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Summary Document

GROUP B STREPTOCOCCUS

This summary provides easy access to some of the most essential content of **AOM CPG No. 19 – Antepartum, Intrapartum and Postpartum Management of Group B Streptococcus**, and is intended for use in conjunction with the full-length Clinical Practice Guideline (CPG). For a complete analysis of the research relevant to the management of group B streptococcus, along with citations, refer to the full CPG.

PREVALENCE OF GBS IN BIRTHING PARENTS

Estimates suggest that approximately 15% to 40% of pregnant people are colonized with GBS in the vagina and/or rectum, with rates varying by study populations, specimen collection or culturing techniques. (1) In Ontario in 2019, approximately 19% of pregnant people who were screened for GBS between 35 and 37 weeks' gestation had a positive result. (2) Of pregnant people who did not undergo screening for GBS at 35 to 37 weeks' gestation, 0.5% had already screened positive for GBS bacteriuria through a urine test.

INCIDENCE OF EARLY-ONSET GROUP B STREPTOCOCCUS IN BIRTHING PARENTS

Early-onset group B streptococcus (EOGBSD) occurs within the first seven days of life, and incidence rates vary. Before the widespread adoption of prevention strategies such as intrapartum antibiotic prophylaxis (IAP) in the 1980s, the incidence of EOGBSD was estimated at 3/1000 live births. This has dramatically changed over several decades; in Ontario in 2019, there were only 35 cases of EOGBSD in neonates, a rate of 0.23/1000 live births.

Understanding GBS prevalence, incidence and complications

The following statistics help explain how GBS may impact the neonate:

- 15% to 40% of pregnant people are GBS positive;
- 40% to 70% of babies born to GBS-positive pregnant people will be colonized if untreated;
- 1% to 2% of colonized babies will develop an infection if untreated; (3)
- 5% of babies who develop an infection will die. (1,4)

Using these statistics as a guide, taking an initial group of 50 000 pregnant people:

- 7500 to 20 000 pregnant people will be colonized with GBS;
- 3000 to 14 000 babies will be colonized with GBS;
- 30 to 280 babies will develop an infection if untreated:
  - bacteremia (19 to 232 babies)
  - pneumonia (three to 64 babies)
  - meningitis (two to 35 babies)
- Two to 14 babies will die.

RISK FACTORS

GBS COLONIZATION IN THE BIRTHING PARENT

TABLE 1. FACTORS ASSOCIATED WITH GBS COLONIZATION IN THE BIRTHING PARENT

Risk factor	OR	Interpretation	Sources
Strong predictive factor (OR > 1.75 or < 0.25)			
Colonization in a previous pregnancy	(OR 5.80, 95% CI 4.18-8.05)	Increases likelihood of colonization	(5)
Moderate predictive factor (OR 1.25-1.75 or 0.26-0.75)			
Pregestational diabetes	(OR 1.34, 95% CI 1.09-1.63)	Increases likelihood of colonization	(6–11)
Weak predictive factor (OR < 1.25 and > 0.76)			
Gestational diabetes	(OR 1.17, 95% CI 1.03-1.31)	Increases likelihood of colonization	(6,9–16)
BMI > 25 kg/m²	(OR 1.21, 95% CI 1.11-1.33)	Increases likelihood of colonization	(17–20)

EOGBSD

TABLE 2. FACTORS ASSOCIATED WITH THE DEVELOPMENT OF EOGBSD IN NEWBORNS

Predictive factor	OR	Interpretation	Sources
Strong predictive factor (OR > 1.75 or < 0.25)			
Previous infant with EOGBSD	(OR 27.81, 95% CI 9.08-85.17)	Increases likelihood of EOGBSD	(12)
GBS-positive birthing parent	(OR 10.44, 95% CI 3.69-29.56)	Increases likelihood of EOGBSD	(21–23)
Frequent vaginal exams	(OR 6.32, 95% CI 2.44-16.40)	Increases likelihood of EOGBSD	(24)
GBS bacteriuria	(OR 5.34, 95% CI 2.49-11.46)	Increases likelihood of EOGBSD	(12,21,25)
Chorioamnionitis	(OR 4.19, 95% CI 0.71-24.59)	May increase likelihood of EOGBSD	(12,24,26,27)
Intrapartum fever (> 38°C)	(OR 3.62, 95% CI 1.71-7.66)	Increases likelihood of EOGBSD	(12,23–25,28)
Membrane sweeping	(OR 2.52, 95% CI 1.33-4.78)	Increases likelihood of EOGBSD	(23)
Preterm birth (< 37 weeks)	(OR 2.02, 95% CI 1.36-3.01)	Increases likelihood of EOGBSD	(12,21–24,26,27)
Prelabour rupture of membranes (PROM) > 18 hours)	(OR 2.02, 95% CI 0.87-4.73)	May increase likelihood of EOGBSD	(12,22–25)
Low birth weight (< 2500 g)	(OR 2.01, 95% CI 1.39-2.92)	Increases likelihood of EOGBSD	(12,21,23,24)
Multiple pregnancy	(OR 1.98, 95% CI 0.78-5.02)	May increase likelihood of EOGBSD	(12,26,28)

EOGBSD IN GBS-NEGATIVE CLIENTS

The absolute risk of EOGBSD in the context of a negative prenatal screen is low. However, the majority of cases diagnosed in the context of screening and IAP occur in infants born to pregnant people who screened negative at 35 to 37 weeks' gestation and who did not receive IAP.

ANTEPARTUM PREVENTION OF GBS COLONIZATION

PROBIOTICS

Seven studies were found that investigated the effect of oral probiotics for the prevention of GBS colonization in the birthing parent at or before birth. (29–35) Meta-analyses of four RCTs show that oral probiotics likely reduce GBS colonization close to delivery and likely have no side effects. Observational literature supports these findings. (34,35)

No studies were identified that investigated the effects of dietary sources of probiotics; nor did the available research provide clear guidance on the optimal duration or dosage of probiotics.

Recommendation:

1. Midwives may discuss the use of probiotics in the antepartum period with clients as a means of reducing the chances of GBS colonization at birth. [new 2022]

   Weak recommendation; moderate certainty of evidence

   This recommendation recognizes the limits of the existing research on probiotics for GBS, as well as existing barriers to access.

HOMEOPATHIC AND NATURAL REMEDIES

No studies were identified on the use of homeopathic or natural remedies (including but not limited to garlic suppositories, vitamins, echinacea or other remedies) in the antepartum period for the prevention of GBS colonization at birth.

VAGINAL-RECTAL CULTURE SCREENING FOR GBS

DIAGNOSTIC ACCURACY OF VAGINAL-RECTAL SWABS

Twelve observational studies (n = 15 610) (moderate certainty of evidence) were found that compared the sensitivity and specificity of an antepartum GBS culture taken at 35 to 37 weeks' gestation with an intrapartum GBS culture. (36–47) Results showed that these swabs likely have high specificity (90%) and sensitivity (77%). The concern with these findings is that some pregnant people who have GBS at birth will be missed and therefore will not receive IAP, while a smaller proportion may receive IAP unnecessarily.

SELF-SAMPLING WITH A VAGINAL-RECTAL SWAB

One observational study (n = 800) (very low certainty of evidence) found that self-collection may capture more positive GBS results than collection by a health-care provider, although we are uncertain of these results due to concerns about the imprecision of the estimate of effect. Other observational studies found the performance of self-collected swabs very similar to that of swabs collected by health professionals. (48–51)

Recommendation:

2. Offer all clients screening for GBS at 35 to 37 weeks' gestation, with a culture done from one swab first to the vagina then the rectum. Clients may be offered instructions on how to do the swab themselves. [2022]

   Strong recommendation; moderate certainty of evidence

   This recommendation recognizes the evidence on diagnostic accuracy of vaginal-rectal culture screening, as well as variability in client preferences, values and ability regarding self-sampling.

TIMING OF VAGINAL-RECTAL CULTURE SCREENING FOR GBS

One systematic review (moderate certainty of evidence) that investigated the optimal time to perform antepartum GBS culture screening found that:

- An antepartum culture is most accurate in predicting GBS status at birth when performed at a later gestational age, which allows for a shorter interval between screening and birth.
- An interval of greater than six weeks between antepartum culture and birth likely reduces the probability of an accurate result. (52)

There is no research to guide practice if a client has two or more swabs within five weeks of delivery that indicate different results.

Recommendation:
3. Offer re-screening if more than five weeks have elapsed from initial swab and the client has not yet given birth. [2022] **Strong recommendation; moderate certainty of evidence** *This recommendation recognizes the evidence to demonstrate that the predictive ability of a swab declines after six weeks. However, there may be practical limitations due to long sampling and processing times, which warrant earlier re-swabbing.*

FACILITATING DECISION-MAKING WITH CLIENTS

Clients are generally willing to be screened for GBS; however, they would benefit from receiving information prior to screening about the process and the implications of a positive result. These practice points outline strategies that may lessen the emotional and psychological impacts of screening positive for GBS.

Prior to GBS screening	• Provide general information about GBS and the meaning of a positive result. • Discuss screening options and support informed choice. • If client is self-swabbing, ensure that they have detailed instructions and feel confident about performing the swab
When delivering a positive result to a client	• Share result and explain its meaning. • If possible, deliver the result in person. • Consider the language you use and how it may affect the client: try using "common" rathen than "normal" and explain the meaning of "positive."
After the client receives a positive result	• Provide support and reassurance. • Allow time to answer any questions. • Discuss treatment options and support informed choice. • Discuss relevant risk factors for EOGBSD with client.

ANTEPARTUM MANAGEMENT OF CLIENTS WITH PENICILLIN ALLERGIES

PENICILLIN ALLERGY TESTING

Research suggests that immune-mediated allergic responses are rare among people who report unconfirmed penicillin allergies; and up to 95% of those people may have the label removed through testing. (53,54) Allergy tests have been shown to be safe for pregnant people (with or without GBS), with few adverse reactions. (53,55)

GBS-positive pregnant people with active, unverified penicillin allergies have higher rates of caesarean section; and they spend significantly more total days in the hospital within six months of delivery compared with GBS-positive pregnant people with no penicillin allergies. (56) Allergy testing increases the likelihood that individuals will receive narrow beta-lactams, specifically penicillin, rather than beta-lactam alternatives in their current pregnancy and in the future.

Good practice statement:

4. Midwives should discuss the risks and benefits of penicillin allergy testing with clients who have an unconfirmed penicillin allergy, as early in their pregnancy as possible. [new 2022]

   Good practice statement

   This good practice statement recognizes the long-term health benefits of penicillin allergy testing and the importance of appropriate antimicrobial use, as well as potential constraints around prompt access to penicillin allergy testing.

TESTING GBS ISOLATES

There are no direct studies that compare GBS outcomes for those who had testing of GBS isolates. A systematic review shows that most GBS isolates were susceptible to penicillin, ampicillin and vancomycin; and pooled rates of resistance to erythromycin, clindamycin, and tetracycline were 25%, 27% and 73% respectively. (57) Findings in Canada and Ontario are similar. (4,58–60)

Good practice statement:

5. Request sensitivity testing for the GBS swab if:
   - Client has a confirmed penicillin allergy;
   - Client reports symptoms consistent with a penicillin allergy and has not been tested to confirm an allergy. [2022]

   Good practice statement

   This good practice statement recognizes the larger body of evidence on antimicrobial susceptibility of GBS isolates.

INTRAPARTUM MANAGEMENT STRATEGIES

EFFECTIVENESS OF IAP

Two systematic reviews, including 13 RCTs and one cohort study, showed that IAP for birthing parents known to be colonized with GBS likely reduces EOGBS infections, as well as neonatal infections from other bacteria. IAP may also reduce neonatal mortality from EOGBSD and infections caused by bacteria other than GBS, although the results are uncertain. IAP may make little to no difference in the rate of non-GBS neonatal sepsis. (61,62)

In discussions with clients, midwives can share evidence on other effects of IAP:

- In the short term, IAP diminishes beneficial commensals in the newborn's microbiota;
- IAP potentially increases antimicrobial resistance;
- IAP rarely causes anaphylaxis;
- IAP increases the chances of breast/chest candidiasis and yeast infections;
- IAP has no significant impact on penicillin allergies or atopic dermatitis in children.

APPROACHES TO DETERMINING WHO RECEIVES IAP

The following approaches have been studied:

- Culture-screening approach: IAP is given to labouring people who screened positive on a vaginal-rectal culture between 35 and 37 weeks' gestation, those with GBS bacteriuria and those who previously had an infant with EOGBSD. Four observational studies (very low certainty of evidence) showed that culture screening may reduce rates of neonatal EOGBSD compared with no policy. (63)
- Risk-factor approach: IAP is given to labouring people with one or more of the following risk factors: gestation < 37 weeks, rupture of membranes ≥ 18h, intrapartum fever ≥ 38°C, GBS bacteriuria in pregnancy, and/or prior infant with GBS disease. Seven observational studies (very low certainty of evidence) showed that the risk-factor approach may reduce rates of neonatal EOGBSD, compared with no policy. (63)
- Culture-screening and risk-factors approach: IAP is given to labouring people who screened positive on a vaginal-rectal culture between 35 and 37 weeks' gestation and who also have one or more risk factors. One observational study (very low certainty) showed that the culture-screening and risk-factor approach may reduce the cases of EOGBSD, compared with no policy. (64)

Ten observational studies (very low certainty) showed that culture screening may reduce rates of neonatal EOGBSD compared with the risk-factor approach. (63)

To help contextualize these research findings, Table 5 models the impact of each IAP approach on important neonatal outcomes, as well as the number of birthing parents needed to treat (NNT) with antibiotics, in order to prevent one case of EOGBSD. No available research provides a direct comparison between the culture-screening approach and the culture-screening and risk-factor approach. Well-designed comparative studies with similar populations and settings are needed to understand the relative efficacy of these two strategies. Without such direct comparisons, it cannot be ascertained that similar results, as presented above, would be found. While the research to date suggests that the incidence of EOGBSD and neonatal mortality is lowest when a culture-screening strategy is used, the culture-screening plus risk-factor approach may serve as a targeted approach to EOGBSD prevention that could result in lower rates of IAP use.

TABLE 3. NEONATAL OUTCOMES BY APPROACH TO IAP

	No approach	Risk-factor approach	Culture-screening and risk-factor approach	Culture-screening approach
Cases of EOGBSD	10 per 1000	8.4 per 1000	5.4 per 1000	3.1 per 1000
Neonatal mortality	0.9 per 1000	0.76 per 1000	0.49 per 1000	0.28 per 1000
NNT with IAP	–	23	22	63

Recommendations:

6. The risks and benefits of the following two approaches to IAP delivery should be discussed with clients as part of their informed choice discussion about GBS:

a) Culture-screening approach

- All clients who receive a GBS-positive swab at 35 to 37 weeks' gestation, have documented GBS bacteriuria or previously had an infant with GBS should be offered IAP.

b) Culture-screening and risk-factor approach

- All clients who receive a GBS-positive swab at 35 to 37 weeks' gestation and develop one or more of these intrapartum risk factors should be offered IAP. Intrapartum risk factors include:
  - Preterm labour (>37 weeks)
  - Prolonged rupture of membranes (≥ 18 hours)
  - Maternal fever (≥ 38°C)
- All clients with documented GBS bacteriuria or who previously had an infant with GBS should be offered IAP.

Informed choice discussions should address:

- The body of evidence for both strategies, including a discussion of the larger body of evidence in support of a culture-screening approach;
- The SOGC recommendation to use a culture-screening approach;
- Community standards regarding approaches to determining who receives IAP;
- Alternatives to penicillin, as well as choice of birthplace considerations for those with penicillin allergies;
- Client values, preferences and risk tolerance. [2022]

Strong recommendation; very low certainty of evidence

This recommendation acknowledges that both approaches reduce EOGBSD, and it recognizes the larger body of evidence in support of the culture-screening approach.

7. For clients with an unknown GBS status, offer IAP if one or more intrapartum risk factors are present:

- Preterm labour (< 37 weeks)
- Prolonged rupture of membranes (≥ 18 hours)
- Maternal fever (≥ 38°C) [2022]

Strong recommendation; very low certainty of evidence

This recommendation acknowledges the evidence suggesting that administering IAP to those with risk factors, in the absence of known GBS status, is more protective than no policy.

INTRAPARTUM MANAGEMENT OF PRELABOUR RUPTURE OF MEMBRANES (PROM): INDUCTION VS. EXPECTANT MANAGEMENT

In a secondary analysis of the TermPROM study, results show that for pregnant people with GBS (n = 270), induction may reduce cases of neonatal infection, compared with expectant management. (65) However, we are very uncertain of these findings due to issues with risk of bias, directness and precision. As well, the data from the TermPROM trial does not address different management approaches based on length of PROM.

INTRAPARTUM MANAGEMENT OF PROM: TIMING OF IAP

No studies were identified that compared different timing of IAP for GBS-positive pregnant people who experience PROM. In the absence of research, midwives use a variety of approaches to ensure adequate administration of IAP for these clients. Further research is needed to understand optimal timing of IAP for those who experience PROM.

Recommendations:

8. Offer a choice between expectant management and immediate medical induction of labour to clients at term who are GBS positive, experience PROM for < 18 hours, and have no other risk factors.

   Informed choice discussions should include information on:

   - Research gaps regarding the most effective approach to preventing EOGBSD in infants born to GBS carriers who experience term PROM;
   - Guidance from the SOGC on induction for those who experience PROM;
   - Client preferences and values. [2022]

   Strong recommendation; very low certainty of evidence

   This recommendation recognizes the limited evidence on expectant management and induction of GBS-positive clients who experience PROM < 18 hours, and it recognizes the client as the primary decision-maker.

9. Recommend medical induction of labour to clients who are GBS positive with PROM ≥ 18 hours. IAP should be offered upon start of labour. [2022]

   Strong recommendation; very low certainty of evidence

   This recommendation recognizes the increased risk of EOGBSD for clients who experience PROM ≥ 18 hours.

10. Offer GBS-positive clients with PROM who choose expectant management a range of options for IAP administration, taking into account local resource constraints:

    a. IAP in active labour
    b. IAP in the latent phase
    c. IAP upon initiation of induction of labour [2022]

    Weak recommendation; no direct evidence

    This recommendation recognizes the lack of evidence on timing of IAP for clients who experience PROM, as well as acknowledging the client as the primary decision-maker.

POSTPARTUM MANAGEMENT STRATEGIES: EOGBSD

IDENTIFYING EOGBSD

None of the GBS prevention strategies available will prevent all cases of EOGBSD. As current incidence patterns demonstrate, EOGBSD can occur in the presence of a negative prenatal screen, in the absence of risk factors or despite administration of IAP. There is no clear distinction between EOGBSD and other early-onset infections in the clinical signs that may present, and non-infectious neonatal disorders may share similar signs.

Signs of sepsis include:

- Respiratory distress
- Temperature instability
- Tachycardia
- Seizures
- Hypotonia
- Lethargy
- Poor peripheral perfusion
- Hypotension
- Acidosis

As the progression of EOGBSD is very rapid, any neonate with clinical signs suggestive of infection should receive immediate assessment and consultation for treatment. (66)

ASSESSMENTS FOR EOGBSD

How can midwives assess neonates for EOGBSD?

Conventional monitoring practices have not been evaluated for their impact on clinical outcomes. However, studies consistently suggest that most cases of EOGBSD occur soon after birth. According to the Canadian Pediatric Society (CPS), 95% of septic infants present within the first 24 hours of life, regardless of antibiotic exposure. (66) The first 24 hours is the most critical period to assess for EOGBSD.

Midwives may conduct assessments and monitor the newborn in the home, clinic, birth centre or hospital. They also educate parents on how to take an active role in identifying signs of illness; respond to inquiries from parents about their newborns; give advice by phone; and determine the urgency and necessity of an in-person assessment of the newborn as needed. After discussing concerns with parents, midwives use clinical judgement and consider local community factors to determine whether clinical evaluation of the newborn should occur in the clinic, at home or in hospital.

Good practice statements:

11. Midwives should discuss with all clients, regardless of prenatal GBS status:
    - What to expect as normal newborn transition and behaviour in the first 24 hours;
    - How to recognize signs in the newborn that may be indicative of sepsis (including breathing, temperature instability, colour and tone);
    - How to contact the midwife and access urgent care when necessary. [2022]

    Good practice statement

    This good practice statement recognizes midwives' strengths in providing health education to clients, and it acknowledges that sepsis may occur in infants born to parents who have tested negative for GBS or received IAP.

12. If a midwife suspects EOGBSD, an assessment should be done promptly. If signs of sepsis are noted upon an in-person exam, they should arrange an immediate consult.
    - Once a consult has been initiated, the midwife should discuss with the client any hospital protocols and care plans applicable to management decisions. [2022]

    Good practice statement

    This good practice statement recognizes the rapid progression of sepsis, as well as midwives' ability to identify emerging complications and work interprofessionally to provide safe, excellent client care.

POSTPARTUM MANAGEMENT STRATEGIES: CHORIOAMNIONITIS

Researchers note a relatively high frequency of maternal fever and chorioamnionitis in cases where neonates develop EOGBSD despite the administration of IAP. Data from risk-factor literature suggests that chorioamnionitis may be strongly predictive of EOGBSD, as is intrapartum fever (>38°C). (12,24,25,28)

No studies were identified that compared management strategies of expectant observation vs. routine laboratory testing, including complete blood count (CBC) and/or blood culture, for asymptomatic newborns born to GBS-positive birthing parents who experienced chorioamnionitis. Results from two small observational studies of GBS-negative parents suggest that clinical monitoring of well-appearing asymptomatic newborns exposed to chorioamnionitis, including examination at birth and every four hours in the first 24 hours of life, maintains low rates of laboratory testing and antibiotic use, reduces separation of the parent-infant dyad and results in no adverse events. (67,68)

Because the majority of EOGBSD cases tend to present within the first 24 hours, CBC may not be as useful for guiding treatment decisions vs. promptly recognizing clinical signs of sepsis.

The latest guidance from CPS (2017) suggests the following approach:

- **Multiple risk factors for sepsis and/or chorioamnionitis:** Infants should be investigated and treated using an individualized approach that includes consideration of the severity of risk factors and maternal antibiotic therapy. At minimum, infants should have close observation in hospital for at least 24 h with vital signs every 3 h to 4 h and reassessment before discharge. A CBC done after 4 h of age may be helpful; WBC <5 x 109/L and ANC <1.5 x 109/L have the highest positive predictive value. Some infants may warrant investigation and antibiotic therapy.

Good practice statement:

13. For asymptomatic newborns of clients with confirmed or suspected chorioamnionitis, midwives should:
    - Offer hospital observation;
    - Discuss the increased risk of EOGBSD for newborns of birthing parents with confirmed or suspected chorioamnionitis, regardless of IAP status;
    - Relay CPS guidance for managing infants born to parents with confirmed or suspected chorioamnionitis;
    - Consult with a pediatrician or physician if assessment or treatment is required. [2022]

Good practice statement

This good practice statement recognizes the evidence on the risks of chorioamnionitis to the neonate and the value of continuity of care, as well as midwives' ability to identify emerging complications and escalate care as the clinical picture requires.

POSTPARTUM MANAGEMENT STRATEGIES: WELL-APPEARING AT-RISK NEONATE

EOGBSD may be initially asymptomatic, and signs of illness may be equivocal and/or transient in infants with or without EOGBSD. Research suggests that initial asymptomatic status is a strong negative predictor of culture-proven EOGBSD: infants who appear well will most likely remain well. (69–71)

DURATION OF IAP AND NEWBORN ASSESSMENTS

Four or more hours of IAP is considered full IAP, while less than four hours is considered partial IAP. Results from three studies (low certainty of evidence) suggest that full IAP (> 4 hours) compared with partial IAP (< 4 hours) may result in decreased rates of EOGBSD/EOGBS infection and neonatal clinical sepsis. (72–74)

One study examines the effectiveness of partial IAP in more detail, comparing durations of < 2 hours, 2-4 hours and > 4 hours. (72) Results suggest that the risk of EOGBSD and sepsis decreases as the duration of IAP increases; receiving IAP for < 2 hours poses a higher risk to newborns compared with receiving 2-4 hours or > 4 hours.

EXPECTANT OBSERVATION VS. LABORATORY TESTING

Results from two observational studies (very low certainty of evidence) suggest that serial physical examinations (expectant observation) have a similar ability to detect early-onset sepsis as compared with laboratory testing. Moreover, expectant management appears to reduce the rate of newborn antibiotic use without increasing the risk of suspected sepsis. (75,76)

CPS provides the following guidance for the monitoring and assessment of well-appearing newborns (≥ 37 weeks' gestation) in the context of GBS:

- **GBS positive birthing parent, adequate IAP, no risk factors OR GBS-negative or GBS-unknown status, with one other risk factor and adequate IAP:** Infants do not require investigation or treatment for sepsis. They may be discharged home after 24 hours if they remain well, meet other discharge criteria and if parents understand signs of sepsis and when to seek medical care. (Strong recommendation)

- **GBS positive birthing parent, inadequate IAP, no risk factors OR GBS-negative or GBS-unknown status, with one other risk factor and inadequate IAP:** Infants should be examined at birth, observed closely in hospital with vital signs every 3 to 4 hours, and reassessed before discharge home. They may be discharged home after 24 hours if they remain well and meet other discharge criteria, providing there is ready access to health care and the parents understand and are able to seek medical care if the infant develops signs of sepsis. Routine investigation or treatment is not required. (Strong recommendation)
- **Multiple risk factors for sepsis and/or chorioamnionitis:** Infants should be investigated and treated using an individualized approach that includes consideration of the severity of risk factors and maternal antibiotic therapy. At minimum, infants should have close observation in hospital for at least 24 hours with vital signs every 3 h to four hours and reassessment before discharge. A CBC done after 4 h of age may be helpful; WBC <5 x 109/L and ANC <1.5 x 109/L have the highest positive predictive value. Some infants may warrant investigation and antibiotic therapy. (Weak recommendation.)

CPS guidance differs from midwifery approaches, as it focuses on in-hospital birth, and CPS recommendations for postpartum management are structured around standard discharge times. As a standard of midwifery care, early postpartum visits, along with home visits, are important components of how midwives monitor for signs of sepsis.

For clients with confirmed penicillin allergies who receive clindamycin or vancomycin, CPS suggests that due to the lack of clinical trials, these IAP approaches should be considered inadequate when managing the neonate.

Good practice statement:

14. When discussing management options for the well-appearing term newborn with risk factors for EOGBSD, midwives should address the following in informed choice discussions with clients:
    - CPS guidelines, as well as local hospital protocol applicable to the client's and newborn's clinical circumstances;
    - What is known about how any risk factors may increase the risks of developing EOGBSD;
    - What is known about how full, partial or no IAP may affect the risk of developing EOGBSD;
    - The client's values, preferences and risk tolerance, as well as their comfort level and ability to monitor their newborn. [2022]

    Good practice statement

    This good practice statement recognizes the client as the primary decision-maker.

Recommendations:

The following recommendations refer to management of well-appearing term infants born to parents colonized with GBS:

15. For well-appearing newborns who received IAP ≥ four hours before birth, midwives should offer home observation. [2022]

    Strong recommendation; very low certainty of evidence

    This recommendation recognizes the evidence that IAP is most effective when delivered ≥ four hours before birth. It also acknowledges that observation in the home setting is appropriate for this population.

16. For well-appearing newborns who received < four hours of IAP prior to birth (partial IAP) and had no other risk factors, midwives may offer home observation. [2022]

    Weak recommendation; very low certainty of evidence

    This recommendation recognizes the evidence that IAP < four hours before birth may still reduce risks to the neonate. It also acknowledges that observation in the home setting is appropriate for this population.

Recommendations:

17. For well-appearing newborns of clients who received < four hours of IAP prior to birth (partial IAP) and experienced PROM ≥ 18 hours and/or fever, midwives may offer home or hospital observation. [2022]

    Weak recommendation; very low certainty of evidence

    This recommendation recognizes the risks to the neonate posed by multiple risks factors, while acknowledging that the presence of one or more of these factors is not necessarily strongly predictive of EOGBSD and therefore should not limit choice. This recommendation also recognizes midwives' ability to provide relevant education to parents about neonatal sepsis.

18. For well-appearing newborns of clients who have not received IAP but have no other risk factors, midwives may offer home or hospital observation. [2022]

    Weak recommendation; very low certainty of evidence

    This recommendation recognizes the evidence that the risk of EOGBSD is highest when no IAP has been given, while acknowledging that GBS status alone is associated with a low absolute risk of EOGBSD and therefore should not limit choice.

19. For well-appearing newborns of clients who have not received IAP and who experienced PROM ≥ 18 hours and/or fever, midwives may offer hospital observation. [new 2022]

    Weak recommendation; very low certainty of evidence

    This recommendation recognizes the evidence that receiving no IAP, in combination with PROM ≥ 18 hours, may increase risks to the neonate.

POSTPARTUM MANAGEMENT STRATEGIES: NEAR-TERM NEONATES

The near-term neonate will more likely face challenges with thermoregulation, feeding difficulties and poor immunological and respiratory defence systems. (77) Researchers have found increased mortality rates for both early and late GBS infection in preterm and near-term infants compared with term infants. (78) Because the signs of early-onset sepsis (EOS) can be subtle or can mimic other medical conditions (hypoglycemia, delayed transition, transient tachypnea of the newborn), diagnosis in the near-term neonate is challenging. This may result in many near-term neonates being evaluated for sepsis and receiving empiric antibiotics. (79)

CPS acknowledges that specific evidence related to the management of late-preterm/near-term infants is lacking, but it recommends that:

- If infants are stable enough to remain with their birthing parent in a birthing parent and baby unit, they can be managed similar to infants ≥37 weeks' GA, but should be observed in hospital for at least 48 hours

Good practice statement:

20. For well-appearing near-term infants, midwives should:
    - Discuss CPS guidance for managing well-appearing near-term neonates;
    - Discuss evidence related to the increased risk of EOGBSD in preterm populations;
    - Consult with a pediatrician or physician if assessment or treatment is required. [new 2022]

    Good practice statement

    This good practice statement recognizes midwives' ability to identify emerging complications and escalate care as the clinical picture requires.

REFERENCES

1. Society of Obstetricians and Gynaecologists of Canada. Pregnancy Info [Internet]. 2021. Available from: https://www.pregnancyinfo.ca/your-pregnancy/routine-tests/group-b-streptococcus-screening/
2. Better Outcomes Registry and Network (BORN) Ontario. Group B Streptococcus Screening Results.
3. Baker CJ, Edwards MS. Group B streptococcal infections. In: Remington JS, Klein J, editors. Infectious diseases of the fetus and newborn infant. WB Saunders; 1995. p. 980.
4. Spaetgens R, DeBella K, Ma D, Robertson S, Mucenski M, Davies HD. Perinatal antibiotic usage and changes in colonization and resistance rates of group B streptococcus and other pathogens. Obstet Gynecol [Internet]. 2002 Sep;100(3):525–33. Available from: http://www.ncbi.nlm.nih.gov/pubmed/12220773
5. Turrentine MA, Colicchia LC, Hirsch E, Cheng P-J, Tam T, Ramsey PS, et al. Efficiency of Screening for the Recurrence of Antenatal Group B Streptococcus Colonization in a Subsequent Pregnancy: A Systematic Review and Meta-analysis with Independent Patient Data. Am J Perinatol [Internet]. 2016 Apr;33(5):510–7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/26683604
6. Furfaro LL, Nathan EA, Chang BJ, Payne MS. Group B streptococcus prevalence, serotype distribution and colonization dynamics in Western Australian pregnant women. J Med Microbiol [Internet]. 2019 May;68(5):728–40. Available from: http://www.ncbi.nlm.nih.gov/pubmed/31013212
7. Colicchia LC, Lauderdale DS, Du H, Adams M, Hirsch E. Recurrence of group B streptococcus colonization in successive pregnancies. J Perinatol [Internet]. 2015 Mar;35(3):173–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/25321646
8. Chen Z, Wen G, Cao X, Li S, Wang X, Yao Z, et al. Group B streptococcus colonisation and associated risk factors among pregnant women: A hospital-based study and implications for primary care. Int J Clin Pract [Internet]. 2019 May;73(5):e13276. Available from: http://www.ncbi.nlm.nih.gov/pubmed/30273994
9. Khalil MR, Uldbjerg N, Møller JK, Thorsen PB. Group B streptococci cultured in urine during pregnancy associated with preterm delivery: a selection problem? J Matern Fetal Neonatal Med [Internet]. 2019 Oct;32(19):3176–84. Available from: http://www.ncbi.nlm.nih.gov/pubmed/29595087
10. Venkatesh KK, Vladutiu CJ, Strauss RA, Thorp JM, Stringer JSA, Stamilio DM, et al. Association Between Maternal Obesity and Group B Streptococcus Colonization in a National U.S. Cohort. J Womens Health (Larchmt) [Internet]. 2020;29(12):1507–12. Available from: http://www.ncbi.nlm.nih.gov/pubmed/32364822
11. Manzanares S, Zamorano M, Naveiro-Fuentes M, Pineda A, Rodríguez-Granger J, Puertas A. Maternal obesity and the risk of group B streptococcal colonisation in pregnant women. J Obstet Gynaecol [Internet]. 2019 Jul;39(5):628–32. Available from: http://www.ncbi.nlm.nih.gov/pubmed/30932731
12. Zhu Y, Huang J, Lin X-Z, Chen C. Group B Streptococcus Colonization in Late Pregnancy and Invasive Infection in Neonates in China: A Population-Based 3-Year Study. Neonatology [Internet]. 2019;115(4):301–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/30808831
13. Ji Y, Zhao C, Ma X-X, Peppelenbosch MP, Ma Z, Pan Q. Outcome of a screening program for the prevention of neonatal early-onset group B Streptococcus infection: a population-based cohort study in Inner Mongolia, China. J Med Microbiol [Internet]. 2019 May;68(5):803–11. Available from: http://www.ncbi.nlm.nih.gov/pubmed/30994439
14. Chen J, Fu J, Du W, Liu X, Rongkavilit C, Huang X, et al. Group B streptococcal colonization in mothers and infants in western China: prevalences and risk factors. BMC Infect Dis [Internet]. 2018;18(1):291. Available from: http://www.ncbi.nlm.nih.gov/pubmed/29970020
15. Moraleda C, Benmessaoud R, Esteban J, López Y, Alami H, Barkat A, et al. Prevalence, antimicrobial resistance and serotype distribution of group B streptococcus isolated among pregnant women and newborns in Rabat, Morocco. J Med Microbiol [Internet]. 2018 May;67(5):652–61. Available from: http://www.ncbi.nlm.nih.gov/pubmed/29543148
16. Alvareza MD, Subramaniam A, Tang Y, Edwards RK. Obesity as an independent risk factor for group B streptococcal colonization. J Matern Fetal Neonatal Med [Internet]. 2017 Dec;30(23):2876–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/27997266
17. Gopal Rao G, Hiles S, Bassett P, Lamagni T. Differential rates of group B streptococcus (GBS) colonisation in pregnant women in a racially diverse area of London, UK: a cross-sectional study. BJOG [Internet]. 2019 Oct;126(11):1347–53. Available from: http://www.ncbi.nlm.nih.gov/pubmed/30734508
18. Namugongo A, Bazira J, Fajardot Y, Joseph N. Group B Streptococcus Colonization among Pregnant Women Attending Antenatal Care at Tertiary Hospital in Rural Southwestern Uganda. Int J Microbiol [Internet]. 2016;2016:3816184. Available from: http://www.ncbi.nlm.nih.gov/pubmed/27313620
19. Capraro GA, Lala S, Khaled K, Gosciniak E, Saadat B, Alvarez SM, et al. Association of sexually-transmitted infection and

African-American race with Streptococcus agalactiae colonization in pregnancy. Antimicrob Resist Infect Control [Internet]. 2020;9(1):174. Available from: http://www.ncbi.nlm.nih.gov/pubmed/33148312

20. Kleweis SM, Cahill AG, Odibo AO, Tuuli MG. Maternal Obesity and Rectovaginal Group B Streptococcus Colonization at Term. Infect Dis Obstet Gynecol [Internet]. 2015;2015:586767. Available from: http://www.ncbi.nlm.nih.gov/pubmed/26300620

21. Carroll A, Eogan M, Monteith C, Foran A, Drew RJ. Case-control study of neonatal group B streptococcal disease risk factors in a Dublin maternity hospital over a 13-year period. Int J Gynaecol Obstet [Internet]. 2016 Oct;135(1):117–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/27392804

22. Cho C-Y, Tang Y-H, Chen Y-H, Wang S-Y, Yang Y-H, Wang T-H, et al. Group B Streptococcal infection in neonates and colonization in pregnant women: An epidemiological retrospective analysis. J Microbiol Immunol Infect [Internet]. 2019 Apr;52(2):265–72. Available from: http://www.ncbi.nlm.nih.gov/pubmed/28882582

23. Ying Q, Wang S, Lou X, Ding J, Ding J. Burden and risk factors of invasive group B Streptococcus disease among neonates in a Chinese maternity hospital. BMC Infect Dis [Internet]. 2019 Feb 6;19(1):123. Available from: http://www.ncbi.nlm.nih.gov/pubmed/30727961

24. Santhanam S, Arun S, Rebekah G, Ponmudi NJ, Chandran J, Jose R, et al. Perinatal Risk Factors for Neonatal Early-onset Group B Streptococcal Sepsis after Initiation of Risk-based Maternal Intrapartum Antibiotic Prophylaxis-A Case Control Study. J Trop Pediatr [Internet]. 2018 Aug 1;64(4):312–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/29036682

25. Berardi A, Spada C, Creti R, Ambretti S, Chiarabini R, Barozzi A, et al. Risk factors for group B streptococcus early-onset disease: an Italian, area-based, case-control study. J Matern Fetal Neonatal Med [Internet]. 2020 Jul;33(14):2480–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/31170843

26. Tudela CM, Stewart RD, Roberts SW, Wendel GD, Stafford IA, McIntire DD, et al. Intrapartum evidence of early-onset group B streptococcus. Obstet Gynecol [Internet]. 2012 Mar;119(3):626–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22353962

27. Stafford IA, Stewart RD, Sheffield JS, Wendel GD, Sanchez PJ, McIntire DD, et al. Efficacy of maternal and neonatal chemoprophylaxis for early-onset group B streptococcal disease. Obstet Gynecol [Internet]. 2012 Jul;120(1):123–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22914400

28. Ireland S, Larkins S, Kandasamy Y. Group B streptococcal infection in the first 90 days of life in North Queensland. Aust N Z J Obstet Gynaecol [Internet]. 2014 Apr;54(2):146–51. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24359598

29. Olsen P, Williamson M, Traynor V, Georgiou C. The impact of oral probiotics on vaginal Group B Streptococcal colonisation rates in pregnant women: A pilot randomised control study. Women Birth [Internet]. 2018 Feb;31(1):31–7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/28668229

30. Ho M, Chang Y-Y, Chang W-C, Lin H-C, Wang M-H, Lin W-C, et al. Oral Lactobacillus rhamnosus GR-1 and Lactobacillus reuteri RC-14 to reduce Group B Streptococcus colonization in pregnant women: A randomized controlled trial. Taiwan J Obstet Gynecol [Internet]. 2016 Aug;55(4):515–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/27590374

31. Farr A, Sustr V, Kiss H, Rosicky I, Graf A, Makristathis A, et al. Oral probiotics to reduce vaginal group B streptococcal colonization in late pregnancy. Sci Rep [Internet]. 2020;10(1):19745. Available from: http://www.ncbi.nlm.nih.gov/pubmed/33184437

32. Sharpe M, Shah V, Freire-Lizama T, Cates EC, McGrath K, David I, et al. Effectiveness of oral intake of Lactobacillus rhamnosus GR-1 and Lactobacillus reuteri RC-14 on Group B Streptococcus colonization during pregnancy: a midwifery-led double-blind randomized controlled pilot trial. J Matern Fetal Neonatal Med [Internet]. 2019 Aug 13;1–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/31362572

33. Martín V, Cárdenas N, Ocaña S, Marín M, Arroyo R, Beltrán D, et al. Rectal and Vaginal Eradication of Streptococcus agalactiae (GBS) in Pregnant Women by Using Lactobacillus salivarius CECT 9145, A Target-specific Probiotic Strain. Nutrients [Internet]. 2019 Apr 10;11(4). Available from: http://www.ncbi.nlm.nih.gov/pubmed/30974819

34. Di Pierro F, Parolari A, Brundu B, Nigro R. Positive clinical outcomes derived from using a proprietary mixture of selected strains during pregnancy. Acta Biomed [Internet]. 2016;87(3):259–65. Available from: http://www.ncbi.nlm.nih.gov/pubmed/28112691

35. Hanson L, Vandevusse L, Duster M, Warrack S, Safdar N. Feasibility of oral prenatal probiotics against maternal group B Streptococcus vaginal and rectal colonization. J Obstet Gynecol Neonatal Nurs [Internet]. 2014;43(3):294–304. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24754328

36. Virranniemi M, Raudaskoski T, Haapsamo M, Kauppila J, Renko M, Peltola J, et al. The effect of screening-to-labor interval on the sensitivity of late-pregnancy culture in the prediction of group B streptococcus colonization at labor: A prospective multicenter cohort study. Acta Obstet Gynecol Scand [Internet]. 2019;98(4):494–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/30578547

37. Khalil MR, Uldbjerg N, Thorsen PB, Møller JK. Intrapartum PCR assay versus antepartum culture for assessment of vaginal carriage of group B streptococci in a Danish cohort at birth. PLoS One [Internet]. 2017;12(7):e0180262. Available from: http://www.ncbi.nlm.nih.gov/pubmed/28678829

38. Young BC, Dodge LE, Gupta M, Rhee JS, Hacker MR. Evaluation of a rapid, real-time intrapartum group B streptococcus assay. Am J Obstet Gynecol [Internet]. 2011 Oct;205(4):372.e1-6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21864820

39. Zietek M, Jaroszewicz-Trzaska J, Szczuko M, Mantiuk R, Celewicz Z. Intrapartum PCR assay is a fast and efficient screening method for Group B Streptococcus detection in pregnancy. Ginekol Pol [Internet]. 91(9):549–53. Available from: http://www.ncbi.nlm.nih.gov/pubmed/33030736

40. Kunze M, Zumstein K, Markfeld-Erol F, Elling R, Lander F, Prömpeler H, et al. Comparison of pre- and intrapartum screening of group B streptococci and adherence to screening guidelines: a cohort study. Eur J Pediatr [Internet]. 2015 Jun;174(6):827–35. Available from: http://www.ncbi.nlm.nih.gov/pubmed/25922140

41. Szymusik I, Kosinska-Kaczynska K, Krolik A, Skurnowicz M, Pietrzak B, Wielgos M. The usefulness of the universal culture-based screening and the efficacy of intrapartum prophylaxis of group B Streptococcus infection. J Matern Fetal Neonatal Med [Internet]. 2014 Jun;27(9):968–70. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24047083

42. de Tejada BM, Pfister RE, Renzi G, François P, Irion O, Boulvain M, et al. Intrapartum Group B streptococcus detection by rapid polymerase chain reaction assay for the prevention of neonatal sepsis. Clin Microbiol Infect [Internet]. 2011 Dec;17(12):1786–91. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20860701

43. el Helali N, Habibi F, Azria E, Giovangrandi Y, Autret F, Durand-Zaleski I, et al. Point-of-Care Intrapartum Group B Streptococcus Molecular Screening: Effectiveness and Costs. Obstet Gynecol [Internet]. 2019;133(2):276–81. Available from: http://www.ncbi.nlm.nih.gov/pubmed/30633130

44. Yancey MK, Schuchat A, Brown LK, Ventura VL, Markenson GR. The accuracy of late antenatal screening cultures in predicting genital group B streptococcal colonization at delivery. Obstet Gynecol [Internet]. 1996 Nov;88(5):811–5. Available from: http://www.ncbi.nlm.nih.gov/pubmed/8885919

45. Khalil MR, Uldbjerg N, Thorsen PB, Møller JK. Risk-based approach versus culture-based screening for identification of group B streptococci among women in labor. Int J Gynaecol Obstet [Internet]. 2019 Feb;144(2):187–91. Available from: http://www.ncbi.nlm.nih.gov/pubmed/28645088

46. Towers C v, Rumney PJ, Asrat T, Preslicka C, Ghamsary MG, Nageotte MP. The accuracy of late third-trimester antenatal screening for group B streptococcus in predicting colonization at delivery. Am J Perinatol [Internet]. 2010 Nov;27(10):785–90. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20458663

47. Lin F-YC, Weisman LE, Azimi P, Young AE, Chang K, Cielo M, et al. Assessment of intrapartum antibiotic prophylaxis for the prevention of early-onset group B Streptococcal disease. Pediatr Infect Dis J [Internet]. 2011 Sep;30(9):759–63. Available from: http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=ovftl&NEWS=N&AN=00006454-201109000-00009

48. Molnar P, Biringer A, McGeer A, McIsaac W. Can pregnant women obtain their own specimens for group B streptococcus? A comparison of maternal versus physician screening. The Mount Sinai GBS Screening Group. Fam Pract [Internet]. 1997 Oct;14(5):403–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/9472376

49. Mercer BM, Taylor MC, Fricke JL, Baselski VS, Sibai BM. The accuracy and patient preference for self-collected group B Streptococcus cultures. Am J Obstet Gynecol [Internet]. 1995 Oct;173(4):1325–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/7485347

50. Arya A, Cryan B, O'Sullivan K, Greene R a, Higgins JR. Self-collected versus health professional-collected genital swabs to identify the prevalence of group B streptococcus: a comparison of patient preference and efficacy. Eur J Obstet Gynecol Reprod Biol [Internet]. 2008 Jul [cited 2013 Jul 24];139(1):43–5. Available from: http://www.ncbi.nlm.nih.gov/pubmed/18255214

51. Seto MTY, Ko JKY, Cheung KW, To KKW, Hui PW, Lao TT, et al. The Accuracy of Self-Screening of Group B Streptococcus in Pregnant Women-A Randomized Crossover Study. Journal of obstetrics and gynaecology Canada : JOGC = Journal d'obstetrique et gynecologie du Canada : JOGC [Internet]. 2019 Jun;41(6):792–7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/30393060

52. Valkenburg-van den Berg AW, Houtman-Roelofsen RL, Oostvogel PM, Dekker FW, Dörr PJ, Sprij AJ. Timing of group B streptococcus screening in pregnancy: a systematic review. Gynecol Obstet Invest [Internet]. 2010;69(3):174–83. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20016190

53. Wolfson AR, Mancini CM, Banerji A, Fu X, Bryant AS, Phadke NA, et al. Penicillin Allergy Assessment in Pregnancy: Safety and Impact on Antibiotic Use. J Allergy Clin Immunol Pract [Internet]. 2021;9(3):1338–46. Available from: http://www.ncbi.nlm.nih.gov/pubmed/33212237

54. CDC. Evaluation and Diagnosis of Penicillin Allergy for Healthcare Professionals. [Internet]. 2017. Available from:

https://www.cdc.gov/antibiotic-use/clinicians/penicillin-allergy.html

55. Macy E. Penicillin skin testing in pregnant women with a history of penicillin allergy and group B streptococcus colonization. Ann Allergy Asthma Immunol [Internet]. 2006 Aug;97(2):164–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/16937745

56. Desai SH, Kaplan MS, Chen Q, Macy EM. Morbidity in Pregnant Women Associated with Unverified Penicillin Allergies, Antibiotic Use, and Group B Streptococcus Infections. Perm J [Internet]. 2017;21:16–080. Available from: http://www.ncbi.nlm.nih.gov/pubmed/28333608

57. Huang J, Li S, Li L, Wang X, Yao Z, Ye X. Alarming regional differences in prevalence and antimicrobial susceptibility of group B streptococci in pregnant women: A systematic review and meta-analysis. J Glob Antimicrob Resist [Internet]. 2016 Dec;7:169–77. Available from: http://www.ncbi.nlm.nih.gov/pubmed/27837713

58. Sherman K, Whitehead S, Blondel-Hill E, Wagner K, Cheeptham N. Penicillin susceptibility and macrolide-lincosamide-streptogramin B resistance in group B Streptococcus isolates from a Canadian hospital. The Canadian journal of infectious diseases & medical microbiology = Journal canadien des maladies infectieuses et de la microbiologie medicale [Internet]. 2012;23(4):196–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24294274

59. Church D, Carson J, Gregson D. Point prevalence study of antibiotic susceptibility of genital group B streptococcus isolated from near-term pregnant women in Calgary, Alberta. The Canadian journal of infectious diseases & medical microbiology = Journal canadien des maladies infectieuses et de la microbiologie medicale [Internet]. 2012;23(3):121–4. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23997778

60. Teatero S, Ferrieri P, Martin I, Demczuk W, McGeer A, Fittipaldi N. Serotype Distribution, Population Structure, and Antimicrobial Resistance of Group B Streptococcus Strains Recovered from Colonized Pregnant Women. J Clin Microbiol [Internet]. 2017;55(2):412–22. Available from: http://www.ncbi.nlm.nih.gov/pubmed/27852675

61. Li S, Huang J, Chen Z, Guo D, Yao Z, Ye X. Antibiotic Prevention for Maternal Group B Streptococcal Colonization on Neonatal GBS-Related Adverse Outcomes: A Meta-Analysis. Front Microbiol [Internet]. 2017;8:374. Available from: http://www.ncbi.nlm.nih.gov/pubmed/28367139

62. Ohlsson A, Shah VS. Intrapartum antibiotics for known maternal Group B streptococcal colonization. Cochrane Database Syst Rev [Internet]. 2014 Jun 10;(6):CD007467. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24915629

63. Hasperhoven GF, Al-Nasiry S, Bekker V, Villamor E, Kramer B. Universal screening versus risk-based protocols for antibiotic prophylaxis during childbirth to prevent early-onset group B streptococcal disease: a systematic review and meta-analysis. BJOG [Internet]. 2020;127(6):680–91. Available from: http://www.ncbi.nlm.nih.gov/pubmed/31913562

64. Renner RM, Renner A, Schmid S, Hoesli I, Nars P, Holzgreve W, et al. Efficacy of a strategy to prevent neonatal early-onset group B streptococcal (GBS) sepsis. J Perinat Med [Internet]. 2006;34(1):32–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/16489884

65. Hannah ME, Ohlsson A, Wang EE, Matlow A, Foster GA, Willan AR, et al. Maternal colonization with group B Streptococcus and prelabor rupture of membranes at term: the role of induction of labor. TermPROM Study Group. Am J Obstet Gynecol [Internet]. 1997 Oct;177(4):780–5. Available from: http://www.ncbi.nlm.nih.gov/pubmed/9369819

66. Jefferies AL. Management of term infants at increased risk for early-onset bacterial sepsis. Paediatrics & Child Health [Internet]. 2017 Jul 1;22(4):223–8. Available from: https://academic.oup.com/pch/article/22/4/223/3868378

67. Joshi NS, Gupta A, Allan JM, Cohen RS, Aby JL, Kim JL, et al. Management of Chorioamnionitis-Exposed Infants in the Newborn Nursery Using a Clinical Examination-Based Approach. Hosp Pediatr [Internet]. 2019;9(4):227–33. Available from: http://www.ncbi.nlm.nih.gov/pubmed/30833294

68. Joshi NS, Gupta A, Allan JM, Cohen RS, Aby JL, Weldon B, et al. Clinical Monitoring of Well-Appearing Infants Born to Mothers With Chorioamnionitis. Pediatrics [Internet]. 2018;141(4). Available from: http://www.ncbi.nlm.nih.gov/pubmed/29599112

69. Barrington KJK, Canadian Paediatric Society, Fetus and Newborn Committee. Management of the infant at increased risk for sepsis. Paediatr Child Health [Internet]. 2007 Dec;12(10):893–905. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2532578&tool=pmcentrez&rendertype=abstract

70. Mukhopadhyay S, Eichenwald EC, Puopolo KM. Neonatal early-onset sepsis evaluations among well-appearing infants: projected impact of changes in CDC GBS guidelines. Journal of Perinatology. 2012.

71. Escobar GJ, Li DK, Armstrong M a, Gardner MN, Folck BF, Verdi JE, et al. Neonatal sepsis workups in infants >/=2000 grams at birth: A population-based study. Pediatrics [Internet]. 2000 Aug;106(2 Pt 1):256–63. Available from: http://www.ncbi.nlm.nih.gov/pubmed/10920148

72. Fairlie T, Zell ER, Schrag S. Effectiveness of intrapartum antibiotic prophylaxis for prevention of early-onset group B streptococcal disease. Obstet Gynecol [Internet]. 2013 Mar;121(3):570–7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23635620

73. Kojima K, Tanaka R, Nakajima K, Kurihara N, Oba MS, Yamashita Y, et al. Predicting outcomes of neonates born to GBS-positive women who received inadequate intrapartum antimicrobial prophylaxis. Turk J Pediatr [Internet]. 56(3):238–42. Available from: http://www.ncbi.nlm.nih.gov/pubmed/25341594

74. Turrentine MA, Greisinger AJ, Brown KS, Wehmanen OA, Mouzoon ME. Duration of intrapartum antibiotics for group B streptococcus on the diagnosis of clinical neonatal sepsis. Infect Dis Obstet Gynecol [Internet]. 2013;2013:525878. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23606801

75. Berardi A, Spada C, Reggiani MLB, Creti R, Baroni L, Capretti MG, et al. Group B Streptococcus early-onset disease and observation of well-appearing newborns. PLoS One [Internet]. 2019;14(3):e0212784. Available from: http://www.ncbi.nlm.nih.gov/pubmed/30893310

76. Cantoni L, Ronfani L, da Riol R, Demarini S, Perinatal Study Group of the Region Friuli-Venezia Giulia. Physical examination instead of laboratory tests for most infants born to mothers colonized with group B Streptococcus: support for the Centers for Disease Control and Prevention's 2010 recommendations. J Pediatr [Internet]. 2013 Aug;163(2):568–73. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23477995

77. Whyte R. Safe discharge of the late preterm infant. Paediatr Child Health [Internet]. 2010 Dec;15(10):655–66. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22364676

78. Heath PT, Balfour G, Weisner AM, Efstratiou A, Lamagni TL, Tighe H, et al. Group B streptococcal disease in UK and Irish infants younger than 90 days. Lancet [Internet]. 2004 Jan 24;363(9405):292–4. Available from: http://www.ncbi.nlm.nih.gov/pubmed/14751704

79. Jordan JA, Durso MB, Butchko AR, Jones JG, Brozanski BS. Evaluating the near-term infant for early onset sepsis: progress and challenges to consider with 16S rDNA polymerase chain reaction testing. J Mol Diagn [Internet]. 2006 Jul;8(3):357–63. Available from: http://www.ncbi.nlm.nih.gov/pubmed/16825509