Épidémiologie de l'infection néonatale à streptocoques du groupe B à début précoce

Conséquences pour le dépistage

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RÉSUMÉ

OBJECTIF Déterminer les différences dans les résultats d'un dépistage universel par rapport à ceux d'un dépistage selon le risque en se fondant sur l'épidémiologie des infections aux SGB à début précoce à Winnipeg, au Manitoba et examiner leurs répercussions sur le dépistage prénatal des SGB.

CONCEPTION Une vérification aléatoire et rétrospective de 330 dossiers de femmes en soins hospitaliers intra-partum et une vérification rétrospective des dossiers de tous les nourrissons présentant une infection aux SGB à début précoce sur une période de 2 ans.

CONTEXTE Les 3 hôpitaux à Winnipeg au Manitoba offrant des services intra-partum.

PRINCIPALES MESURES DES RÉSULTATS On a vérifié dans les dossiers médicaux des mères les antécédents de dépistage prénatal des SGB, l'état maternel à cet égard, les facteurs de risque cliniques de transmission néonatale des SGB. Les dossiers des nouveau-nés ont ensuite été vérifiés pour déterminer les facteurs de risque clinique de transmission des SGB, les antécédents de dépistage maternel des SGB et l'état de la mère à cet égard, le recours à une prophylaxie antibiotique maternelle intra-partum et les résultats chez les nouveau-nés.

RÉSULTATS Le dépistage révélait une proportion de 26% de porteuses de SGB dans la population étudiée. De ces femmes, 70% (ou 18% de la population) n'avaient aucun autre facteur de risque clinique de transmission néonatale de SGB. Le taux de transmission chez les femmes porteuses de SGB non traitées était de 1,74 femme sur 1 000. Les différences dans les résultats entre le dépistage universel et celui en fonction du risque étaient minimes dans cette population. Il faudrait au total un dépistage universel auprès de 3 449 femmes pour prévenir un seul cas d'infection néonatale aux SGB à début précoce qui se produirait si une approche fondée sur le risque était utilisé (3 cas par année). Ce chiffre augmentait à 68 966 femmes pour prévenir un seul décès attribuable aux SGB (1 cas en 7 ans). Le dépistage universel se traduirait par 679 femmes additionnelles par année recevant des antibiotiques intra-partum par mesure de prophylaxie, en plus de celles dépistées en fonction d'une approche selon le risque.

CONCLUSION Les différences dans les taux de transmission néonatale des SGB découlant d'un dépistage universel par rapport à un dépistage fondé sur le risque à Winnipeg exigent un grand nombre de femmes pour qu'elles deviennent évidentes. Le dépistage universel et la prophylaxie aux antibiotiques de toutes les porteuses de SGB se traduisent par une hausse de l'exposition aux antibiotiques dans notre population qui, elle aussi, pourrait poser des risques. Par conséquent, les patientes devraient être consultées dans la décision de procéder ou non au dépistage prénatal des SGB.

POINTS DE REPÈRE DU RÉDACTEUR

- Le dépistage universel d'une infection maternelle aux streptocoques du groupe B (SGB) et la prophylaxie aux antibiotiques chez toutes les porteuses représentent actuellement la norme de soins recommandée en Amérique du Nord. D'autres pays ont examiné les mêmes données et recommandent une stratégie en fonction du risque.
- Les auteurs démontrent qu'il faudrait un dépistage universel auprès de 3 449 femmes pour prévenir un seul cas d'infection néonatale aux SGB à début précoce qui ne serait pas détecté à l'aide d'une approche fondée sur le risque; ce chiffre augmentait à 68 966 pour prévenir un seul décès.
- Une prophylaxie universelle aux antibiotiques peut poser des risques, comme une anaphylaxie imprévue à la pénicilline chez la mère, un changement épidémiologique d'une sepsie à gram positif à une sepsie à gram négatif chez le nouveau-né, des changements dans les tendances à la résistance des SGB et d'autres organismes et des taux plus élevés d'autres infections néonatales graves.
- Les auteurs proposent que les médecins de famille utilisent une stratégie de dépistage et de prophylaxie intra-partum aux antibiotiques en se fondant sur une discussion éclairée avec la patiente concernant l'identification des risques et des avantages pertinents.

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Le texte intégral est accessible en anglais à **www.cfpc.ca/cfp.**
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Epidemiology of early-onset neonatal group B streptococcal infection

Implications for screening

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ABSTRACT

OBJECTIVE To determine the difference in outcomes between universal screening and risk-based assessment for prenatal group B streptococcus (GBS) infection based on the epidemiology of early-onset GBS infection in Winnipeg, Man, and to examine its implications for prenatal GBS screening.

DESIGN Retrospective random chart audit of 330 women receiving intrapartum hospital care and retrospective chart audit of all infants with early-onset neonatal GBS disease over 2 years.

SETTING Each of the 3 hospitals in Winnipeg, Man, offering intrapartum services.

MAIN OUTCOME MEASURES Maternal charts were audited for history of prenatal GBS screening, GBS status, clinical risk factors for neonatal GBS transmission, and use of intrapartum antibiotics to prevent neonatal GBS infection. Neonatal GBS records were audited for maternal clinical risk factors for GBS transmission, history of maternal GBS screening and GBS status, use of maternal intrapartum antibiotic prophylaxis, and neonatal outcome.

RESULTS Screening revealed a 26% GBS carrier rate in our population. Among these carriers, 70% (or 18% of the population) had no other clinical risk factors for neonatal GBS transmission. The transmission rate for untreated GBS-positive women was 1.74 per 1000 women. The differences in outcomes between universal and risk-based screening were small in our population. A total of 3449 women would require universal screening to prevent a single case of early-onset neonatal GBS disease that would occur if a risk-based approach were used (3 cases per year). This number increases to 68 966 to prevent a single GBS-related death (1 case in 7 years). An additional 679 women would receive intrapartum prophylactic antibiotics per year with universal screening than would have received antibiotics with a risk-based approach.

CONCLUSION The differences in neonatal GBS transmission rates resulting from universal versus risk-based screening in Winnipeg require universal screening of many women for results to become apparent. Universal screening and antibiotic prophylaxis of all GBS carriers result in increased antibiotic exposure in our population, which might carry its own risks. Therefore, patients should be involved in decisions on whether to be screened based on identification of risks and benefits.

EDITOR'S KEY POINTS

- Universal screening for maternal group B streptococcus (GBS) infection and intrapartum antibiotic prophylaxis of all colonized women is currently the recommended standard of care in North America. Other jurisdictions have examined the same data and recommended a risk-based strategy.
- The authors show that 3449 women would require universal screening to prevent a single case of early-onset neonatal GBS disease that would be missed using a risk-based approach; and that the number increases to 68 966 to prevent a single death.
- Universal antibiotic prophylaxis might carry risks, including unexpected maternal penicillin anaphylaxis, an epidemiologic shift from gram-positive to gram-negative neonatal sepsis, changing resistance patterns among GBS and other organisms, and increased rates of other serious neonatal infections.
- The authors suggest family physicians employ a strategy for screening and intrapartum antibiotic prophylaxis based on informed patient discussion centring on the identification of pertinent risks and benefits.

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Therapeutic interventions to prevent transmission of early-onset neonatal group B streptococcus (GBS) infection remain an issue for debate. No high-quality randomized prospective studies exist to guide our practice. It is unlike ly there will be a one-size-fits-all approach to prenatal GBS screening and intrapartum antibiotic prophylaxis.

Early-onset neonatal GBS infections are defined as GBS sepsis, meningitis, or pneumonia beginning at less than 7 days of life. Three approaches for preventing early-onset neonatal GBS infections have generally been used: universal screening of all pregnant women for GBS colonization, with intrapartum antibiotics given to those with positive results; universal screening of all pregnant women, with intrapartum antibiotics given only to those with positive results as well as other risk factors for GBS transmission; and intrapartum antibiotics for all women with risk factors for GBS transmission without prior screening.

Clinical risk factors for transmission are defined as results of a urine culture positive for GBS at any time during pregnancy, a previous infant with GBS infection, intrapartum fever (temperature, 38°C or higher), preterm labour at less than 37 weeks, or prolonged rupture of membranes more than 18 hours.

While all 3 approaches for preventing early-onset neonatal GBS infections have previously been recommended, a 2002 landmark article by Schrag et al[1] showed in a retrospective cohort study that universal prenatal screening for GBS was statistically superior to risk-based approaches for prevention. In light of these data, the US Centers for Disease Control and Prevention,[2] the American College of Obstetricians and Gynecologists,[3] and the Society of Obstetricians and Gynaecologists of Canada[4] narrowed their recommendations to universal screening and intrapartum antibiotics for all GBS carriers to the exclusion of other strategies.

Professional organizations from other parts of the world, however, have questioned the movement to universal prenatal GBS screening. In 2003, the Royal College of Obstetricians and Gynaecologists in the United Kingdom recommended against offering antenatal GBS screening and promoted patient discussion regarding intrapartum antibiotic prophylaxis based on specific risk factors.[5] In 2004, the New Zealand GBS Consensus Working Party recommended a risk-based prevention strategy over universal screening.[6] Both of these groups developed their recommendations using much the same literature that guided the different recommendations of North American professional groups.

Universal screening for maternal GBS infection and intrapartum antibiotic prophylaxis of all colonized women might carry risks, including unexpected maternal penicillin anaphylaxis,[7] an epidemiologic shift from gram-positive to gram-negative neonatal sepsis,[8] changing resistance patterns among GBS and other organisms,[9] and increased rates of other serious neonatal infections.[10]

Our study was designed to determine the degree of difference in outcome and antibiotic use between universal and risk-based approaches to prenatal GBS screening based on the epidemiology of early-onset GBS infection in Winnipeg, Man, and to examine the implications for GBS screening in our population.

METHODS

Our study comprised a retrospective chart audit of obstetric patients receiving intrapartum care in the Winnipeg region between April 1, 2001, and March 31, 2003. Ethics approval was obtained from the University of Manitoba Research Ethics Board as well as from the ethics boards of each of the 3 hospitals involved.

Randomly selected prenatal charts from each of the 3 Winnipeg hospitals providing intrapartum care during the study period were audited retrospectively. Data were collected for the presence or absence of prenatal GBS screening, the results of screening, the presence of clinical risk factors for neonatal GBS transmission, and use of intrapartum antibiotics to prevent neonatal GBS infection. Clinical risk factors for transmission were defined as noted earlier.

We also conducted a chart review of all cases of early-onset neonatal GBS infections treated at all hospitals providing neonatal intensive care during 2002 and 2003. Cases were determined using laboratory database searches for positive GBS cultures in infants younger than 7 days. These neonatal charts were audited for maternal risk factors for GBS transmission, history of maternal GBS screening and GBS status, use of maternal antibiotic prophylaxis, and neonatal outcome.

The Health Information Management Branch of Manitoba Health collected data about live births between April 1, 2001, and March 31, 2003 from the 3 Winnipeg hospitals providing intrapartum care. These data revealed 19517 live births during the study period. Records of 330 women receiving perinatal care in the 3 regional hospitals between the same dates were reviewed. The quantity of charts from each hospital was weighted so as to match the percentage of births occurring in each hospital during the study period. A total sample size of 330 charts was chosen in order to obtain 95% confidence limits of ±4% for the asymptomatic GBS

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carrier rate in Winnipeg, assuming a rate near 18% as previously reported.[1]

RESULTS

Of the 330 women whose charts were audited, 83% received GBS screening at least 48 hours before delivery. Results of GBS screening were not available for only 2 of these women. Positive GBS status among women in whom screening results were available was 26.1% (95% confidence interval 20.9%-31.3%).

Of the women with positive GBS status, 30% showed other clinical risk factors for neonatal GBS transmission. Of these, 86% received intrapartum prophylactic antibiotics. Of the 70% of GBS-positive women with no other clinical risk factors for GBS transmission, 84% were given intrapartum prophylactic antibiotics. Across the entire population of women studied, 19% demonstrated clinical risk factors for neonatal GBS transmission other than a positive result for GBS screening. Overall, 31% of women presenting for intrapartum care were treated with intrapartum antibiotics (**Table 1**).

Table 1. Results of prenatal chart audits: *N = 330.*

AUDIT VARIABLES	N (%)
Universal prenatal GBS screening	274 (83.0)
GBS culture results available	272 (82.4)
Positive GBS culture results among screened women	71 (26.1)
Positive GBS carriers (n = 71) with no other clinical risk factor for neonatal GBS transmission*	50 (70.4)
Positive GBS carriers (n = 71) with at least 1 other clinical risk factor for neonatal GBS transmission*	21 (29.6)
Positive GBS carriers with no other risk factors (n = 50) receiving prophylactic antibiotics	42 (84.0)
Positive GBS carriers with at least 1 other risk factor (n = 21) receiving prophylactic antibiotics	18 (85.7)
Women with clinical risk factors for neonatal GBS* (n = 330)	63 (19.1)
Total number of women treated with intrapartum antibiotics (n = 330)	102 (30.9)

GBS—group B streptococcus.
*Clinical risk factors defined as a urine culture positive for GBS at any time during the pregnancy, previous infant with GBS infection, intrapartum fever (temperature, 38°C or higher), preterm labour at less than 37 weeks, or prolonged rupture of membranes more than 18 hours.

Three cases of early-onset neonatal GBS disease were documented in Winnipeg between April 1, 2001, and March 31, 2003. All had positive results of blood cultures for GBS with negative results for cerebrospinal fluid. Two had maternal screening cultures positive for GBS while the third was documented as negative. Of the 2 cases with positive GBS status, 1 was not treated with intrapartum prophylactic antibiotics and the second was treated with a single dose before an imminent delivery. Other maternal risk factors for GBS transmission were absent in all cases. All 3 infants recovered without complications.

DISCUSSION

Our data showed that a substantial percentage of GBS carriers were otherwise asymptomatic. When a universal approach to screening is consistently applied, all of these asymptomatic GBS carriers would be screened and consequently treated with intrapartum prophylactic antibiotics. They would be overlooked, however, if a risk-based approach were used. If intrapartum prophylactic antibiotics were used in this group of women, how would it affect neonatal GBS outcomes? To answer this question, we must first determine the neonatal transmission rate among GBS carriers receiving no prophylactic antibiotics.

During the time period studied there were 19517 births in Winnipeg. Projecting from our data, 26.1% (5093) of women in this group were GBS carriers, with 70.4% (3586) of them being otherwise asymptomatic. Of these asymptomatic GBS carriers, 16% (574) received no intrapartum prophylactic antibiotics. Because only 1 infant born to this group of asymptomatic GBS carriers developed early-onset neonatal GBS disease, the GBS transmission rate was 1.74 cases per 1000 live births to untreated GBS-positive women in the absence of other clinical risk factors. This is consistent with a transmission rate of 1.3 cases per 1000 previously reported.[1]

If 100000 women in Winnipeg present for prenatal care, we project that 26.1% (26100) will be GBS carriers (**Table 2**). Of these, 70.4% (18374) will be asymptomatic. If they are managed using a risk-based approach, these 18374 asymptomatic GBS carriers would deliver without intrapartum antibiotic prophylaxis (**Figure 1**).

With a transmission rate of early-onset neonatal GBS disease for untreated asymptomatic culture-positive women of 1.74 per 1000 live births, 32 infants from our group of 18374 asymptomatic untreated GBS carriers would develop GBS disease using a risk-based approach.

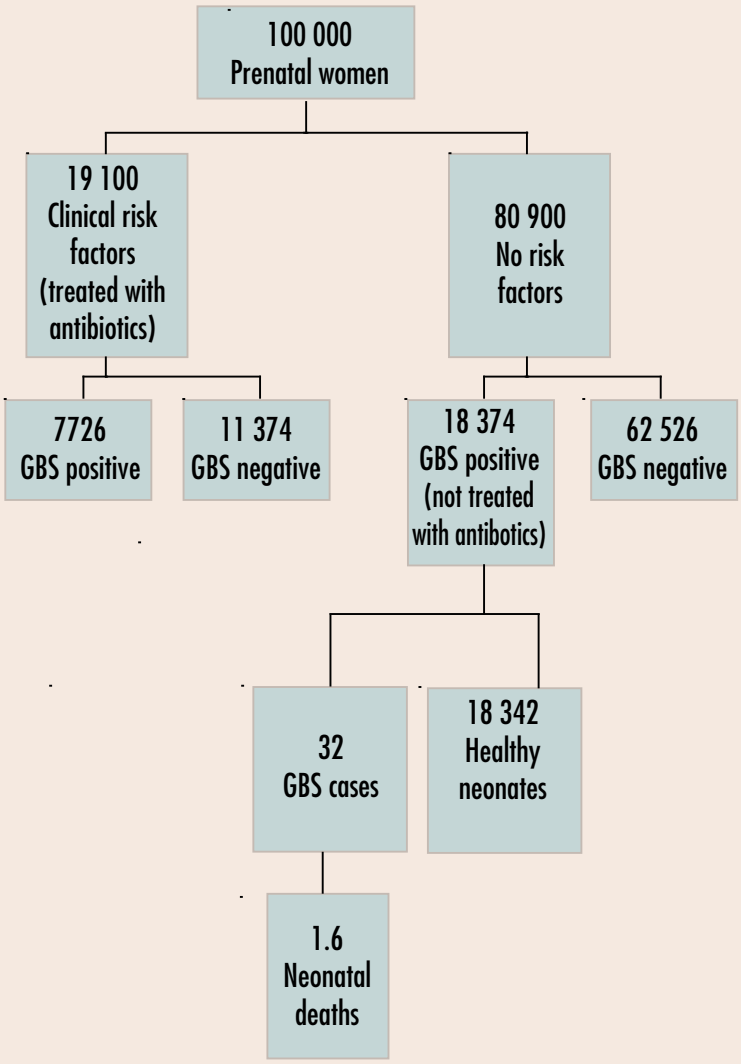
Intrapartum prophylaxis has been previously shown to be 88.6% effective in preventing neonatal disease.[1] Therefore, of these 32 infants, 29 will benefit from intrapartum antibiotic prophylaxis as applied with a universal screening strategy (**Figure 2**). While this number might seem significant, the absolute percentage of infants benefiting from universal screening and intrapartum antibiotic prophylaxis is very small. In fact, 3449 women

Table 2. Projected outcomes from universal screening and risk-based maternal GBS prophylaxis in Winnipeg, Man, region: *N = 100 000.*

RISK STATUS	UNIVERSAL SCREENING N (%)	RISK-BASED PROPHYLAXIS N (%)
Positive GBS carriers	26 100 (26.1)	26 100 (26.1)
Symptomatic carriers	7726 (7.7)	7726 (7.7)
Asymptomatic carriers	18 374 (18.4)	18 374 (18.4)
Women receiving prophylactic antibiotics*	26 100 (26.1)	7726 (7.7)
Neonatal GBS infection†	3 (0.003)	32 (0.032)
Neonatal GBS deaths†	0.15 (0.00015)	1.6 (0.0016)

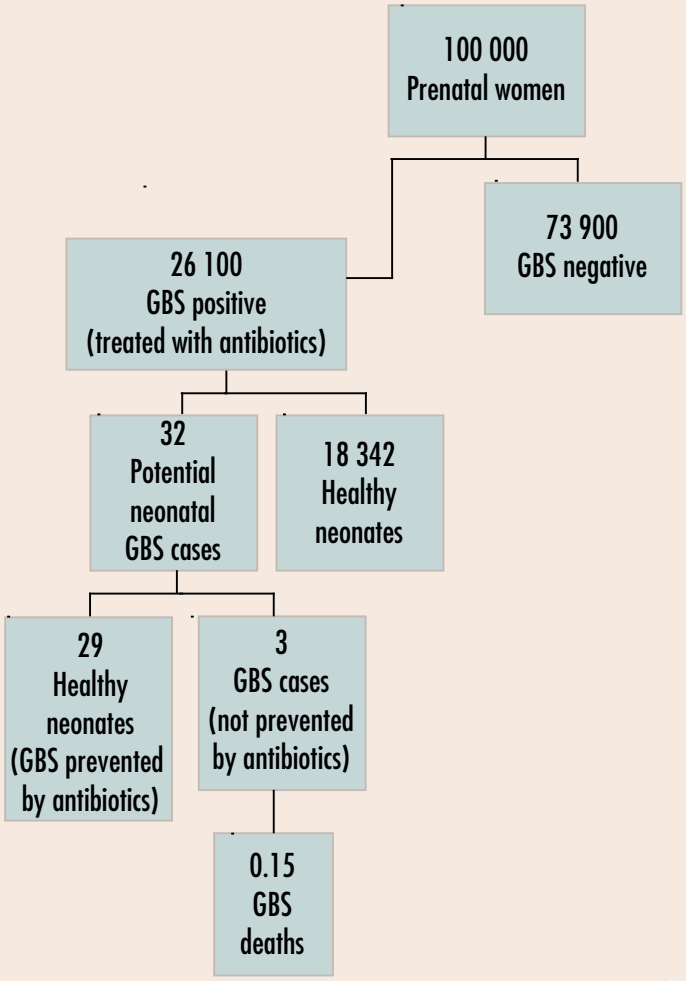
GBS—group B streptococcus.
*Does not include GBS culture–negative women presenting with risk factors for GBS transmission receiving prophylactic antibiotics.
†Does not include neonatal GBS infections arising from GBS culture–positive women with risk factors for neonatal GBS transmission, nor those arising from GBS culture negative women (equivalent in both groups).

Figure 1. Projected outcomes from risk-based maternal GBS prophylaxis



GBS—group B streptococcus.

Figure 2. Projected outcomes from universal maternal GBS screening and prophylaxis



GBS—group B streptococcus.

Table 3. Number needed for universal screening to prevent a single neonatal GBS infection that would occur with risk-based screening

NEONATAL OUTCOMES	UNIVERSAL SCREENING %	RISK-BASED PROPHYLAXIS %	ABSOLUTE RISK REDUCTION WITH UNIVERSAL SCREENING %	NO. NEEDED FOR UNIVERSAL SCREENING TO PREVENT 1 CASE*
Neonatal GBS infections	0.003	0.032	0.029	3449
Neonatal GBS deaths	0.00015	0.0016	0.00145	68 966

GBS—group B streptococcus.
*Number needed to screen equals 100 divided by percent absolute risk reduction.

(100 000÷29) would require universal screening to prevent a single case of early-onset neonatal GBS disease that would be missed using a risk-based approach (**Table 3**). The case-fatality rate for early-onset neonatal GBS infection has been previously reported at 5.0%.[11] This being the case, the number needed to be screened increases to 68 966 to prevent a single death attributed to GBS.

While these results are limited by the small number of cases, they are similar

to those of larger studies. Applying these calculations to the much larger population reported by Schrag et al,[1] we find that 4762 women need to be universally screened to prevent a single case of neonatal GBS infection that is missed using a risk-based approach. This number increases to 95 240 to prevent a single neonatal death attributed to GBS.

At a stable rate of 9700 births per year in the Winnipeg region, universally screening all women can be expected to prevent 3 cases of early-onset neonatal GBS infection each year that would be missed using a risk-based approach, and it would be necessary to apply universal screening to all prenatal women over the next 7 years to prevent a single neonatal death attributable to GBS.

When looking at our actual experience in Winnipeg, we find that universal screening would have potentially prevented 2 of the 3 documented cases of early-onset GBS disease, while a risk-based approach would have missed all 3. In other words, universal screening prevented 2 cases over a 2-year period that risk-based screening would have overlooked without affecting infant mortality. Also, neither strategy prevents neonatal GBS disease arising unpredictably from pregnancies without microbial or clinical risk factors for GBS transmission.

When employing a risk-based approach, the 19.1% of women presenting with clinical risk factors for GBS transmission will receive intrapartum prophylactic antibiotics. On the other hand, with a universal approach, the 26.1% of women who are GBS carriers will receive intrapartum antibiotics. This difference of 7 percentage points results in prophylactic exposure for 679 more women each year when a universal approach is employed rather than a risk-based approach. The costs of such an increase in antibiotic exposure, both financially and with regard to potential risks, are unknown.

In any population, these numbers depend on the underlying carrier rate of GBS relative to the rate of other risk factors for GBS transmission in that population. In the study by Schrag et al,[1] there was no significant increased use of antibiotics among the universally screened women.

In another recent study,[12] universal screening was actually favoured over a risk-based strategy to *reduce* the use of intrapartum antibiotics due to a low asymptomatic GBS carrier rate relative to the rate of other risk factors in that community. This clearly does not apply to our community.

Conclusion

Despite consistent recommendations in North America for universal screening for prenatal GBS colonization and treatment of all GBS carriers with intrapartum antibiotics to prevent early-onset neonatal GBS infection, the advantages gained by this approach over that of a risk-based approach in the Winnipeg region are small, with only 1 case prevented for 3449 women screened and 1 GBS-related neonatal death prevented for 68 966 women screened.

Much of the current literature points to a statistical improvement in neonatal GBS transmission when universal GBS screening is employed. However, in communities such as Winnipeg, where the rate of GBS transmission among untreated GBS carriers and the neonatal mortality associated with GBS disease are low, these benefits might not outweigh the uncertain costs of antibiotic exposure for all GBS carriers.

One of the foundation principles of family medicine is that the physician-patient relationship is of great importance. A patient-centred approach to care often necessitates involvement of the patient in the decision-making process. Consequently, in most clinical situations family physicians employ a strategy for screening and antibiotic prophylaxis based on informed patient discussion centring on identifying pertinent risks and benefits. It seems prudent that, when considering GBS screening for preventing neonatal GBS disease, we should maintain this standard in the care of our prenatal patients as well.

Contributors

Dr Konrad *developed the concept and contributed to the design of the study; he collected and analyzed the data and prepared and revised the article for submission.* **Dr Katz** *contributed to concept and design of the study and reviewed, revised, and approved the article for submission.*

Competing interests

None declared

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