIV antigen/antibody combination laboratory tests from which preliminary results were received from the laboratory within 1 to 2 hours. One hospital, which had more than 14,000 annual births, used the fourth-generation antigen/antibody combination laboratory test for screening that provided results in 3 to 24 hours. Laboratory assessment confirmed availability of virologic testing, by either DNA or RNA polymerase chain reaction testing, of infants on site at 3 of the 11 hospitals. All units stocked liquid AZT for prophylaxis in infants. However, 7 of the 11 hospitals did not stock NVP suspension and thus were not able to follow national guidelines for high-risk neonatal exposures to HIV [11, 12] (Table 1).

Provider Knowledge and Practices Survey Results
Although recommended in the national guidelines, HIV testing at delivery to women who had not undergone a third-trimester HIV test was not routinely offered by 75% (33 of 44) of the obstetricians, and 93% (41 of 44) of them failed to offer testing at delivery if the woman had declined antenatal HIV testing (Figure 1).

The majority (82% [36 of 44]) of the obstetricians reported administering intravenous (IV) AZT to women with an unknown HIV type 1 (HIV-1) RNA level or a most recent HIV-1 RNA level of >1000 copies/mL, regardless of the mode of delivery. However, in contrast to current US recommendations, 75% (33 of 44) of the obstetricians also administered IV AZT to women with an undetectable viral load.

National perinatal HIV guidelines refer clinicians to a federally funded resource with free telephone consultation. Just 18% (13 of 71) of the participants were aware of this Perinatal HIV/AIDS Clinical Consultation Center Hotline, and only 3 of them reported using it. Just 50% (8 of 16) of the neonatologists and neonatal nurses reported performing routine virologic diagnostic testing at birth for HIV-exposed infants at high risk of perinatal HIV transmission. Of the neonatologists, 33% (2 of 6) and 50% (3 of 6) did not identify correct dosing for AZT and NVP, respectively. The majority (90% [64 of 71]) of the participants reported a need for increased education and adherence to national PMTCT guidelines at their facility.

DISCUSSION
Current MTCT rates in resource-rich settings can be <1% with virologic suppression from the routine administration of antiretroviral therapy during pregnancy and avoidance of breastfeeding [13]. However, an unacceptably high annual rate of newly diagnosed HIV infections among infants remains in
parts of the United States [7]. These transmission events most often represent system failures that necessitate urgent implementa-
tion of corrective measures [11, 14]. This article identifies several infrastructure deficits in major delivery units that might have contributed to perinatal HIV transmission events in the Atlanta MSA.

The CDC recommends opt-out HIV testing for all pregnant women at entry to prenatal care and again in the third trimester in areas of high incidence, including the Atlanta MSA [10]. Georgia state law formally adopted opt-out HIV testing in 2007 and mandated third-trimester testing in March 2015 [8]. Any woman who presents in labor with an unknown or undoc-
umented HIV status should undergo expedited HIV testing unless she refuses. Expedited HIV testing is recommended also for women who present in labor who tested negative for HIV in their early pregnancy but are at increased risk of HIV infection and were not retested in the third trimester.

Although the majority of providers in our study reported offering HIV testing to women with an unknown HIV status at delivery, many of them failed to offer testing to women who had declined antenatal testing previously or were without a docu-
mented repeat third-trimester test.

The CDC recommends a fourth-generation HIV antigen/ antibody combination test as the preferred serologic screening test, but only 3 hospitals in this assessment used this test [9, 10]. Two hospitals in our study had the capacity to provide rapid point-of-care testing, and the majority of them still used third-generation antibody laboratory-based tests. Expedited HIV testing should be available on a 24-hour basis at all facilities with a maternity service, and their results should be available within 1 hour [9, 10]. The majority of hospitals surveyed received expedited results within 1 to 2 hours. However, the hospital with the largest number of annual births did not have rapid testing in the delivery units, and expedited HIV test results did not become available until well beyond the recom-
\[\text{mended 1-hour time frame, potentially delaying administration of IV AZT for prophylaxis and putting the infant at a higher risk of HIV transmission.}\]

In all situations, infant prophylaxis should be initiated as soon as possible after delivery (ideally within 6–12 hours of birth). All infants at high risk of HIV transmission should receive the 2-drug regimen consisting of 4 to 6 weeks of AZT plus 3 doses of NVP, with the first doses initiated soon after birth [12]. The results of this survey revealed that all the units stocked liquid AZT. However, the majority of the hospitals in the Atlanta MSA do not have the capacity to provide optimal prophylaxis for infants with high-risk exposure to HIV, because NVP suspension is not on formulary at 7 of these 11 hospitals (Figure 1).

The results of this study suggest that some obstetric and pediatric centers in the Atlanta MSA do not follow standard-of-care guidelines, which includes assessment of maternal HIV status during labor by performing rapid testing. Furthermore, nearly all the providers were unaware of the National HIV Clinical Consultation Center, a free 24-hour resource that provides advice on indications and interpretations of standard and rapid HIV testing in pregnancy and consultation on antiretro-
\[\text{viral use in pregnancy, during labor and delivery, and in the postpartum period.}\]

The major limitations of this study include the fact that we used a small convenience sample of participants surveyed. The correlation between provider knowledge and institutional implementation was not analyzed. Furthermore, there might have been variation in knowledge between groups of providers. Finally, Ob/Gyn providers were not surveyed in the prenatal setting.

The PMTCT of HIV requires a series of sequential and coordinated interventions targeted to women and their infant antenatally, during labor and delivery, and after birth. Unless delivery units and prenatal clinics across Georgia can reach the majority of pregnant women and each step along the pathway to prevention is carried out with more than 95% reli-
\[\text{ability [15], the goal of eliminating transmission will not be reached. There is an urgent need to close the healthcare gaps identified in Georgia and in the United States, assuming the situation is similar nationally, if we are to eliminate MTCT of HIV in the United States. Strong state and national leadership, particularly in public health departments, is necessary to disseminate evidence-based guidelines and to implement infrastructure changes in the many delivery units across the United States.}\]

Notes

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\textbf{Disclaimer.} The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the National Institutes of Health or the Department of Health and Human Services.

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