

OBSTETRICS

Group B *Streptococcus* prophylaxis in patients who report a penicillin allergy: a follow-up study

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OBJECTIVE: The purpose of this study was to compare adherence to the 2002 Centers for Disease Control (CDC) guidelines for the prevention of perinatal group B *Streptococcus* (GBS) disease in patients who are allergic to penicillin during the years 2004-2006 and 2008.

STUDY DESIGN: Previous data from our institution revealed suboptimal adherence to the 2002 CDC guidelines for GBS prophylaxis among women who are allergic to penicillin. These data caused the hospital to implement a series of interventions. The original cohort (2004-2006) was compared with a cohort of women who delivered between April 2008 and January 2009 ($n = 74$) to determine whether the proportion of women who had antimicrobial sensitivity testing and who had received an appropriate antibiotic had improved.

RESULTS: In 2008, 76% (95% confidence interval, 66–84%) of GBS-positive women who are allergic to penicillin received an appropriate antibiotic (compared with 16.2% in 2004-2006; $P < .001$). Antimicrobial sensitivity testing was performed in 79.4% of cases (95% confidence interval, 68–87%), compared with 11.4% in 2004-2006 ($P < .001$).

CONCLUSION: With directed intervention, adherence to the 2002 CDC guidelines for GBS prophylaxis in women who are allergic to penicillin improved dramatically.

Key words: group B *Streptococcus* prophylaxis, guideline adherence, penicillin allergy

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Group B *Streptococcus* (GBS) is a leading cause of neonatal infection; intrapartum prophylactic antibiotics have reduced the incidence of early-onset neonatal GBS disease by 70%.^{1,2} Penicillin is the recommended antibiotic for GBS prophylaxis; historically, patients who have reported a penicillin allergy re-

ceived either clindamycin or erythromycin. Given the increasing prevalence of GBS resistance to both clindamycin and erythromycin, the Centers for Disease Control (CDC), in collaboration with the American College of Obstetricians and Gynecologists and the American Association for Pediatrics, provided new guidelines for the prevention of early-onset neonatal GBS disease in 2002 that included specific guidelines for patients with a reported penicillin allergy.³⁻⁹

In 2007, we published the results of our study that evaluated adherence to the 2002 CDC GBS prophylaxis guidelines for women who were GBS-positive and allergic to penicillin who delivered at Women and Infants Hospital (WIH) between 2004 and 2006.¹⁰ We found suboptimal adherence, with only 11% of patients who were GBS-positive and allergic to penicillin undergoing sensitivity testing and 16% receiving an appropriate antibiotic based on the 2002 CDC recommendations.¹⁰ In response to these findings, WIH instituted a series of interventions that were aimed to improve adherence to the guidelines. These interventions included educating providers by presenting lectures on the guidelines (hospital research presentation, staff

meetings, and Grand Rounds) and highlighting the 2002 CDC guidelines for GBS prophylaxis as “guideline of the month” (where details of the guidelines were provided on posters throughout the hospital). In addition, a field for “penicillin allergy” was added to laboratory ordering systems so that, if filled out properly, the laboratory could be prompted reflexively to perform GBS sensitivity testing.

The aim of the current study was to evaluate whether adherence to the 2002 CDC guidelines for GBS prophylaxis has improved since the 2004-2006 data collection period. We hypothesized that, among patients who were allergic to penicillin and GBS-positive who delivered at WIH between April 2008 and January 2009, both the proportion of patients who received antimicrobial sensitivity testing and the proportion who received an appropriate antibiotic increased from the previous 2004-2006 data collection period.

MATERIALS AND METHODS

We performed a retrospective cohort study of obstetric patients who were GBS-positive and reported a penicillin allergy and who delivered at WIH be-

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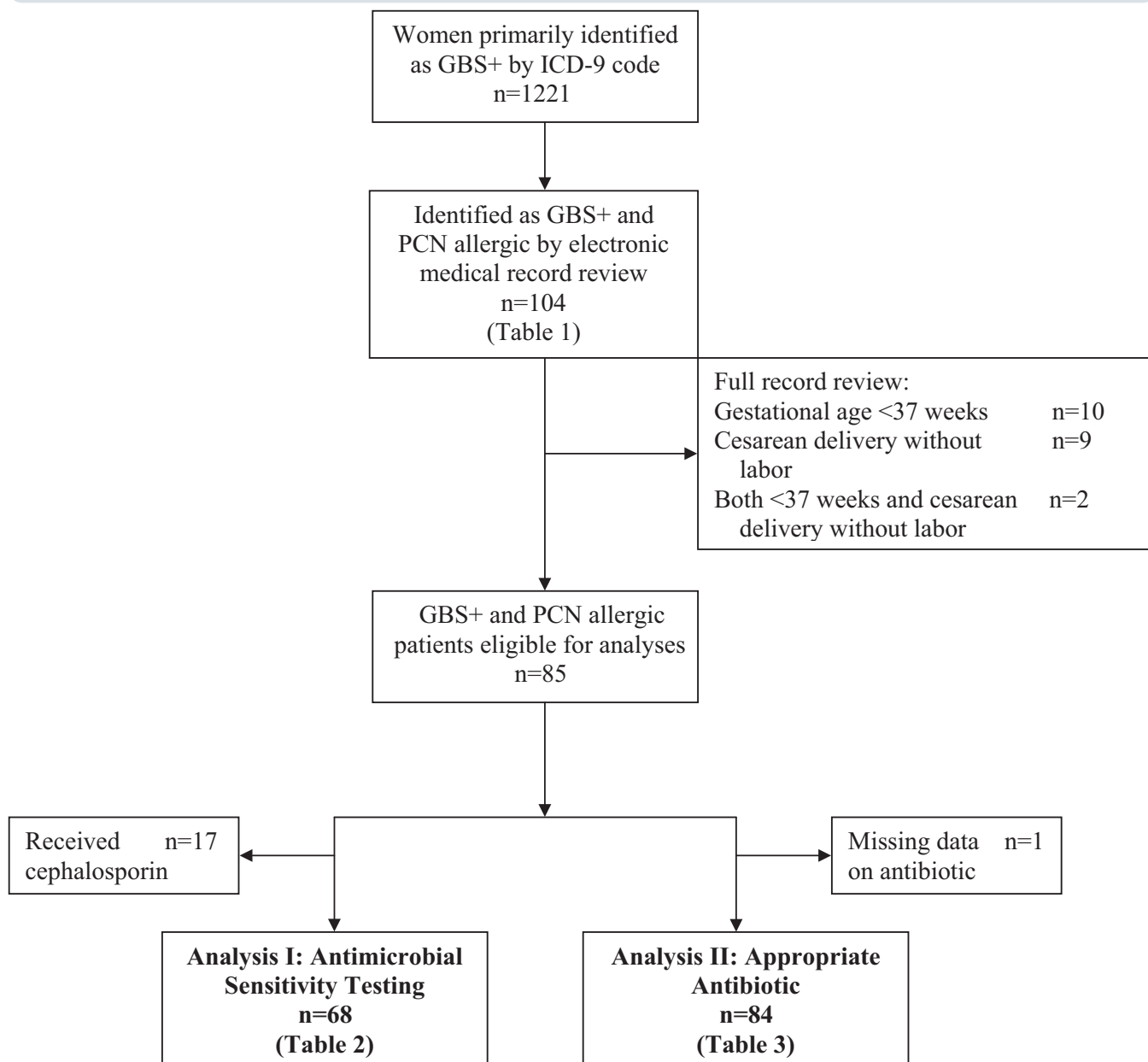
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FIGURE

Patient selection for the study

GBS, group B *Streptococcus*; ICD-9, International Classification of Diseases–9th revision; PCN, penicillin.
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tween April 1, 2008, and January 1, 2009. April 1, 2008, was chosen because WIH implemented its interventions that were aimed to improve adherence to the guidelines between May 2007 and March 2008. WIH institutional review board approval for this project was obtained in December 2007.

To select the study sample, a list of all patients who were GBS-positive who delivered between April 1, 2008, and Janu-

ary 1, 2009, was generated with the use of *International Classification of Diseases–9th revision* codes 648.91 and v02.51. The electronic medical records of each patient who was GBS-positive ($n = 1221$) was reviewed by the research team to identify those patients who also reported a penicillin or penicillin-derivative allergy ($n = 104$; Figure 1).

Data were abstracted from medical records onto standardized data collec-

tion forms by the principal investigator and a trained research assistant. We recorded data on age, obstetric provider, insurance status, gestational age at delivery, type of delivery, recorded nature of the penicillin allergy, means of identifying GBS positivity, antimicrobial sensitivity testing, and antibiotics received. Selection of the study sample was verified for accuracy first by having 10% of the medical records of patients who were

GBS-positive reviewed by 2 members of the research team to confirm penicillin allergy; no discrepancies were identified. Additionally, we used a system of double data entry for all abstracted charts; discrepancies were reconciled by rereviewing the data collection sheets before data analysis. All data were maintained in a confidential computerized database.

We described the age, gravidity, parity, race/ethnicity, provider type, type of insurance, gestational age at delivery, mode of delivery, means in which GBS positivity was determined, whether the nature of the penicillin allergy was documented, and antibiotic administered for our population of patients who were GBS-positive penicillin-allergic ($n = 104$). We then compared, in this population, (1) patients who received antimicrobial sensitivity testing with those who did not and (2) patients who received an appropriate antibiotic with those who did not. For both of these analyses, we excluded women who had a gestational age <37 weeks ($n = 10$) and women who had a cesarean delivery without labor who were at a gestational age of >37 weeks ($n = 9$). We excluded women who delivered at <37 weeks of gestation because the women are not universally screened for GBS. Women with a cesarean delivery without labor were excluded because these patients do not universally require GBS prophylaxis.

Antimicrobial sensitivity testing was defined as “performed” if it was documented in the antenatal records, in the laboratory data sheets, in the intrapartum chart, in the postpartum chart, or in the electronic laboratory data files. Women who received a cephalosporin who were determined to be at low risk for anaphylaxis ($n = 17$) were excluded for the analyses of antimicrobial sensitivity testing, because antimicrobial sensitivity testing is not uniformly necessary for patients who are at low risk for anaphylaxis. The final sample size for these analyses was 68 women.

Appropriate antibiotic was defined as cephalosporin for patients who were at low risk for anaphylaxis, clindamycin, or erythromycin if GBS was susceptible to both of these antibiotics and as vancomycin if antimicrobial sensitivity was

unknown or if GBS was resistant to either clindamycin or erythromycin. One patient who had missing data on the outcome (antibiotic administered) was excluded from the analyses of appropriate antibiotic administration. The final sample size for these analyses was 84 women.

We performed a sample size calculation for both of our primary outcomes (proportion of patients who received antimicrobial sensitivity testing and proportion who received an appropriate antibiotic). From our previous study, we knew that 11% of women who were GBS-positive and penicillin-allergic received antimicrobial sensitivity testing and that 16% of the women received an appropriate antibiotic. To determine at least a 20% increase in both of these outcomes and to set an α of .05 and a β of .20, we needed 53 women for analyses of antimicrobial sensitivity testing and 68 women for analyses of appropriate antibiotic administration. Data were analyzed with Stata software (version 9.0; Stata Corporation, College Station, TX). Categorical variables were compared with the use of the Fisher’s exact test; medians were compared with the Wilcoxon’s rank sum test, and 95% confidence intervals (CIs) were calculated for binomial proportions with the Agresti-Coull method.

RESULTS

Between April 1, 2008, and December 31, 2008, there were 6982 deliveries at WIH. Of those, 1221 patients who were GBS-positive were identified, giving a 17.5% prevalence of GBS positivity. Approximately 9% of these women ($n = 104$) reported a penicillin allergy; these charts were reviewed.

In this population, 75% of women had documentation of the nature of their penicillin allergy, and 76% of women delivered vaginally (Table 1). Overall, 94% of women received antibiotic prophylaxis; 47% of these women were given clindamycin. After the detailed exclusion and inclusion criteria were applied to the sample, 85 patients remained, and their charts were eligible for analyses (Figure 1).

Next, we compared women who did and did not have antimicrobial sensitivity testing (Table 2). Seventy-nine per-

cent (95% CI, 68.2–87.4%) of the 68 women in the sample received antimicrobial sensitivity testing. We found a lower rate of sensitivity testing for GBS isolates that were identified in urine, compared with rectovaginal screening culture. Although 86% of patients ($n = 43/50$) with GBS that were identified by rectovaginal culture had sensitivity testing, only 55% of patients ($n = 6/11$) with GBS bacteriuria had sensitivity testing ($P = .05$). We found that women without antimicrobial sensitivity testing were more likely to have higher gravidity and be multiparous than women with antimicrobial sensitivity testing; however, there was no difference between groups in terms of age, race/ethnicity, and whether they received antibiotics.

Table 3 shows the comparisons between women who did and did not receive an appropriate antibiotic. Of the 84 patients included in these analyses, 76.2% (95% CI, 66–84.1%) received an appropriate antibiotic. Of those patients who received an inappropriate antibiotic, 80% (95% CI, 57.8–92.5%) received clindamycin. Again, there was no difference between groups in terms of age, race/ethnicity, provider type (not shown), gravidity, and whether they received any antibiotics. The women who did not receive an appropriate antibiotic were more likely to be multiparous, compared with women who received an appropriate antibiotic.

Our final analyses compared antimicrobial sensitivity testing, appropriate antibiotic prophylaxis, and antimicrobial received between 2004–2006 and 2008 (Table 4). Antimicrobial sensitivity testing increased from 11.4% in 2004–2006 to 79.4% in 2008 (95% CI, 7.5–16.8% and 68.2–87.4%, respectively; $P < .001$). Appropriate antibiotic prophylaxis increased from 16.2% in 2004–2006 to 76.2% in 2008 (95% CI, 11.7–22.1% and 66–84.1%, respectively; $P < .001$). Overall, between both time periods, both cephalosporin use and vancomycin use increased significantly (from 8.1% to 20.2% and from 6.6% to 28.6%, respectively), and clindamycin use decreased significantly (from 83.3% to 48.8%).

TABLE 1
Characteristics of the study population

Characteristic	n ^a	Column % ^{ab} (95% CI)
Race/ethnicity		
White, non-Hispanic	74	71.2 (61.8–79.0)
Black, non-Hispanic	10	9.6 (5.1–17.0)
Hispanic	12	11.5 (6.6–19.2)
Other	5	4.8 (1.8–11.0)
Unknown	3	2.9 (0.6–8.5)
Gestational age at delivery, wk		
<37	10	9.6 (5.1–17)
≥37	94	90.4 (83.0–94.9)
Age, y ^c	29	13–41
Gravidity	2	1–9
Parity	1	0–4
Type of delivery		
Vaginal	79	76.0 (66.9–83.2)
Cesarean after labor	14	13.5 (8.1–21.5)
Cesarean without labor	11	10.6 (5.8–18.1)
Method of identification GBS +		
Rectovaginal culture	73	70.2 (60.8–78.2)
GBS bacteruria	14	13.5 (8.1–21.5)
Screening method not documented	17	16.4 (10.4–24.7)
Nature of penicillin allergy documented in medical record	78	75.0 (66.6–83.5)
Received intrapartum antibiotics	98	94.2 (87.7–97.6)
Type of antibiotics received		
Cephalosporin	22	22.5 (15.3–31.7)
Clindamycin	46	46.9 (37.4–56.7)
Erythromycin	2	2.0 (0.1–7.6)
Vancomycin ^d	28	28.6 (20.5–38.2)

CI, confidence interval.

^a Unless otherwise specified; ^b May not add up to 100% secondary to rounding; ^c Data are given as median (range); ^d Includes 1 patient who received cephalosporin also.

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COMMENT

Most cases of early onset neonatal GBS disease can be prevented by the administration of appropriate intrapartum antimicrobial prophylaxis to women who are at risk for transmitting GBS to their newborn infant. National guidelines for the prevention of GBS disease were first published in 1996 and were revised in 2002.^{9,11} In our study that was published in 2007, we found that 2 important aspects of the 2002 guidelines were not be-

ing followed: request for antimicrobial sensitivity testing and prescription of the recommended antibiotic.¹⁰ In the current follow-up study, which was conducted after institutional interventions were implemented, we found that adherence to these aspects of the 2002 guidelines improved dramatically.

The recommended treatment strategy for women with a penicillin allergy was significantly changed in the 2002 version and reflected the increasing prevalence

of GBS resistance to both clindamycin and erythromycin. The revised treatment strategy, now 7 years old, includes a detailed history of the nature of the penicillin allergy to determine whether a cephalosporin may be appropriate, a request for antimicrobial sensitivity testing for GBS isolates, and treatment with antibiotics based on the sensitivity testing.² Because we found suboptimal adherence to these guidelines in 2004–2006, our institution implemented basic strategies (posters, educational sessions, and reformatting of laboratory requisition systems) that focused on educating providers about the new guidelines and the reasoning behind them and facilitating ordering antimicrobial sensitivity testing.

The 2002 CDC guidelines and experts on infectious diseases and clinical pharmacology advocate that practitioners obtain a detailed clinical history of the penicillin allergy to determine the likelihood that the patient has had a previous type I/anaphylactic reaction to penicillin. Only 10–20% of patients who self-report a penicillin allergy are truly penicillin-allergic, as assessed by skin testing.^{12,13} For many patients who report a penicillin allergy, cephalosporins may be the best alternative, and experts suggest obtaining a detailed history to determine which patients may receive cephalosporins safely. They suggest that the practitioner use his or her judgment to determine whether a cephalosporin would be appropriate for the individual patient. The true incidence of cephalosporin cross-reactivity in patients with penicillin allergy is controversial. Although some studies have shown that allergic reactions to cephalosporins are greater in the population of penicillin-allergic individuals than in non-penicillin-allergic individuals, the overall incidence of anaphylaxis to cephalosporins is <0.001%.^{12–16}

In our study, the use of cephalosporins for GBS prophylaxis in women who report a penicillin allergy increased significantly, from 8% in 2004–2006 to 20% in 2008. Although the patients who received cephalosporins in our population were assumed to have been low risk for anaphylaxis, it is also very likely that many patients who are at low risk for

TABLE 2

Presence or absence of antimicrobial sensitivity testing

Characteristic	No sensitivity testing				Sensitivity testing				P value
	Median	Range	n	Column% ^a (95% CI)	Median	Range	n	Column% ^a (95% CI)	
Age, y	30	20–40			29.5	13–41			.43
Gravidity, n	3	1–9			2	1–5			.03
Parity, n	1	0–4			0	0–3			.02
Total			14	20.6 (12.5–31.8)			54	79.4 (68.2–87.4)	
Race/ethnicity									.93
White, non-Hispanic			10	71.4 (45.0–88.7)			41	75.9 (62.9–85.5)	
Black, non-Hispanic			2	14.3 (2.8–41.2)			4	7.4 (2.4–18.0)	
Hispanic			1	7.1 (0–33.5)			5	9.3 (3.6–20.3)	
Other			1	7.1 (0–33.5)			4	7.4 (2.4–18.0)	
Method of identification of GBS positive									.05
Rectovaginal culture			7	50.0 (26.8–73.2)			43	79.6 (66.9–88.4)	
GBS bacteriuria			5	35.7 (16.2–61.4)			6	11.1 (4.8–22.6)	
Not documented			2	14.3 (2.8–41.2)			5	9.3 (3.6–20.3)	
Received intrapartum antibiotics			13	92.9 (66.5–100)			54	100 (92.1–100)	.21
Type of antibiotics received									.24
Clindamycin			7	50.0 (26.8–73.2)			34	63.0 (49.6–74.6)	
Erythromycin			0	0 (0–25.1)			2	3.7 (0.3–13.3)	
Vancomycin ^b			6	42.9 (21.3–67.4)			18	33.3 (22.2–46.7)	
Missing			1	7.1 (0–33.5)			0	0 (0–7.9)	

Column % is the percent of the study population who did not have sensitivity testing and had sensitivity testing, by characteristic, method of identification of GBS, and type of antibiotics received.
CI, confidence interval; GBS, group B *Streptococcus*.

^a May not add up to 100% because of rounding; ^b Includes 1 patient who received cephalosporin also.

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anaphylaxis also received clindamycin or even vancomycin. Because of the retrospective nature of this study, we could not determine clearly which patients were high risk and which patients were low risk. Although if 80–90% of our patients could have been low risk for anaphylaxis based on what is known about true penicillin allergy, we are likely still underusing cephalosporins. Increased cephalosporin use could be attained possibly by increasing provider awareness of the elements of a detailed history for risk of penicillin anaphylaxis. Working with infectious disease specialists, we could also optimize cephalosporin use by developing a checklist for a detailed history for risk for penicillin anaphylaxis. Ultimately, however, determining risk for anaphylaxis is at the discretion of the

healthcare provider who is responsible for ordering the intrapartum antibiotic.

Based on the 2002 guidelines, women who were not candidates for cephalosporin administration (determined to be too “high risk” for anaphylaxis) should have received antimicrobial sensitivity testing of their GBS isolates. We found a drastic improvement (from 11% in our previous study to 79% in 2008) in the rates of GBS antimicrobial sensitivity testing. In addition, we found a similar reduction in the use of clindamycin in patients with unknown antimicrobial sensitivities. Clindamycin should be given only to women with GBS isolates with known antimicrobial sensitivity to both clindamycin and erythromycin, otherwise vancomycin should be administered. In the 2004–2006 data collection period, almost

all patients (149/163) who received clindamycin did not have antimicrobial sensitivity testing (91%); this decreased to 17% (7/41) in 2008.¹⁰ Interestingly, we also noted that women without antimicrobial sensitivity testing were more likely to be of higher gravidity and multiparity. In our search, there does not appear to be any link in the published scientific literature between gravidity and adherence to prenatal care recommendations. Therefore, we are lacking an explanation for this finding.

This study also highlights 1 unresolved issue for the management of GBS colonization in women who report a penicillin allergy: management of GBS bacteriuria. The CDC guidelines do not include specific recommendations or algorithms for patients with GBS bacteriuria who re-

TABLE 3
“Appropriate” antibiotic utilization

	Did not receive an appropriate antibiotic			Received an appropriate antibiotic					
Characteristic	Median	Range	n	Column% ^a (95% CI)	Median	Range	n	P value	
Age, y	30	21–40			28.5	13–41		.2	
Gravidity, n	2	1–9			2	1–5		.15	
Parity, n	1	0–5			0	0–2		.03	
Total			20	23.8 (15.9–34.0)			64	76.2 (66.0–84.1)	
Race/ethnicity								.43	
White, non-Hispanic			14	70.0 (47.9–85.7)			46	71.9 (59.8–81.5)	
Black, non-Hispanic			3	15.0 (4.4–36.9)			6	9.4 (4.0–19.3)	
Hispanic			1	5.0 (0–25.4)			8	12.5 (6.2–23.0)	
Other			1	5.0 (0–25.4)			4	6.3 (2.0–15.4)	
Unknown			1	5.0 (0–25.4)			0	0 (0–6.8)	
Method of identification GBS positive								.16	
Rectovaginal culture			12	60.0 (38.6–78.2)			51	79.7 (68.2–87.9)	
GBS bacteriuria			5	25.0 (10.8–47.2)			7	10.9 (5.1–21.2)	
Not documented			3	5.0 (4.4–36.9)			6	9.4 (4.0–19.3)	
Nature of penicillin allergy documented in medical record			13	65.0 (43.2–82.0)			53	82.8 (71.6–90.3)	.12
Type of antibiotic received								.001	
Cephalosporin			2	10.0 (1.6–31.3)			15	23.4 (14.6–35.2)	
Clindamycin			16	80.0 (57.8–92.5)			25	39.1 (28.0–51.3)	
Erythromycin			2	10.0 (1.6–31.3)			0	0 (0–6.8)	
Vancomycin ^b			0	0 (0–19.0)			24	37.5 (26.6–49.8)	

Column % is the percent of the study population who did not receive an appropriate antibiotic and who received an appropriate antibiotic, by characteristic, method of identification of GBS, and type of antibiotics received.

CI, confidence interval; GBS, group B *Streptococcus*.

^a May not add up to 100% because of rounding; ^b Includes 1 patient who received cephalosporin also.

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port a penicillin allergy. GBS is “incidentally” found in urine cultures that are performed to screen for asymptomatic bacteriuria, which could represent a missed opportunity for antimicrobial sensitivity testing. This was suggested in our study by the trend towards decreased rates of sensitivity testing in those women who were noted to be GBS-positive by bacteriuria when compared with rectovaginal swab. Authors of future revisions of GBS prophylaxis guidelines may want to consider addressing management strategies for this population of patients with GBS that is identified only by urine culture. One strategy that may facilitate reflexive antimicrobial sensitivity testing would be to require manda-

tory documentation of penicillin allergy for all ordered urine cultures and GBS screens for order entry. At our institution and other institutions, this could be implemented easily with the use of computerized order entry systems.

This study had several strengths. First, we reviewed the charts of the entire population of pregnant women who were GBS-positive who delivered during the study period to determine penicillin allergy to establish our study sample. Second, we reviewed several separate data sources to determine the outcomes, antimicrobial sensitivity testing and appropriate antibiotic choice, which maximized the accuracy of our classification of the outcomes. One limitation of our

study is that this study was a retrospective review of medical records. Therefore, our data were limited by what was actually recorded in the medical record. In addition, our study sample was generated with the use of International Classification of Diseases–9th revision codes. Although coding at WIH has been shown to be valid and our rates of GBS positivity and reported penicillin allergy are consistent with previous studies, some eligible patients may not have been included in our study sample.¹⁰ Last, although our adherence clearly improved from 2004–2006 to 2008, it is not clear whether any 1 particular intervention was more influential than another. The very low adherence rates in 2004–2006 to

TABLE 4
GBS prophylaxis, comparisons between 2004-2006 and 2008

Characteristic	2004-2006		2008		P value
	N/total ^a	Column% ^b (95% CI)	N/total ^a	Column% ^b (95% CI)	
Underwent antimicrobial sensitivity testing	21/185	11.4 (7.5–16.8)	54/68	79.4 (68.2–87.4)	.001
Received an appropriate antibiotic	32/197	16.2 (11.7–22.1)	64/84	76.2 (66.0–84.1)	.001
Type of antibiotic received					.001
Cephalosporin	16/197	8.1 (5.0–12.9)	17/84	20.2 (12.9–30.1)	
Clindamycin	164/197	83.3 (77.4–87.9)	41/84	48.8 (38.4–59.3)	
Erythromycin	4/197	2.0 (0.6–5.3)	2/84	2.4 (0.1–8.8)	
Vancomycin	13/197	6.6 (3.8–11.1)	24/84	28.6 (20.0–39.0)	

Column % is the percent of the study population in 2004-2006 and in 2008, by antimicrobial sensitivity testing, appropriate antibiotic used, and type of antibiotic received.
 CI, confidence interval; GBS, group B *Streptococcus*.

^a "N" refers to the number in the row; "total" means the total in the analytic sample. For example, for "underwent antimicrobial sensitivity testing" in the 2004-2006 column, there were 21 women who underwent antimicrobial sensitivity testing of a total of 185 women in the sample; ^b May not add up to 100% because of rounding.

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the guidelines for GBS prophylaxis in women with penicillin allergy prompted the hospital to begin a multifaceted intervention that involved both laboratory form changes and educational sessions. Given that our data were collected after the hospital had implemented all of its interventions, we are unable to determine whether the form changes or educational sessions had a larger impact on the increased adherence.

Although this study includes only 1 institution and does not provide information about adherence at other institutions or nationally, it is an example for other institutions to investigate their adherence to the 2002 guidelines for GBS chemoprophylaxis in women with penicillin allergy and to implement changes when adherence is found to be suboptimal. Our institution educated providers and staff and made simple changes to order forms that allowed documentation of whether patients have a penicillin allergy (to allow for reflex testing of GBS isolates). These changes were not expensive or difficult to implement and easily could be considered at other institutions.

Reduction of the use of ineffective antibiotics (clindamycin or erythromycin for patients with GBS isolates of unknown susceptibilities) could further reduce the incidence of early onset GBS disease. Appropriate antepartum and intrapartum management of women who

have penicillin allergy and are GBS-positive could have a significant impact on GBS disease. Using a prevalence of GBS colonization of 20% and a prevalence of reported penicillin allergy of 10%, we estimate that 2% of the pregnant population is both GBS colonized and reportedly penicillin-allergic. Treating this 2% of patients appropriately could affect the outcomes of 80,000 neonates annually (using the estimated 4 million US births in 2008).

The administration of prophylactic antibiotics during labor has reduced greatly the incidence of early onset neonatal GBS disease. Choosing an appropriate antibiotic is a key to this strategy. Antimicrobial sensitivity testing and appropriate antibiotic prophylaxis are highlighted in the 2002 CDC guidelines. We found that, although adherence to these guidelines at our institution was suboptimal, adherence could be improved dramatically by the implementation of easy low-cost strategies. Institutions should consider monitoring their antibiotic practices for women who are GBS-positive who report a penicillin allergy to maximize reductions in the incidence of early-onset GBS disease. ■

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