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Congenital Syphilis Investigation Processes and Timing in Louisiana

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Abstract

Background: Congenital syphilis (CS) is a potentially life-threatening yet preventable infection. State and local public health jurisdictions conduct investigations of possible CS cases to determine case status and to inform public health prevention efforts. These investigations occur when jurisdictions receive positive syphilis test results from pregnant women or from infants.

Methods: We extracted data from Louisiana's electronic case management system for 328 infants investigated as possible CS cases in 2010 to 2011. Using date stamps from the case management system, we described CS investigations in terms of processes and timing.

Results: Eighty-seven investigations were prompted by positive test results from women who were known to be pregnant by the health jurisdiction, and 241 investigations were prompted by positive syphilis test results from infants. Overall, investigations required a median of 101 days to complete, although 25% were complete within 36 days. Investigations prompted by positive test results from infants required a median of 135 days to complete, and those prompted by positive test results from pregnant women required a median of 41 days.

Conclusions: Three times as many CS investigations began with reported positive syphilis test results from infants as from pregnant women, and these investigations required more time to complete. When CS investigations begin after an infant's birth, the opportunity to ensure that women are treated during pregnancy is missed, and surveillance data cannot inform prevention efforts on a timely basis. Consistently ascertaining pregnancy status among women whose positive syphilis test results are reported to public health jurisdictions could help to assure timely CS prevention efforts.

Congenital syphilis (CS) is a potentially life-threatening illness occurring in infants whose mothers have infection during pregnancy. When contracted in utero, syphilis can result in stillbirth, perinatal death, prematurity, and a range of developmental abnormalities.

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Importantly, CS is preventable when women are screened and treated adequately for syphilis early in pregnancy.[1]

Local and state health jurisdictions conduct CS surveillance to prevent CS cases by ensuring adequate treatment for pregnant women and infants, and to identify missed opportunities for prevention. Providers and laboratories are mandated to report all positive syphilis test results to local and state health jurisdictions, which classify these reports as CS cases if they involve (*a*) a mother with untreated or inadequately treated syphilis infection at the time of delivery, or (*b*) an infant with abnormal serologic and clinical findings on evaluation.[2,3] Congenital syphilis case reports comprise the surveillance data that jurisdictions subsequently use to inform prevention programs.

Louisiana reported high and increasing rates of CS from 2005 to 2010.[2] In 2011, the Louisiana Office of Public Health STD/HIV Program requested assistance from the Centers for Disease Control and Prevention (CDC) to review recent CS investigations in order to identify areas for improvement in CS surveillance. The characteristics of mothers and infants in these investigations are described elsewhere.[4] In this analysis, we describe the processes and timeliness of these investigations. We consider the implications of how CS investigations are conducted, both for preventing CS cases and for informing public health prevention efforts.

MATERIALS AND METHODS

We reviewed and extracted data from Louisiana's communicable disease data management system, Patient Reporting Investigating Surveillance Manager (PRISM), for infants investigated as possible CS cases from January 1, 2010, to October 6, 2011. Data included in this report represent mother-infant pairs because infants are investigated when positive syphilis test results are reported for either mothers or infants.

Congenital syphilis investigations are carried out by disease intervention specialists (DISs) in local and state health jurisdictions. These investigations take two main forms. The first type begins when a woman's syphilis infection is reported to the health jurisdiction, and the DIS learns she is pregnant. Disease intervention specialists in Louisiana aim to investigate all women of reproductive age with positive syphilis laboratory results and to interview those who are newly diagnosed or have no record of treatment. In interviews, DIS collect information about women's current pregnancy status and history of syphilis infections, including details about timing and administration of treatment.

The second type of investigation begins when a newborn tests positive for syphilis and the laboratory results are reported to the health jurisdiction. This can happen if women were not tested for syphilis during pregnancy, or if they acquire syphilis after testing. In addition, some women with syphilis are tested during pregnancy, but they are not identified as pregnant when the positive test result is reported. The health jurisdiction may remain unaware of the pregnancy until after delivery if the DISs are unable to interview the woman due to high caseloads or difficulty contacting them.

The processes involved in a CS investigation depend on the starting point for the investigation. We describe processes for: (group 1) investigations prompted by a positive syphilis laboratory result from a woman found to be pregnant and (group 2) investigations prompted by a positive syphilis laboratory result from an infant (group 2).

We extracted the following information from the PRISM database: the common identifier linking mothers to infants; demographic information for mothers and infants, including infant's birthdate; syphilis serology results for mothers and infants, including test type, date, and result; and the DIS's determination of the investigation as a CS case or noncase.

To assess the sequence and timing of investigation processes, we extracted PRISM-generated date stamps for each process. We calculated the total number of days between a newborn's syphilis test result and investigation completion, which was defined as the day the STD/HIV surveillance program was notified of the results of the investigation. We also calculated this interval by investigation group, using the infant's date of birth as the starting point for both types of investigations. Although group 1 investigations are prompted by a positive syphilis test result from a woman found to be pregnant, a DIS cannot assign a case or noncase status to an infant until he/she is born. We calculated the median number of days required to complete investigations, as well as 25th and 75th percentiles. We calculated medians by group and by case status, to explore whether investigation timing may be influenced by DIS perception of severity based on the likelihood that an investigation would ultimately be classified as a case.

RESULTS

There were 87 investigations in group 1 and 241 investigations in group 2 (Fig. 1). In group 1 investigations, when a DIS learned that a woman with current or previous syphilis infection was pregnant, he/she first ensured the woman had been treated. When the infant was born, he/she was tested for syphilis, clinically examined for signs of CS, and treated if indicated. The DIS assured that the infant was treated appropriately and recorded the infant's syphilis test result(s) and treatment information. Based on a combination of maternal and infant information, the DIS determined whether or not the infant met the case definition for CS, and information was made available for surveillance purposes.

Group 2 investigations began with identification of an infant with a positive syphilis test result. Infants in Louisiana are often tested for syphilis at birth using a nontreponemal test, either for screening purposes or because of known syphilis infection in the mother. After the infant's positive syphilis test result was reported to the STD/HIV program, the DIS linked the infant to a mother and ascertained the mother's history of syphilis infection and treatment through existing public health records, clinical charts, and/or interviews. At this point, the DIS assured the mother was treated appropriately. Based on the combination of maternal and infant information, the DIS determined whether or not the infant met the case definition for CS, and information was made available for surveillance purposes.

Of investigations in group 1 and group 2, 13% and 19%, respectively, met the CS case definition (Table 1). In aggregate, investigations took a median of 101 days to complete.

Investigations ultimately determined to be cases took fewer days than those determined to be noncases to complete, a median of 91 days compared to 101 days. A median of 41 days were required to complete an investigation in group 1, and a median of 135 days were required to complete an investigation in group 2. In group 1, 25% of the investigations were completed within 22 days, and 25% took 106 days or longer. In group 2, 25% of investigations took 51 or fewer days to complete, whereas 25% took 242 days or longer.

DISCUSSION

During the period we examined, most (73%) of the 328 CS investigations in Louisiana were prompted by positive syphilis test results from infants. This suggests that many infants at risk for CS in Louisiana are being identified by the public health system too late to benefit from optimal prevention interventions. Congenital syphilis is preventable, but only if women infected with syphilis are treated adequately during pregnancy. When CS investigations begin after an infant's birth, the opportunity for a DIS to ensure that women are treated during pregnancy is missed.

Congenital syphilis investigations are labor intensive and can require several months to complete. In this study, investigations identified by positive syphilis laboratory results from infants took longer to complete than those identified by positive syphilis laboratory results from pregnant women. This is expected because reconstructing a mother's history of syphilis infection and treatment, which is necessary for case determination, takes much longer when DIS must work backward from an infant's test result. Delays in gathering information translate into less timely surveillance data and limit the STD/HIV program's ability to correct potential health system deficiencies.

Most positive syphilis test results are electronically transmitted to local and state health jurisdictions by large laboratories. Transmitted information is limited to basic demographic information and does not include pregnancy status. Although Louisiana's policy is to interview all reproductive-aged women with positive syphilis results, these interviews may be delayed or not conducted for a number of reasons. In these cases, it would be advantageous for DIS to have an easy way to ascertain whether or not a woman with syphilis is pregnant.

More than 17% (56/328) of infants investigated for CS met the case definition, which is concerning. This percentage was even higher (19%; 45/241) among infants whose investigations were prompted by a positive syphilis test result at birth. However, infants meeting the CS case definition may or may not have had clinical disease. Some of these infants' positive syphilis test results likely represented transplacental passage of maternal antibodies without active infant infection. Mothers of infants testing positive at birth may have had old or recent syphilis infections that may or may not have been adequately treated.

This analysis has limitations. Many of the dates used were computer generated. Disease intervention specialists may have had information needed for an investigation (e.g., a woman's pregnancy status) before they recorded it in PRISM. However, data were not available for surveillance until they were recorded in PRISM, so information known only to

an individual DIS could have been used solely for investigative purposes. Last, we used the CS case determinations as assigned by the Louisiana STD/HIV program for this analysis, some of which may have been incorrectly applied.[4] The primary reason for using the program's case determinations was to explore how DIS perception of the likelihood an investigation would be classified as a case may have influenced investigation timing.

At the time of this data collection, the Louisiana STD/HIV Program had been using PRISM for electronic case management for less than 1 year. Efficiencies have been gained in use of the system since that time. The Louisiana STD/HIV program also made other program improvements based at least partially on findings from this investigation, including automation of existing electronic laboratory data sources and identification of new sources of pregnancy information, customization of PRISM to facilitate more accurate and timely classification of CS cases, and participation in a multistate PRISM work group.

Optimal prevention and control strategies for CS rely on identifying positive syphilis test results among pregnant women, not among infants. Data on syphilis infections are increasingly available to health jurisdictions via electronic reporting; ideally, pregnancy status should also be available through these electronic reports. Programs should consider some of the strategies undertaken by Louisiana's STD/HIV program, such as encouraging commercial and private laboratories to include a pregnancy checkbox on their requisition forms or advocating that state and local laws specify pregnancy status as a required data element for syphilis case reporting. In addition, programs may be able to use existing pregnancy data from both private laboratories and public programs such as Medicaid. Identifying syphilis infections in pregnancy is critical to ensure not only prevention of CS, but also to enable timely dissemination of data to inform public health programs and resource allocation.

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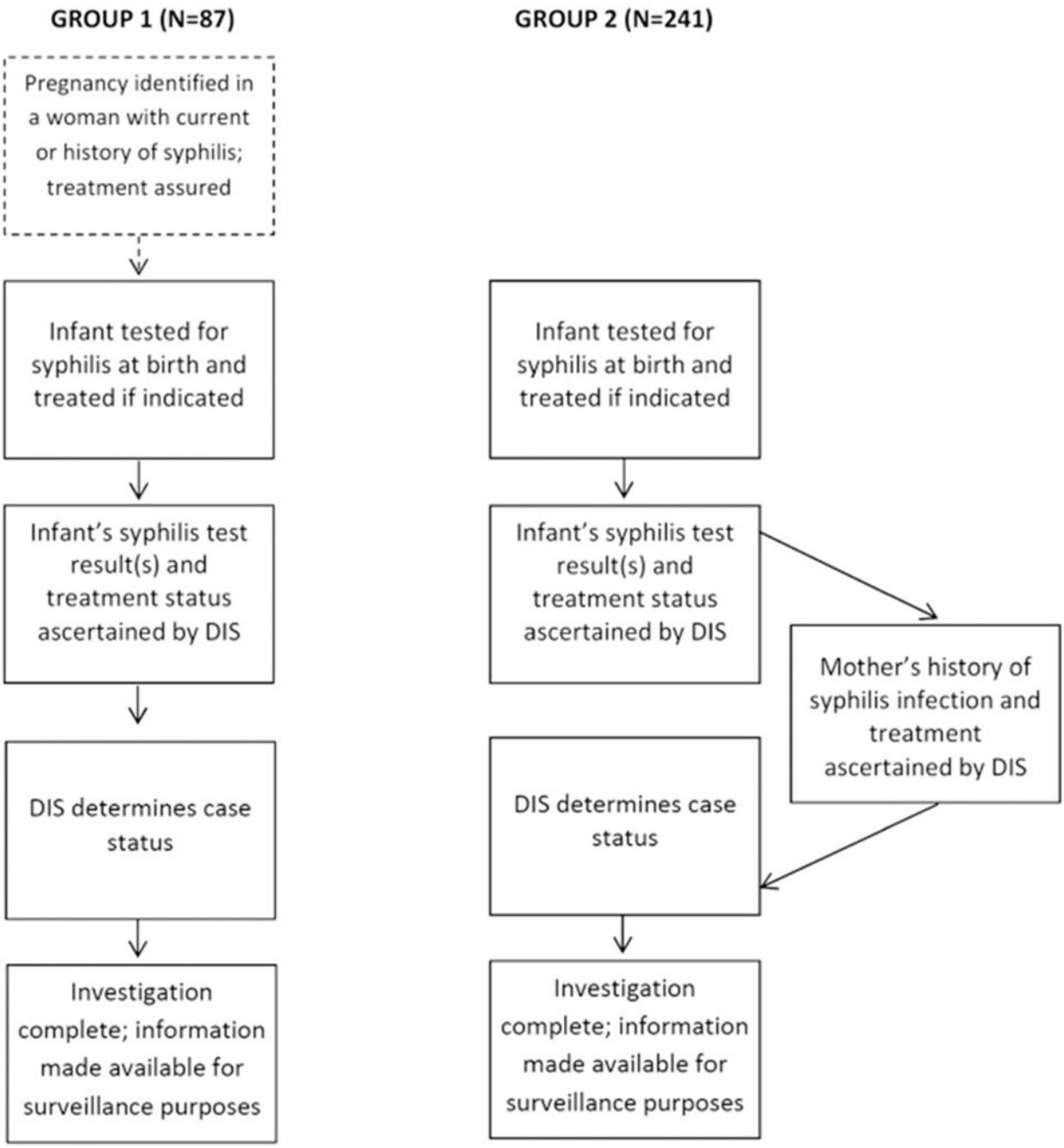

Figure 1.
CS investigation processes in 2 groups.

TABLE 1.

Quartiles for Number of Days Between Infant's Syphilis Test and Investigation Completion by Investigation Type and Case Determination

	Total (n = 328)			Group 1 (n = 87)*			Group 2 (n = 241)*		
	Total (n = 328)	Case (n = 56)	Noncase (n = 272)	Total	Case (n = 11)	Noncase (n = 76)	Total	Case (n = 45)	Noncase (n = 196)
25th percentile	36	33	36	22	16	22	51	48	51
Median	101	91	101	41	27	41	135	112	138
75th percentile	211	170	217	106	87	107	242	198	243

*Group 1 investigations begin with the identification of syphilis infection in a pregnant woman. Group 2 investigations begin with the identification of an infant with a positive syphilis test result.

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