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Interpretation of 2002 Centers for Disease Control Guidelines for Group B Streptococcus and Evolving Provider Practice Patterns

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Abstract

We investigated if clinicians were altering their care of group B streptococcus (GBS)-positive women in labor to achieve 4 hours of intrapartum antibiotic prophylaxis based on their interpretation of the 2002 Centers for Disease Control (CDC) guidelines on prevention of perinatal GBS disease. We surveyed all clinicians with privileges on the labor floor at our institution about their interpretation and clinical application of the 2002 CDC guidelines. Seventy of 96 eligible clinicians (72.9%) completed our survey. In our survey, only 22.9% of clinicians reported not altering their management of labor in GBS-positive pregnancies that achieved less than 4 hours of prophylaxis. These alterations included “laboring down” or delaying pushing; turning off or decreasing an oxytocin infusion; or delaying or avoiding artificial rupture of membranes. Clinicians are altering their management of labor to attempt to achieve 4 hours of intrapartum prophylaxis. The 2002 CDC guidelines do not specifically recommend prolonging labor and are being interpreted differently in the clinical setting than the authors may have intended. The effects and consequences of this interpretation are unknown.

Keywords

Group B streptococcus; intrapartum prophylaxis; CDC guidelines; early onset neonatal sepsis

Group B streptococcus (GBS) is a well-known cause of early onset neonatal sepsis, meningitis, and pneumonia. GBS colonization of the vagina and rectum is present in 10 to 30% of pregnant women.¹ Transmission of GBS to the fetus occurs in utero or during descent through the birth canal, the latter resulting most often in benign colonization. Intrapartum antibiotic prophylaxis can be used to interrupt vertical transmission of the organism and has been associated with decreased rates of neonatal GBS sepsis, now currently reported at an all time low of 0.3/1000 births in the United States.²

In 2002, the Centers for Disease Control and Prevention (CDC) issued guidelines recommending that all pregnant women be screened at 35 to 37 weeks of gestation for rectovaginal GBS colonization.³ Upon admission in labor, GBS-positive women are administered intravenous antibiotics (usually penicillin G: loading dose of 5 million units followed by 2.5 million units every 4 hours until delivery). Based on the 2002 guidelines, a

maternal-infant dyad is considered adequately treated if the mother has received 4 or more hours of prophylaxis before delivery, but there are no recommendations to attempt to prolong the course of labor to achieve this duration. If a mother receives less than 4 hours of prophylaxis before delivery, it is recommended that her infant have blood cultures drawn and be observed in the hospital for 48 hours. A recent systematic review of the evidence regarding duration of intrapartum prophylaxis for GBS failed to find compelling evidence to support the 4-hour threshold among low-risk women,⁴ and as many as 25 to 50% of GBS-positive women in labor fail to achieve the 4-hour recommendation due the rapidity of their labors.⁵

The 2002 CDC recommendations are used by many hospitals and clinicians to guide management of GBS-colonized women during labor. Due to the implicit assumption that 4 hours of intrapartum prophylaxis is beneficial, as well as institutional protocols being applied to newborns born prior to 4 hours of therapy, we sought to investigate if clinicians were altering their care of GBS-positive women in labor to achieve greater than 4 hours of prophylaxis.

MATERIALS AND METHODS

We developed a survey to query clinicians about their interpretation and clinical application of the 2002 CDC guidelines on prevention of perinatal group B streptococcal disease.

This study was exempted from review by the Human Investigation Committee at Yale University. The focus of the survey addressed whether or not clinicians alter their management of labor in response to the 2002 protocol by asking a series of questions that used clinical scenarios. We also addressed clinician perceptions of the protocol and any perceived patient or provider stress the clinicians had observed.

This survey was offered to all midwives, resident physicians, and attending physicians who have privileges on the labor and birth unit of Yale-New Haven Hospital, which has ~4700 deliveries annually of which ~20% occur in the setting of maternal GBS colonization. Surveys were distributed in three ways: providers were given surveys at grand rounds for the Department of Obstetrics and Gynecology at Yale University; surveys were distributed on the labor and delivery floor of Yale-New Haven Hospital; and surveys were distributed by e-mail. All surveys were confidential and collected in a sealed box to preserve anonymity. When respondents placed surveys in the sealed box, their names were checked off on a list of providers to ensure that multiple surveys were not returned by a single person.

RESULTS

All clinicians surveyed had active privileges on the labor and birth unit of Yale-New Haven Hospital during the period of survey collection, July 12, 2007 to September 15, 2007. A total of 96 clinicians met the criteria to receive the survey, and 70 completed it, yielding a participation rate of 72.9%. All 70 survey respondents answered all of the survey questions. Demographics for all respondents are reported in Table 1.

We asked clinicians how, if at all, they changed their management of GBS-positive multiparous women compared with GBS-negative multiparous women. Only 21.4% responded they did not change their management at all; 35.7% encouraged GBS-positive women to come to the hospital at the first signs of labor; 11.4% reported that they admitted GBS-positive women to the hospital before they were in active labor; and 57.1% said that they admitted GBS-positive women earlier in the course of labor than they would normally admit GBS-negative women. We also specifically addressed the labor course itself and asked clinicians if they recommended any interventions if a GBS-positive woman had not

yet received 4 hours of prophylaxis. Only 22.9% of clinicians responded that they would not alter their management of labor; 21.4% recommended “laboring down”/delay pushing; 27.1% would turn off or decrease an oxytocin infusion; and 74.3% reported that they delay or avoid artificial rupture of membranes. These data are reported in Table 2.

The majority (71.4%) of providers said that they would consider a woman who received 4.5 hours of prophylaxis adequately treated even if she never received a second dose of penicillin G at the 4-hour time point (Table 3). This is in accordance with the 2002 CDC guidelines and differentiates from the 1996 protocol,⁶ which required a second dose of antibiotic even if the woman was in the act of delivering at the 4-hour time point.

We also solicited their opinions about the 2002 CDC protocol (Table 3). The majority (55.7%) of clinicians responded that the protocol was “excessive,” and 46.3% described it as “optimal.” They also responded that trying to achieve 4 hours of intrapartum prophylaxis created significant stress for themselves as providers (35.7%), the patient (54.3%), the labor and delivery floor staff (42.9%), and the patient’s family (30%).

DISCUSSION

National agencies of health are charged with promoting the public health and welfare and therefore have the responsibility to create guidelines and recommendations for hospitals and health care providers to reduce the disease burden within our population. Early onset neonatal group B streptococcal disease has become largely preventable with antenatal GBS screening among pregnant women and the use of intrapartum antibiotic prophylaxis.² Therefore, it is very appropriate that the CDC has issued guidelines on this topic. The variations in the interpretation and application of guidelines are often hard to anticipate. The recommendation to perform additional testing and prolonged observation of newborns who have been exposed to less than 4 hours of intrapartum prophylaxis has led many maternity care providers to attempt to either prolong the duration of labor or avoid common interventions to hasten labor, in the belief that 4 hours of intrapartum antibiotic exposure is preferable to a shorter labor and a shorter duration of fetal exposure to the maternal GBS organism. This is not an irrational conclusion, especially if we assume that the evidence to support special attention to infants born to GBS-positive mothers after short labors is well justified. However, if this evidence is not compelling or of high quality, prolonging labor and fetal exposure to the GBS organism may be neither in the best interest of the neonate nor the mother.

In the past several years, we have learned that the evidence supporting the 4-hour threshold is relatively weak, especially for low-risk GBS-positive women.^{4,7–10} These would include those who are delivering at term, are afebrile, have no history of GBS bacteriuria, have intact chorioamniotic membranes upon arrival, and have no prior history of a GBS-septic infant.⁶ Studies regarding the duration of prophylaxis among these women and their newborns are lacking; however, low-risk women make up more than 90% of parturients exposed to the GBS prophylaxis protocol.¹¹ Among GBS-positive women with risk factors, the existing evidence supports at least 1 or 2 hours of intrapartum prophylaxis to significantly reduce neonatal GBS colonization or disease.^{4,8,9} Maternal rectovaginal GBS colonization declines rapidly within 2 to 4 hours of initiating intrapartum prophylaxis,¹² and pharmacokinetic data show that fetal penicillin G levels peak within the first hour after maternal intravenous administration and remain 10- to 79-fold greater than the minimum inhibitory concentration throughout the remainder of the 4-hour interval.¹³ Furthermore, if attaining 4 hours of antibiotics is crucial to preventing group B streptococcal disease among low-risk women, as the CDC recommendation for universal screening suggests, we should expect to see increased cases of group B streptococcal sepsis among those neonates whose

mothers received less than 4 hours of prophylaxis. However, a review that examined all published case series through 2006 representing >600,000 births identified 581 cases of early onset GBS sepsis, of which only 7 were born to low-risk women whose infants received less than 4 hours of prophylaxis.⁴

We are not aware of evidence to support attempts to prolong labor in GBS-positive women to reduce the risk of early onset neonatal GBS sepsis. It is quite possible that efforts to prolong labor in such women would actually increase the risk of sepsis in newborns. Indeed, the CDC guidelines outline management for newborns who happen to be delivered before 4 hours have passed; the guidelines do not recommend altering the course of labor to achieve a 4-hour threshold. However, the confusion is understandable if providers assume that an intrapartum antibiotic duration of 4 hours is strongly evidence-based.

Our survey documents that on the labor floor at our academic medical center, the 2002 CDC guidelines on prevention of perinatal group B streptococcal disease had altering effects on management of labor. The 2002 CDC document³ provides a flowchart approach to the management of neonates born to mothers with GBS colonization, which indicates that maternal-infant dyads exposed to greater than 4 hours of intrapartum antibiotic prophylaxis are considered adequately treated. In our survey, respondent clinicians placed great emphasis on duration of prophylaxis and attainment of 4 hours. Only 21.4% of clinicians stated that there would be no difference in their instruction about time of admission between the GBS-positive and -negative women. Once in labor, a majority of clinicians also indicated that they would manage the labor course of GBS-positive women differently if they had not yet received 4 hours of prophylaxis, with only 22.9% of clinicians replying that they would make no changes to prolong the course of labor for these women. Interventions included delaying rupture of membranes, stopping oxytocin infusions, or instructing women to delay pushing or “labor down.” These alterations may or may not negatively impact labor. Delaying rupture of membranes could have theoretical benefit if the clinician is concerned about exposure of the fetus to the colonized birth canal or ascending GBS infection in a slowly progressing labor. However, stopping oxytocin infusions and “laboring down” carry the risk that the fetus may spend a longer duration in the birth canal, increasing exposure to the organism. Clinicians also reported increased stress resulting from the protocol for patients, providers, hospital staff, and patient families.

Using a survey-based instrument to study provider practice patterns clearly has limitations, because it depends on clinician report, which may not always mirror actual practice. Documenting and comparing durations of labor and obstetric interventions among GBS-positive and -negative women would be another means to investigate provider practice patterns; however, it would not yield information about how providers are interpreting the CDC guidelines and how they are applying the information to different clinical scenarios. Our goal was to elucidate the latter, and therefore we chose a survey-based approach. Another potential limitation of this study is that Yale respondents may not necessarily be representative of clinicians at other medical centers, because this center has a particular interest in this topic. Other medical center surveys would be of interest.

The 2002 Prevention of Perinatal Group B Streptococcal Disease guidelines from the CDC provide an interesting case study on how guidelines can be interpreted differently in the clinical setting than how might have been intended by the authors. This hospital-based survey reveals that a majority of clinicians have altered their management of labor among GBS-positive women based on guidelines about managing newborns after delivery exposed to different durations of intrapartum prophylaxis. Further studies will be needed to enhance the evidence around optimal duration of intrapartum prophylaxis, so that we can determine if prolonging labor to achieve this threshold is actually more beneficial than delivering the

infant in an expedited or naturally timed fashion. Furthermore, additional testing and prolonged observation of infants born to GBS-positive mothers without other risk factors should be more evidence-based given the unexpected repercussions that it has had on clinical practice and patient and provider anxiety.

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Table 1

Demographics: Demographics for All 70 Clinicians Who Completed Our Survey

	<i>n</i> (%)
Gender	
Male	26 (37.1%)
Female	44 (62.9%)
Provider type	
Midwives	17 (24.3%)
Physicians	38 (54.3%)
Residents	15 (21.4%)
Provider practice type	
Private practice	36 (51.4%)
Hospital staff/faculty	34 (48.6%)
Patient insurance status	
>80% private insurance	39 (55.7%)
<80% private insurance	31 (44.3%)
Date completed training	
Before 1990	38 (54.3%)
After 1990	32 (45.7%)
Attended CME on GBS	19 (27.1%)

CME, Continuing Medical Education; GBS, group B streptococcus.

Table 2

Labor Management Responses: Survey Responses from 70 Clinicians in Response to Questions about Labor Management of GBS-Positive Pregnancies in the Setting of the 2002 CDC Protocol*

Question	n (%)
Given that the CDC recommends a minimum of 4 h of prophylaxis, do you change your management of GBS-positive <i>multiparous</i> women in any of the following ways?	
Encourage admission at the first signs of labor	25 (35.7%)
Admit GBS-positive women earlier than GBS-negative women	40 (57.1%)
Admit women before they are in active labor	8 (11.4%)
Make no changes in management	15 (21.4%)
When a GBS-positive woman has received <4 h of prophylaxis, would you recommend any of the following to prolong the labor?	
"Labor down" or delay pushing	15 (21.4%)
Delay/avoid artificial rupture of membranes	52 (74.3%)
Turn off or decrease oxytocin infusion	19 (27.1%)
Make no changes to prolong labor	16 (22.9%)

* All providers answered all questions and providers could select multiple responses to each question (selecting the "no change" option precluded selecting other options).

CDC, Centers for Disease Control; GBS, group B streptococcus.

Table 3

Clinicians' Opinions and Interpretations: Survey Responses from 70 Clinicians in Response to Questions about Clinicians' Opinions and Interpretations of the 2002 CDC Protocol*

Question	n (%)
Does the 4-h prophylaxis protocol cause additional stress or anxiety to any of the following? (Providers could select multiple responses.)	
Me, the provider	25 (35.7%)
Patient	38 (54.3%)
Delivery floor staff	30 (42.9%)
Patient's family	21 (30%)
Do you believe that the duration of 4 h of intrapartum prophylaxis to prevent GBS transmission to the neonate is any of the following? (Providers could select one response.)	
Excessive	39 (55.7%)
Optimal	31 (44.3%)
Inadequate	0 (0%)
Would you consider a woman who received intrapartum prophylaxis of 4.5 h adequately treated if she never received her second dose of 2.5 million units?	
Yes	50 (71.4%)
No	20 (28.6%)
Would you recommend performing blood cultures on the child under these conditions?	
Yes	11 (15.7%)
No	59 (84.3%)

* All providers answered all questions.

CDC, Centers for Disease Control; GBS, group B streptococcus.