**Green-top Guideline No. 36**
**Peer Review Draft – June 2026**

# The Prevention of Group B Streptococcal Disease in Pregnancy, Labour, Neonatal and Early Infant Life

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## Key recommendations

- All pregnant women and people should be provided with an appropriate information leaflet, such as that produced by the RCOG. If they are tested for group B streptococcus (GBS) carriage, there must be administrative arrangements in place to ensure that they are informed of the result and its significance as soon as possible. The parents of any baby affected by GBS should be given a leaflet explaining the implications for a future pregnancy. [Good Practice Point]
- Pregnant women and people with the risk factors listed in this guideline should be offered IAP (intravenous intrapartum antibiotic prophylaxis). This approach is currently supported by the UK National Screening Committee and NICE. [Grade D]
- For pregnant women and people who have agreed to IAP in labour for the prevention of early onset GBS disease (EOGBSD), benzylpenicillin 3g should be given as soon as possible once labour is diagnosed (whether spontaneous or induced), and then 1.5g 4 hourly until birth. If the penicillin vials come in 600mg or 1.2g doses, then follow on doses of 1.2g four hourly are likely sufficient. [Grade C]
- If there is suspected chorioamnionitis, use an intravenous broad-spectrum antibiotic which is effective both against GBS and Gram-negative organisms, such as amoxicillin plus gentamicin plus metronidazole. If there is a non-severe penicillin allergy, use a cephalosporin and metronidazole and local antibiotic susceptibility and resistance data to determine whether gentamicin should be given. If severe penicillin allergy, use vancomycin plus metronidazole plus gentamicin. These should be started as soon as possible. [Grade C]
- Intravenous intrapartum antibiotic prophylaxis (IAP) should be recommended to pregnant women and people without further investigation if they have previously had a baby with GBS infection. [Grade C]
- IAP is recommended for all pregnant women and people in confirmed preterm labour, regardless of GBS status. [Grade C]
- If known to be colonised with GBS, pregnant women and people with prelabour rupture of membranes (PROM) at term should be offered immediate intravenous antibiotic prophylaxis and induction of labour. [Grade C]
- Pregnant women and people known to have previous GBS carriage should be offered the alternatives of bacteriological testing for GBS carriage from $35^{+0}$ weeks of gestation for women without a planned delivery date OR 3–5 weeks prior to the planned delivery date for those women with a planned induction of labour prior to 40 weeks of gestation; or IAP administration without testing. Repeat testing should be considered if more than 5 weeks elapse from testing without labour having occurred. [Grade B]
- Detection of GBS on any bacteriological investigation during pregnancy suggests that the pregnant woman or person may be more likely than average to be a GBS carrier and should

therefore be offered the alternatives of bacteriological testing for GBS carriage from 35 weeks of gestation, or IAP administration without testing. [Good Practice Point]

- Women and people with preterm prelabour rupture of membranes (PPROM) at 34–36 weeks inclusive and unknown GBS status should be offered testing with a low vaginal-rectal swab sent for either GBS polymerase chain amplification and detection testing (PCR) or enriched culture medium (ECM) testing for the presence of GBS and offered immediate induction of labour if these tests confirm GBS carriage. [Grade B]

## 1. Purpose and scope

This guideline comprises recommendations on the prevention of early-onset neonatal Group B streptococcal disease (EOGBSD). It includes the information that should be provided to pregnant women and people and their families. Treatment of EOGBSD and prevention of late-onset Group B streptococcal disease (LOGBSD) is not considered in this guideline beyond initial antibiotic therapy and the information that should be given to parents.

## 2. Introduction and background epidemiology

Group B streptococcus (GBS) is a common and usually harmless commensal in the gut or genital tract of 20–40% of pregnant women and people, who are called 'carriers'. Half of these people will transmit GBS bacteria to their child during pregnancy, most commonly during labour.(1)(2) Most carrier babies remain well, but 0.6–1.1% of newborns will develop early-onset GBS disease (EOGBSD),(3)(4) mostly manifesting as pneumonia and sepsis. GBS is the single commonest cause of neonatal infection, causing a third of bacteraemias in the first two days of life in England and Wales.(5) There are 10 serotypes of group B Streptococcus, based on variations in the carbohydrate capsule. The serotypes most prevalent in pregnancy vary but a 2023 study from an ethnically diverse population in London reported that the most common were III (26%), V (21%), II (19%) and Ia (19%).(6)

GBS can also cause infection in the mother, but with the exception of urinary tract infection, this is uncommon and is not covered in this guideline. GBS predominantly resides in the bowel, but due to the proximity of the vagina to the anus, female carriers commonly have GBS in their vagina, mainly in the lower part. It is the presence of GBS in the vagina, on the perineum and in the rectum that is thought to account for its ability to infect susceptible infants around birth.

EOGBSD is a global problem. It was estimated in 2017 that globally it affected on average about one in 2000 newborns (7); it was estimated to affect 231 800 newborns out of a putative 130 million births in 2020 – one in 570(8) *[Evidence level 2+]*

However, the incidence varies according to geographical location. People of African heritage exhibit a higher prevalence of GBS vaginal colonisation and neonatal disease compared to other populations.(9)(10) (11)(12)*[Evidence level 2+]*

The prevalence is particularly high in southern Africa,(13) where it is estimated to be as high as 1 per 1000, and in the Caribbean where it is estimated to be one in 700.(7) This contrasts with South Asia where only one in 5000 babies are affected.(7)*[Evidence level 2+]*

In the USA, reported rates in African-American newborns are 0.55 per 1000 compared with 0.15 per 1000 in white European newborns.(14) Corresponding variations in maternal carriage rate have been reported from the UK (Black African 39.5%, white British 27.4%, South Asian 23.3%).(15) *[Evidence level 2+]*

Obesity increases the rate of carriage by 1.2 to 1.5 times.(16)(17)(18) *[Evidence level 2++]*

A study of GBS infection in the first three months of life in the UK and Ireland published in 2018 reported a mortality rate in early onset disease of 6.2% and a mortality rate in late onset disease (LOGBSD, 7–28 days) of 7.7%.(19) Of 631 infants who survived, and whose discharge status was known, 91% were clinically well (93% of cases with EOGBSD and 93% of cases with LOGBSD). Of the deaths, 52% were in preterm infants with a case fatality rate of EOGBSD in very preterm infants (≤$33^{+0}$ weeks of gestation) of 27%, ten times higher than that of infants born at term (2.7%).

## 3. Identification and assessment of evidence

The Cochrane Library and electronic databases (DARE, EMBASE, Trip, MEDLINE and PubMed) were searched for relevant papers. The search was inclusive of all relevant articles published between October 2016 and March 2024. The databases were searched using the relevant Medical Subject Headings (MeSH) terms, including all subheadings and synonyms, and this was combined with a keyword search. Search terms included 'group B streptococcus', '*Streptococcus agalactiae*', 'group B streptococcus and pregnancy', 'streptococcal Infections' and 'GBS bacteriuria'. The full search strategy is available to view online as supporting information.

This guideline was developed using the standard methodology for developing RCOG Green-top Guidelines. Where possible, recommendations are based on available evidence. Areas lacking evidence are highlighted and annotated as 'good practice points'. Further information about the assessment of evidence and the grading of recommendations may be found in Appendix A.

## 4. What are the clinical factors increasing the risk of early onset GBS disease of the newborn?

### *4.1 Having a previous baby with GBS disease*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **Intravenous intrapartum antibiotic prophylaxis (IAP) from the onset of labour should be recommended to pregnant women and people without further investigation if they have previously had a baby with GBS infection.** | **2+** | **C** | Pregnant women and people with a previous baby infected with GBS are more likely to have an infected baby in a subsequent pregnancy. This may be due to either a virulent GBS strain or poor maternal antibody response. There is also a small possibility of false-negative results when testing for GBS carriage status. |

Pregnant women and people who have had a previous baby affected by EOGBSD are at increased risk of another affected baby compared with women of similar carrier status who have not had an affected baby.(20)(21) *[Evidence level 2+]*

The reasons for this increased risk are not clear but may include persistent carriage of a virulent strain of GBS or a poor immune response.

*4.2 Being a previously known GBS carrier*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **Pregnant women and people known to have previous GBS carriage should be offered the alternatives of bacteriological testing for GBS carriage from $35^{+0}$ weeks of gestation for women without a planned delivery date OR 3–5 weeks prior to the planned delivery date for those women with a planned induction of labour prior to $40^{+0}$ weeks of gestation; or IAP administration from the onset of labour without testing.** | **2++** | **B** | Known previous GBS carriage in pregnancy doubles the likelihood of GBS carriage in the current pregnancy. |

A number of studies have reported that the persistence/recurrence rate of GBS carriage in successive pregnancies is approximately 50% (22)(23)(24)(25)(26). *[Evidence level 2++]*

The risk of EOGBSD in the baby if the pregnant woman or person is known to have been a previous carrier is likely to be around 1 in 700–800. *[Evidence level 4]*

At this level of risk, some women may choose IAP and others may not. Bacteriological testing in this circumstance can help to refine the risk. A positive test for GBS carriage, either within 4 weeks of the onset of labour or at the beginning of labour, and not given IAP, indicates a risk of EOGBSD ranging from 1 in 67 to 1 in 167(27). An antenatal negative test for GBS carriage has a negative predictive value of GBS carriage at the onset of labour of 96%(28) and so reduces the risk to 1 in 1675-4175. *[Evidence level 2++]*

If bacteriological tests for GBS are performed in pregnancy, they should be performed within the 4 weeks before labour starts,(29) therefore usually starting no earlier than 35 weeks of pregnancy for women without a planned birth date (if there is labour before 37 weeks, IAP is recommended anyway); or 3–5 weeks prior to the planned delivery date for those women with a planned induction of labour prior to $40^{+0}$ weeks of gestation; or IAP administration without testing. *[Evidence level 4]*

Repeat testing should be considered if more than 4 weeks elapse from testing without labour having occurred. *[Evidence level 4]*

While there are no data on the implications of previous GBS carriage outside pregnancy, there is no reason to assume that this has a different significance. *[Evidence level 4]*

*4.3 Discovery of GBS carriage through bacteriological testing during pregnancy (for example urine culture, or a vaginal swab taken for other reasons)*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **Clinicians should offer IAP from the onset of labour to pregnant women and people with GBS bacteriuria identified during the current pregnancy. Those with GBS urinary tract infection (growth of greater than $10^5$ cfu/ml) during pregnancy should be advised to have antibiotics at the time of diagnosis as well as IAP.** | **2+** | **B** | Known carrier status increases the risk of EOGBSD four-fold compared with the average for the population. |
| **Detection of GBS on any bacteriological investigation during pregnancy suggests that the pregnant woman or person may be more likely than average to be a GBS carrier and should therefore be offered the alternatives of bacteriological testing for GBS carriage from $35^{+0}$ weeks of gestation, or IAP from the onset of labour without testing. Repeat testing should be considered if more than 5 weeks elapse from testing without labour having occurred.** | **1++** | **GPP** | Known carrier status increases the risk of EOGBSD four-fold compared with the average for the population. |

Women and people with GBS identified in the urine during pregnancy should receive antibiotics at the time of diagnosis if the colony count is suggestive of a urinary infection.(30) *[Evidence level 2++]*

True GBS bacteriuria can be defined as either a pure growth of ≥105 /ml GBS identified in a mid-stream urine sample in someone who has symptoms of a urinary infection, or a pure growth of ≥105/ml GBS identified in a mid-stream urine sample in an asymptomatic person that is confirmed on a repeat clean catch mid-stream urine sample. IAP should still be offered during labour irrespective of colony count because the presence of GBS in the urine suggests a high level of vaginal and rectal colonisation and therefore an increased risk of EOGBSD.(31)(32) *[Evidence level 4]*

Colonisation with GBS detected at any stage of pregnancy (e.g. during the investigation of vaginal discharge) is not an indication for treatment at that time but the pregnant woman or person should be offered IAP during labour. *[Evidence level 4]*

In 2019, the American College of Obstetricians and Gynecologists (ACOG) recommended that universal prenatal group B streptococcus (GBS) screening be shifted from 35 0/7–37 6/7 weeks of gestation to 36 0/7–37 6/7 weeks to provide accurate test results up to 41 0/7 weeks, and subsequent follow-up using data from the Centers for Disease Control and Prevention's Active Bacterial Core surveillance system showed an average decline of 2.1% per year in the annual neonatal GBS early-onset disease over the three years following the change.(33) However, we consider that in the UK's system of antenatal care it would be better to continue to allow a wider range of gestations for testing and instead recommend retesting if pregnancy continued for more than five weeks after testing (i.e. if testing was at 35 weeks, retest at 40 weeks).

*4.4 Preterm birth*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **IAP is recommended for all pregnant women and people in confirmed preterm labour, regardless of GBS status.** | **2+** | **C** | There is an increased risk of EOGBSD when labour and birth is preterm and poorer outcomes for preterm babies who develop EOGBSD. |
| **Pregnancies with PPROM up to $33^{+6}$ weeks of gestation should be managed expectantly irrespective of GBS colonisation status unless there is evidence of chorioamnionitis or other indications for urgent birth. Oral erythromycin or penicillin for ten days can be used for prophylaxis against the development of chorioamnionitis.** | **3** | **B** | The overall risk associated with preterm birth is higher than the risk of developing GBS infection. |
| **Pregnant women and people with PPROM at $34^{+0}$–$36^{+6}$ weeks inclusive and unknown GBS status should be offered testing with a low vaginal-rectal swab sent for either GBS polymerase chain amplification and detection testing (PCR) or enriched culture medium (ECM) testing for the presence of GBS and offered immediate induction of labour if these tests confirm GBS colonisation. This is particularly important if the pregnant woman or person is known to have been colonised with GBS previously. If testing is not available, the knowledge of previous GBS colonisation should be taken into account when considering the balance between expectant management or induction of labour.** | **3** | **B** | GBS carriage increases the risk of developing EOGBSD four-fold compared with the average for the population. |

The risk of EOGBSD is higher in infants born preterm. In the UK in 2007 it was estimated to be 2.3 per 1000 (34) and in 2014–15 it was 1.17 per 1000 in babies with a birthweight of 1500–2499g and 2.24 per 1000 in babies with a birthweight of less than 1500g.(19) *[Evidence level 2+]*

The mortality rate from infection is also increased (20–30% versus 2–3% at term)(35). *[Evidence level 2+]*

In the 2014–15 British Paediatric Surveillance Unit national UK surveillance study, the mortality rate in preterm infants at $33^{+0}$ weeks of gestation or less was 27% versus 2.7% at term.(19) For this reason, IAP is recommended for all women and people in confirmed preterm labour regardless of GBS carriage status. *[Evidence level 2+]*

Given the high morbidity associated with early preterm birth, expedited birth in pregnancies less than $34^{+0}$ weeks is not indicated unless there are overt signs of infection. This includes pregnancies with prelabour rupture of membranes. *[Evidence level 4]*

There is no evidence that treating GBS colonisation before labour is beneficial (36). *[Evidence level 2–]*

The 2022 National Institute for Health and Care Excellence (NICE) guideline 'Preterm labour and birth'(37) recommends that with preterm prelabour rupture of the membranes, general antimicrobial prophylaxis should be offered with oral erythromycin 250 mg, 4 times a day for a maximum of 10 days or until the woman or person is in established labour (whichever is sooner. *[Evidence level 1+]*

These recommendations are based on the Oracle I trial which found that erythromycin was associated with an improved outcome, but co-amoxiclav)was associated with an increase in necrotising enterocolitis.(38) For women or people who cannot tolerate erythromycin or in whom erythromycin is contraindicated, intravenous amoxicillin 2g every 6 hours followed by oral amoxicillin 250mg three times a day can be considered as an alternative(39). IAP should be recommended as soon as labour is diagnosed.

Between 34 and 37 completed weeks of gestation, an individual patient meta-analysis of three trials has shown that neonatal sepsis rates did not significantly differ between induction of labour and expectant management (2.6% after induction of labour versus 3.5% after expectant management, RR 0.74, 95% CI 0.47–1.15)(40). *[Evidence level 1+]*

However, combining the PPROMEXIL(41) and PPROMT(42) trials, Quist-Nelson et al found in a pre-planned sub-analysis that babies born to those with a vaginal culture positive for GBS had a reduced risk of neonatal sepsis after induction of labour compared with expectant management(40) (2.3% after induction of labour versus 6.5% after expectant management, adjusted RR 0.35, 95% CI 0.14–0.86). *[Evidence level 2+]*

Such testing would likely be cost-effective(43) (NICE guideline NG195 2021). *[Evidence level 2–]*

Therefore, based on the available evidence and depending on the use of antibiotics, for women and people with PPROM at 34–37 completed weeks of gestation who test positive for GBS, induction of labour should be discussed and offered.(44) *[Evidence level 2++]*

In order to ensure informed choice, those with confirmed rupture of the membranes should therefore be offered testing for GBS carriage, preferably using polymerase chain reaction (PCR) tests that ideally can be completed in under an hour. If PCR tests are not available, testing using low vaginal and rectal swabs sent for enriched culture medium (ECM) testing should be offered. Pregnant women and people should then be counselled depending on the results.

*4.5 Prelabour rupture of membranes at term*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **If known to be colonised with GBS, pregnant women and people with prelabour rupture of membranes (PROM) at term should be offered immediate intravenous antibiotic prophylaxis and induction of labour.** | **2+** | **C** | The risk of EOGBSD is higher with prelabour rupture of membranes. |
| **If a woman or person with prelabour rupture of membranes (PROM) at term is known to be a previous GBS carrier, they should be offered testing for GBS using a PCR test and if positive, recommended to have immediate induction of labour and IAP. If such a test is not available, the possibility of an increased risk of EOGBSD should be discussed and induction of labour and IAP offered.** | **2+** | **C** | Previous GBS carriage means that carriage in this pregnancy is more likely. PCR testing informs maternal choice regarding the offer of IAP. |

If known to be colonised with GBS, pregnant women and people at term should be offered immediate induction of labour and IAP because of the increased risk of EOGBSD with prolonged rupture of membranes.(45) *[Evidence level 2+]*

Although GBS carriage status can fluctuate during pregnancy, almost half (49.5%) of women found to be carrying GBS in the first trimester will still be carriers at birth.(46) *[Evidence level 2+]*

Accordingly, the pregnant woman or person should be offered a rapid PCR test to establish if they are still a carrier. If carriage is confirmed, immediate induction of labour should be recommended. If such a test is not available, the possibility of an increased risk of EOGBSD should be discussed and induction of labour and IAP offered. If the pregnant person or woman declines induction of labour or wishes to wait, a low vaginal and rectal swab and enriched culture for GBS should be offered.

*4.6 Suspected maternal intrapartum infection, including suspected chorioamnionitis and pyrexia*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **If there is suspected chorioamnionitis, use an intravenous broad-spectrum antibiotic which is effective both against GBS and Gram negative organisms, such as amoxicillin plus gentamicin plus metronidazole. If there is a non-severe penicillin allergy, use a cephalosporin and metronidazole and local antibiotic susceptibility and resistance data to determine whether gentamicin should be given. If there is a severe penicillin allergy use vancomycin plus metronidazole plus gentamicin. These should be started as soon as possible.** | **2+** | **C** | A broader antibiotic spectrum is required if chorioamnionitis is suspected, because chorioamnionitis can be caused by bacteria other than GBS. |

There is no universally agreed clinical definition of chorioamnionitis but Jung et al have proposed that it should be based on a combination of maternal fever (which they define as more than 37.8°C whereas the NICE guideline CG190 *Intrapartum care for healthy women and babies* defines it as a temperature of 38°C or above on a single reading, or 37.5°C or above on 2 consecutive readings 1 hour apart) and at least two of the following criteria: maternal tachycardia (more than 100 beats per minute), maternal leucocytosis (white blood cell count more than 15,000 cells/$mm^3$), uterine tenderness, fetal tachycardia (more than 160 beats per minute) and foul-smelling amniotic fluid.(47) The definition of maternal fever is a contentious issue as it varies according to the site of measurement,(48) but the above definitions are generally taken to refer to a carefully taken oral temperature. While most intrapartum pyrexias in high income countries are related to the use of regional anaesthesia and do not signify infection, as it is not currently possible to differentiate epidural hyperthermia and intrapartum infection, a confirmed intrapartum pyrexia is still an indication for intravenous antibiotic therapy.(49) *[Evidence level 2++]*

Although it can be caused by GBS, chorioamnionitis is often polymicrobial, involving both anaerobic and aerobic bacteria, and it often arises from the vaginal flora.(50). Accordingly, an intravenous broad spectrum antibiotic, that is effective both against GBS and Gram-negative organisms, such as amoxicillin (2g every 6 hours), should be given as soon as possible, rather than just penicillin, (43)(47) plus metronidazole (500mg in 100ml infused at 5ml/minute) plus gentamicin (1.5mg/kg intravenous every 8 hours). If there is a non-severe penicillin allergy a cephalosporin (e.g. cefuroxime 1.5g every 6 hours or cefotaxime 2g initially and then 1g every 4 hours) should be given instead of amoxicillin, plus metronidazole 500mg I/V every 8 hours with (depending on local antibiotic susceptibility and resistance data) I/V gentamicin (2mg/kg loading dose then 1.5g/kg every 8 hours) is recommended.(43)(47) *[Evidence level 4]*

If there is severe penicillin allergy it is safer to use intravenous vancomycin (1g every 12 hours) plus gentamicin plus metronidazole. These recommendations are independent of GBS carriage status.

## 5. What is the optimal pregnancy care of women and people with evidence of any previous or current GBS colonisation or infection (including of their babies)?

### *5.1 Intrapartum antibiotic prophylaxis*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **For pregnant women and people who have agreed to intravenous IAP for the prevention of early onset GBS disease, benzylpenicillin 3g should be given as soon as possible once labour is diagnosed (whether spontaneous or induced), and then 1.5g 4 hourly until birth. If the penicillin vials come in 600mg or 1.2g doses, then follow-on doses of 1.2g four hourly are likely sufficient.** | **2+** | **C** | This regimen has been shown to reduce EOGBSD by 50–80% in observational studies. |
| **For pregnant women and people who report an allergy to penicillin without a history of a severe reaction, cefuroxime 1.5g loading dose followed by 750mg every 8 hours is a suitable alternative.** | **2** | **C** | GBS is usually sensitive to cephalosporins. The risk of maternal anaphylaxis is small and outweighed by the benefits of using cephalosporins to treat chorioamnionitis and prevent neonatal infection. Nonetheless, caregivers should remain aware of the very rare risk of anaphylaxis. |
| **If the allergy to beta-lactam antibiotics is severe then intravenous vancomycin (1g every 12 hours) is recommended.** | **2** | **C** | Cephalosporins are not recommended in the case of severe penicillin allergy because of an increased chance of a severe allergic reaction. GBS is usually sensitive to vancomycin in laboratory testing. |

In randomised trials, intravenous intrapartum antibiotic prophylaxis (IAP) given to those who carry GBS reduces the incidence of neonatal colonisation by 96%.(51) *[Evidence level 1+]*

There have been no randomised controlled trials large enough to assess the impact of IAP on the incidence of EOGBSD, but a systematic review and meta-analysis of observational studies suggest a reduction of approximately 70% in routine clinical practice.(52) *[Evidence level 2++]*

A 1999 review by Benitz et al identified a multiplicity of regimens for IAP in labour,(53) including the use of benzyl penicillin, ampicillin, co-amoxiclav and erythromycin. *[Evidence level 2+]*

In 2002 the Centre for Disease Control in the USA recommended either penicillin G, 5 million units intravenously as an initial dose, then 2.5 million units intravenously every 4 hours until delivery, or ampicillin, 2g intravenously as an initial dose, then 1g intravenously every 4 hours until delivery.(54) They commented that "*Because of its narrow spectrum of activity, penicillin is the preferred agent*."

Since then, the most widely recommended regimen has remained 3g intravenous benzylpenicillin given as soon as possible after the onset of labour and 1.5 g 4 hourly until birth. *[Evidence level 3]*

Although there is evidence of reduced sensitivity of GBS to beta-lactam antibiotics (which include penicillin and cephalosporins), resistance to penicillin (i.e. clinical ineffectiveness) at therapeutic doses is extremely rare and there is no evidence that its incidence is increasing. (55) *[Evidence level 3]*

Samb et al(56) studied nineteen mothers who received IAP against early-onset GBS infection with benzylpenicillin in a dose of 2,000,000 IU followed by 1,000,000 IU every 4 hours (equivalent to 1.2g and 600mg respectively) and measured the penicillin levels in cord blood. They found that all but one cord blood levels were above the minimum inhibitory concentration of 0.125mg/L for GBS, well past the 4 hour dose interval. Nielsen et al(57) have studied 44 mother-infant diads and, following maternal intravenous administration of 3g of Penicillin G, high concentrations of penicillin G were found in umbilical cord blood of infants born less than 4 hours after IAP administration, well above the minimum inhibitory for GBS. They add that "*Even short intrapartum exposure to penicillin G leads to significant levels in infant's bloodstream well beyond minimal inhibitory concentration for group B streptococcus*" and "*Just one dose of IAP may be sufficient to consider the preventive measure for EOGBS successful*".

In the UK, penicillin comes in vials of 600mg or 1.2g. Assuming that the original dose of 3g (5 vials of 600mg) has been given, the traditionally recommended 4 hourly 'top-up' doses of 1.5g requires opening three 600mg vials, of which 300mg will be wasted, or given unnecessarily. It seems reasonable to assume, on the basis of the evidence provided by Samb et al,(48) that 'top-ups' of 1.2g will be sufficient for prophylaxis and avoid such wastage.

If the history suggests an allergy to beta-lactam antibiotics, but one that is not severe (i.e. no anaphylaxis, angioedema, respiratory distress or urticaria), then a cephalosporin should be administered intravenously. There are no studies directly comparing cephalosporins with penicillin for IAP but NICE(58) recommends cefuroxime, 1.5g loading dose followed by 750mg every 8 hours for surgical prophylaxis and there is no evidence that a similar regime is unsafe in pregnancy. A 2025 meta-analysis of global resistance patterns reported that only 3% of GBS isolates are resistant to cefuroxime.(59) If the allergy to beta-lactams is severe then intravenous vancomycin (1g every 12 hours) is recommended (GBS resistance rate 1.4%), clindamycin is no longer recommended because 23.9% of GBS isolates are now resistant.(59) *[Evidence level 2++]*

Penicillin allergy testing, if available, is safe during pregnancy.(60) *[Evidence level 3]*

Knowing true allergy status represents a long-term advantage for women and people.(61)

To optimise the efficacy of IAP, the first dose should be given as soon as labour is confirmed and ideally at least 4 hours prior to birth, although studies show that antibiotic levels in umbilical cord blood are many times higher than the minimal inhibitory concentration for GBS as soon as 30 minutes after maternal administration,(62) which is likely to have at least some protective effect.(63) *[Evidence level 3]*

### 5.1.1 Potential harms from the use of intrapartum antibiotic prophylaxis

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **Breastfeeding should be strongly recommended to counter any effects of IAP on the newborn gut microbiome.** | **2+** | **C** | Breastfeeding helps to establish a healthy neonatal microbiome. |
| **The use of probiotics specifically to counter any effects of IAP on the newborn gut microbiome is currently not recommended.** | **2** | **C** | Despite evidence of a small effect of IAP on the microbiome of the baby up to 6 weeks of life, there is currently no evidence that it causes any lasting disruption. Probiotics have not been shown to be beneficial for the microbiome in relation to GBS prophylaxis. |

Penicillin can cause severe, even fatal, anaphylaxis. However, when screening and IAP were introduced in the USA, there were no deaths from anaphylaxis in the first 1.8 million women given penicillin prophylaxis.(51) A UK study published in 2018 reported only one (non-fatal) case of anaphylaxis related to GBS prophylaxis in 2.3 million women.(64) *[Evidence level 2+]*

There is increasing evidence that antibiotics given to the pregnant woman or person, both antepartum and intrapartum, can interfere with the acquisition by the neonate of an optimum gut microbiome.(65) The effect is likely to be greatest when broad spectrum antibiotics are used, but some effect has been reported in relation to IAP even with penicillin, which has a narrow spectrum of antimicrobial efficacy.(66)(67)(68) *[Evidence level 2++]*

One report suggests that IAP increases the prevalence of resistant organisms.(69) It has been suggested that alterations in the neonatal microbiome predispose to obesity in childhood,(70)(71) although a 2019 study specifically relating to IAP (72) found no effect on the Z score of body mass index at 2–5 years of age. *[Evidence level 2+]*

A five-year follow-up study did not confirm previous suggestions of an increase in childhood allergy associated with the use of IAP,(73) although a 2025 meta-analysis reported a significant increase in the risk of atopic dermatitis (RR 3.44; 1.60–7.37).(74) *[Evidence level 2+]*

The same meta-analysis also found a modest increase in child BMI (two studies, standardised mean difference = 0.05; 95% CI: 0.03–0.06), but not BMI *z*-score (three studies, 0.13; 0.03–0.29) or microbiome diversity in infants (six studies, −0.09; −0.20 to 0.02). Breastfeeding has an important role in establishing a favourable gut microbiome in the neonate,(75), as well as a range of other well-defined maternal and neonatal benefits,(76)(77) and should therefore be strongly recommended. *[Evidence level 2+]*

Initial attempts to enhance the proportions of lactobacilli and Bifidobacterium (which are reduced both following caesarean birth and by antibiotics) using pre- and post-natal maternal supplementation of multispecies probiotics were promising,(78)(79)(80) but doubts have been cast on the efficacy of such an approach by observational studies (81)(82)(83) and a small randomised trial.(84) *[Evidence level 2++]*

The use of probiotics in relation to the prevention of EOGBSD is therefore not currently recommended.

*5.2 Effect of GBS carriage on methods of labour induction*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **The method for induction of labour should be determined by individual characteristics and not by GBS status.** | **2–** | **C** | There is no known interaction of GBS infection risk with the method of induction. |

There is no evidence to suggest that induction of labour, by any method (including misoprostol orally or vaginally, prostaglandin E2 vaginally, or mechanical methods such as intra-cervical balloons or osmotic cervical dilators) increases the risk of EOGBSD over and above any effects of prolonged rupture of membranes.(85)

*5.3 Membrane sweeping*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **GBS status should not affect the offer of membrane sweeping.** | **2–** | **C** | There is no known interaction of GBS infection risk with membrane sweeping. |

GBS status should not affect the offer of membrane sweeping to pregnant women and people. Current evidence suggests there is no known increase in the risk of GBS infection associated with membrane sweeping, regardless of the individual's GBS carriage status.(86) *[Evidence level 2–]*

Health professionals can offer this procedure to all eligible pregnant women and people, ensuring recommended IAP is offered, as appropriate, once labour starts.

*5.4 Intrapartum fetal monitoring*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **GBS status should not affect the method of intrapartum fetal monitoring.** | **2–** | **D** | There is no known interaction of GBS infection risk with fetal monitoring. |

A study published in 1997 suggested that, in babies diagnosed with early onset GBS disease, the risk of mortality was increased eight-fold if fetal scalp electrode (FSE) monitoring had been used during labour.(87) A 2003 paper found that intrauterine fetal monitoring (use of FSE or intrauterine catheter) was associated with a two-fold increase in the risk of neonatal GBS disease.(88) However, these were early studies before the use of IAP became routine. A subsequent study of 171 690 women and people with singleton births greater than $23^{+0}$ weeks of gestation reported that a FSE was used in 22% and that, although the adjusted odds ratio of neonatal sepsis was 1.13 (0.50–2.55), they could not 'ascertain whether FSE caused an increased risk of neonatal sepsis, or whether FSE was more likely to be placed during labour in fetuses at higher risk for neonatal sepsis'.(89) There are no subsequent data to suggest that these associations are present if IAP is given appropriately. GBS colonisation should not be considered a contraindication to obstetrically indicated intrauterine

monitoring, either of fetal heart rate or uterine contractions (a recommendation consistent with those of ACOG.(90) *[Evidence level 2–]*

*5.5 Place of birth (including home birth, standalone and alongside maternity units, and water birth*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **Birth at home, in a midwifery led unit, or in a birthing pool, is not contraindicated if the woman or person is known to carry GBS provided IAP is offered.** | **4** | **D** | There is no known interaction of GBS infection risk with place of birth. |

There is no evidence that GBS carriage status should influence the decision for place of birth, including home birth, birth in the midwifery led unit, or in a birthing pool, where appropriate facilities are available to give IAP in labour to women and people who are known to carry GBS. *[Evidence level 4]*

There is no evidence to support the use oral antibiotics as an effective substitute for IAP. Given that the risk of serious anaphylaxis is extremely small, and that by definition there is intravenous access for the administration of adrenaline should an allergic response occur, the use of IAP during a birth at home or in a midwifery unit in the presence of staff appropriately trained in resuscitation is not contraindicated. *[Evidence level 4]*

*5.6 Planned caesarean birth*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **Antibiotic prophylaxis specific for GBS is not required for women and people undergoing planned caesarean birth in the absence of labour and with intact membranes.** | **2++** | **C** | The baby does not come into contact with the vagina, so the risk of EOGBSD is very low. |

The majority of babies who develop early-onset GBS disease acquire the bacterium during their passage through the vagina or following rupture of the amniotic membranes.(91) Birth of the baby with intact membranes via caesarean section, which avoids contact of the baby with the vagina, carries a low risk of GBS infection (91). *[Evidence level 3]*

Current recommendations from NICE are that all women and people undergoing caesarean birth should receive broad-spectrum antibiotic prophylaxis before the procedure is begun to reduce maternal morbidity.(92) This will result in the baby also receiving the antibiotics via placental transfer.(62)(63)

*5.7 Emergency caesarean birth*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **Broad spectrum antibiotic prophylaxis that includes effectiveness against GBS, should be given prior to skin incision if an emergency caesarean birth is required. This eliminates any need for specific prophylaxis against GBS and giving antibiotics should not delay birth.** | **4** | **C** | This is primarily to reduce the incidence of maternal complications due to infection. |

NICE guideline NG192 on caesarean birth 2021 (updated 2024) recommends: 'offer women prophylactic antibiotics before skin incision for caesarean birth, choosing antibiotics that are effective against endometritis, urinary tract and wound infections'.(92) This recommendation applies to both elective and emergency caesarean births. The woman or person in labour should already have been offered IAP if they have risk factors for GBS carriage.

**6. What is the optimal care for women and people not known to be current GBS carriers or known to be previously colonised, and how does it differ from those with known GBS carriage status?**

*6.1 Prelabour rupture of membranes at term*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **In women and people with prelabour rupture of membranes at term and known GBS carriage (either previous or current), recommend immediate induction of labour and IAP.** | **2+** | **C** | GBS carriage increases the risk of EOGBSD. |
| **In women and people with prelabour rupture of membranes at term and known GBS carriage (either previous or current) who have initially declined induction of labour and IAP, make a further offer of induction of labour and IAP after approximately 24 hours.** | **2+** | **C** | Infection rates increase significantly after 24 hours. |
| **In women and people with prelabour rupture of membranes at term and unknown GBS carriage status, offer testing with PCR if available. If PCR testing is not available, offer ECM testing and explain that although the result is unlikely to be available before the baby is born, it can improve postnatal and neonatal care if GBS is detected.** | **2+** | **C** | GBS carriage increases the risk of EOGBSD. Knowledge of GBS status can improve postnatal and neonatal management. |

In pregnant women and people with unknown GBS carriage status, offer management as recommended in NICE guideline NG235 (2023), i.e. a choice of expectant management for up to 24

hours, or immediate induction of labour.(93) For those who choose expectant management, make a further offer of induction of labour after approximately 24 hours. *[Evidence level 2+]*

If PCR testing for GBS is available and GBS carriage is found, offer prompt induction of labour and IAP. If PCR testing is not available, offer ECM testing and explain that although the result is unlikely to be available before the baby is born, it can improve postnatal and neonatal care if GBS is detected. *[Evidence level 2+]*

## 7. What are the best ways of preventing or reducing the risk of early-onset GBS disease?

### *7.1 Risk factor approach*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **Pregnant women and people with the risk factors listed in this guideline should be offered IAP. This approach is currently supported by the UK National Screening Committee and NICE.** | **4** | **D** | **These factors are associated with an increased risk of EOGBSD which is reduced by IAP.** |

Maternal GBS carriage without IAP increases the likelihood of EOGBSD, resulting in reported incidences ranging from 1 in 67 to 1 in 167.(27) *[Evidence level 2++]*

Many people carry the bacteria but in 98% or more of cases their babies are born without developing an infection; because of this, the UK National Screening Committee does not recommend universal bacteriological testing for GBS during pregnancy.(94) There is also concern about exposing 20–40% of birthing people and their babies to antibiotics that in most cases are not necessary to prevent EOGBSD because the baby would not have developed it anyway.(95)

On the other hand, a 2020 systematic review of five observational studies reported that with routine screening the proportion of women given intrapartum antibiotics with antenatal testing was similar to that with risk based screening (31% compared with 29%)(52) though not as effective at preventing EOGBSD. Additionally, risk factors are poor predictors of GBS carriage,(96) so the risk-based approach often fails to target those actually carrying GBS. Moreover, this approach will miss some GBS carriers, resulting in inadequate prevention of GBS transmission to newborn babies. [*Evidence level 2++]*

*7.2 Antenatal testing*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **If antenatal bacteriological testing of pregnant women and people for GBS carriage is done, it should be carried out at or soon after 35 weeks of pregnancy for people without a planned delivery date OR 3–5 weeks prior to the planned delivery date for those people with a planned induction of labour prior to $40^{+0}$ weeks of gestation. Repeat testing should be considered if more than 5 weeks elapse from testing without labour having occurred.** | **2+** | **C** | Pregnant women and people giving birth before 37 complete weeks of pregnancy should be advised to have IAP irrespective of GBS status. Testing from 35 weeks allows time to get the result and discuss the implications. Reliability of testing to predict carriage falls after 4 weeks, which is why repeat testing should be considered. |
| **When testing for GBS carriage, a swab should be taken from the lower vagina and the anorectum. A single swab (vagina then anorectum) or two different swabs can be used. Enriched culture medium tests are strongly recommended.** | **2++** | **B** | These procedures optimise the detection of GBS. |
| **The clinician should indicate on the laboratory request form that the swab is being taken to test for the presence of GBS.** | **4** | **GPP** | **This will ensure that the microbiology laboratory uses the correct testing technique.** |
| **Swabs for GBS should be sent to the laboratory for enriched culture as soon as possible, in transport media. They should be refrigerated if there is any delay.** | **4** | **GPP** | **These procedures optimise the detection of GBS.** |
| **Most pregnant women and people can take the swabs for GBS testing themselves and obtain reliable results. If they decline the rectal swab, they should be advised to swab the perineum instead.** | **1–** | **B** | **Some women prefer to self-test, and this facilitates testing by post.** |

Many countries routinely offer antenatal testing at 35–37 weeks of pregnancy. The majority of testing regimens worldwide are based on taking swabs from the lower vagina and rectum at 35–37 weeks of gestation (changed in 2020 in the USA to 36–37 weeks as prior to 37 weeks, women in labour should be advised to have IAP irrespective of testing), or earlier if there is a high likelihood of earlier vaginal birth (e.g. with twin pregnancy). Repeat testing should be considered if more than 5 weeks elapse from testing without labour having occurred, as the reliability of the result to predict carriage falls over time.(97) In the UK, women and people are not currently routinely offered a test on the NHS for GBS carriage on request alone although they should be informed that such testing is widely available privately.

Public Health England has published a standard for the detection of GBS carriage (98)(99). The standard notes that optimum yield will be achieved with swabs obtained from the lower vagina and the anorectum. A single swab for both sites of collection is rational but two different swabs can be used. The swabs may be rayon or dacron, fibre or flocked, and may be collected by the physician or other qualified caregiver, or by the woman after appropriate instruction. The swab(s) should be sent to a laboratory for testing; currently ECM tests are recommended. The clinician should indicate on the laboratory request form that the swab is being taken for GBS, to ensure the correct culture medium is used. ECM testing means that a swab is placed into broth, the broth is incubated overnight and the broth is then subcultured onto solid medium. The most widely used ECM is Todd-Hewitt broth with nalidixic acid and colistin (e.g. Lim broth), or nalidixic acid and gentamicin further subcultured on a blood agar plate. Several options are available for the subculture of an ECM for isolation of GBS, including selective and chromogenic agar .(100) ECM testing is recommended by Public Health England (98) (99) and by ACOG,(101) because direct plating will only allow detection of a proportion of the cases where GBS is actually present, for example only 59% using Columbia CAN agar, and only 91% using group B streptococcus differential agar (Granada Medium) compared with the detection gold-standard of ECM followed by plating.(102) If the clinician is informed that the local laboratory cannot offer ECM testing, they should inform the pregnant woman or person that they cannot provide a reliable test and advise them that the ECM test is readily available privately.

The reliability of predicting carriage in labour varies with the interval between testing and labour. A study by Yancey et al in 1996(97) reported that using low vaginal and rectal swabs taken at 35–37 weeks of gestation and specialised culture media had a sensitivity and positive predictive value for GBS colonisation at birth of 87%, with a specificity negative predictive value of 96%. Virranniemi et al in 2018 reported that, when intrapartum culture was used as a reference, late-pregnancy culture had an overall sensitivity of 89.2% (95% CI 88.0%-90.4%) and specificity of 96.5% (95% CI 95.8%-97.2%).(29) *[Evidence level 2++]*

GBS isolates can remain viable in transport media for several days at room temperature. As the recovery of isolates declines over 1–4 days, especially at elevated temperatures, swabs should be transported to the laboratory as rapidly as possible, to minimise the risks of false-negative results. If there is any unavoidable delay, specimens should be refrigerated.

A systematic review of the test accuracy of a self-collected swab versus a healthcare professional-collected swab included 10 studies (2578 women).(103) The review reported a pooled sensitivity of self-collected swabs of 0.90 (95%CI 0.81–0.95) and a pooled specificity of 0.98 (95% CI 0.96–0.99). The authors concluded that self-collected swabs for maternal GBS colonisation are highly accurate relative to swabs collected by healthcare professionals. These results are reassuring for the accuracy of pregnant women and people self-testing. Another systematic review (three studies, 643 women) suggests that in pregnant women and people who decline to take the rectal swab, swabbing the perineum can give comparable results.(104) *[Evidence level 2++]*

Women and people being tested should be advised that swabbing only the vagina is less reliable for the detection of Group B strep than taking a rectal swab in addition. If they still decline the rectal swab, then they should be recommended to swab the perineum. *[Evidence level 2–]*

*7.3 Intrapartum testing*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **If pregnant women or people choose to have testing for GBS carriage, they should be offered an alternative between antenatal and intrapartum testing if the latter is available.** | **4** | **GPP** | This facilitates maternal choice. |
| **All NHS Trusts providing maternity care should ensure that an enriched culture medium test for GBS is used when testing for GBS is requested by clinicians.** | **4** | **GPP** | Enriched culture medium is necessary to maximise detection of GBS carriage. |

An alternative to antenatal testing for GBS carriage is taking low vaginal and rectal swabs (as previously described) as soon as labour is diagnosed and testing for GBS using PCR techniques. These have sensitivities and specificities (more than 95%) similar to optimised-culture methods.(105) (106) Studies using this approach have reported carriage rates similar to antenatal testing.(107)(106)

Testing in the antenatal period has a number of advantages, for example pregnant women and people discovered to be carriers can be counselled well before the onset of labour, which gives them time to decide whether to have IAP. In addition, the GBS sensitivity to antibiotics can be assessed, enabling the selection of an appropriate alternative antibiotic when women have an allergy to penicillin. However, up to 6% of women who test negative will change their carrier status between antenatal testing and the onset of labour, a proportion that increases with the length of time between testing and labour onset.(108)

In contrast, the intrapartum PCR test gives a result that is immediately relevant. The disadvantage of the PCR approach is that counselling has to be given while the pregnant woman or person is in labour, which may impair the quality of consent (the individual concerned should be informed in advance if this is the approach taken, so they can think about it ahead of time) and there may be a delay between taking swabs and obtaining the result. In addition, it is another demand on the birth attendants, which may be difficult out of hours or at busy times.

Freedom of Information requests by Group B Strep Support have revealed that despite the above evidence, many maternity units in England and Wales (and the majority in Scotland) cannot routinely provide enriched culture medium (ECM) testing for the detection of GBS (Oliver Plumb, personal communication). This is despite the fact that health minister Nadine Dorries in 2022 wrote to the head of all NHS Trusts instructing them to make ECM testing available. Failure to use the appropriate test to detect GBS when a baby was infected has led to litigation resulting in the payment of compensation. If a clinician wishes to test for the presence of GBS they should make this clear in their request: *"please test for the presence of Group B streptococcus"*. If, despite this, the ECM test is not used, the laboratory and not the clinician will be liable. If the woman or person being tested is pregnant, this should also be clearly stated. If the ECM test is not available locally, the woman or person should be advised that it is widely available privately.

*7.4 What information should women be given about GBS colonisation of the mother and the risk of neonatal infection during pregnancy and after birth?*

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **All pregnant women and people should be provided with an appropriate information leaflet, such as that produced by the RCOG. If they are tested for GBS carriage, there must be administrative arrangements in place to ensure that they are informed of the results and its significance as soon as possible. The parents of any baby affected by GBS should be given a leaflet explaining the implications for a future pregnancy.** | **4** | **GPP** | This facilitates maternal choice. |

All pregnant women and people should be provided with an appropriate information leaflet, such as the RCOG patient information leaflet *Group B streptococcus (GBS) infection in neonates*, which offers information in a format that is accessible to them. The leaflet should ideally be given at the 28-week gestation antenatal check-up to allow the pregnant woman or person time to assimilate the information and seek further clarification if needed. It is vital that any positive results from GBS testing are communicated to the pregnant woman or person as soon as possible so that they can be offered prophylactic intravenous antibiotics when labour starts.

Parents of a baby affected by GBS should be informed that in any future pregnancy they will be recommended to have intravenous antibiotic prophylaxis. This information can usefully be given using a leaflet such as that provided by GBSS (https://gbss.org.uk/info-support/group-b-strep-infection/after-gbs-infection/).

## 8. How should a neonate be managed?

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **Health professionals caring for newborn babies should be aware of the risk factors for, and the clinical signs of, EOGBSD.** | **4** | **GPP** | Early detection is vital to enable early treatment. |
| **Parents should be educated about the red flag clinical indicators for EOGBSD listed below.** | **4** | **GPP** | This enables parents to inform health professionals promptly if there are signs of EOGBSD. |
| **Term babies who are clinically well at birth and where IAP for prevention of EOGBSD was given for more than 4 hours before birth do not require special observation or antibiotic prophylaxis.** | **2+** | **C** | IAP is effective at reducing the risk. |

| | | | |
|---|---|---|---|
| **Well babies at increased risk of EOGBSD and where IAP was not given or given less than 4 hours before birth should be evaluated at birth for clinical indicators of neonatal infection and have their vital signs checked at 0, 1 and 2 hours, and then 2 hourly until 12 hours.** | **4** | **GPP** | Monitoring for signs of EOGBSD is necessary to enable early detection and treatment. |
| **Postnatal antibiotic prophylaxis is not recommended for asymptomatic term infants without known antenatal risk factors.** | **4** | **GPP** | The likelihood of benefit is too small, and there is potential harm. |
| **Breastfeeding should be encouraged irrespective of GBS status.** | **2+** | **C** | There is no evidence to discourage breastfeeding where there are concerns regarding the possible risk of transmission of GBS disease, and there are well-established maternal and neonatal benefits to breastfeeding. |

Health professionals caring for babies should follow the latest NICE guidance(109)(110) and be aware of risk factors and clinical indicators of early-onset neonatal infection (See Appendix A). Appropriate investigations should be performed in line with the NICE guidance (110), and treatment with intravenous penicillin and gentamicin commenced without delay and without awaiting the results of investigations. Babies with clinical signs of EOGBSD should be treated with penicillin and gentamicin within an hour of the decision to treat.

Infants with an infection can be initially asymptomatic or present with nonspecific signs, therefore determining which babies should receive antibiotics can be a challenge, and is a balance between unnecessary use of antibiotics and avoiding harm from delayed antibiotic therapy. In the UK, there are two approaches currently followed: NICE guideline [NG195] or the Kaiser Permanente Sepsis Risk Calculator.(110)(111) The NICE guideline [NG195] uses maternal risk factors, clinical indicators and 'red flags' to guide decisions on investigations and antibiotics. The Kaiser Permanente Sepsis Risk Calculator, developed in the USA and endorsed by the American Academy of Pediatrics, estimates the individual baby's risk of early-onset sepsis based on: background incidence, gestational age, highest maternal antepartum temperature, duration of membrane rupture, maternal GBS status (yes/no/unknown) and type and timing of intrapartum antibiotics. An estimated final risk, which takes into account the infant's clinical assessment is calculated and informs the recommendations for clinical management and monitoring of vital signs. *[Evidence level 4]*

For full details of neonates with risk factors or suspected sepsis, please refer to NICE guideline [NG195] *Neonatal infection: antibiotics for prevention and treatment*. The red flag **risk factor** is "*suspected or confirmed infection in another baby in the case of a multiple pregnancy*". Red flag **clinical indicators** include "*apnoea, seizures, need for cardiopulmonary resuscitation, need for mechanical ventilation, signs of shock*". For the full list of additional non-red flag risk factors and clinical indicators see Appendix C or NICE guideline [NG195].(110) Babies with any red flag or with two or more 'non red-flag' risk factors or clinical indicators should have investigations and antibiotics commenced without waiting for test results. In babies without red flags and only one risk factor or

one clinical indicator, clinical judgement can be applied to decide on subsequent management. *[Evidence level 4]*

Babies of women who have received broad-spectrum antibiotics during labour for indications other than GBS prophylaxis may require investigation and treatment as per NICE guideline [NG195]. Two studies have shown that 90% of infants who are diagnosed with early-onset infection will display signs by 12 hours. (109)(112) *[Evidence level 2+]*

The incidence of EOGBSD in asymptomatic term infants without known antenatal risk factors in the UK is estimated at 0.2 cases/1000 births(19) No RCT has investigated treatment in this group. If postnatal antibiotic treatment were completely effective and there were no adverse effects, 5000 infants would need to be treated to prevent a single case and at least 80,000 infants would have to be treated to prevent a single death from EOGBSD. Routine postnatal antibiotic prophylaxis is not recommended.(113) *[Evidence level 4]*

**9. What should obstetricians and midwives know about late onset GBS disease?**

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **Obstetricians and midwives should be aware of the signs of late onset GBS disease (LOGBSD).** | **4** | **GPP** | Early recognition and treatment of LOGBSD is vital because it reduces neonatal mortality and morbidity. |

While the use of IAP during labour has reduced the incidence of EOGBSD in many countries, the rate of late onset (more than 6 days after birth) disease (LOGBSD) has remained largely unchanged. The incidence is lower than that of early onset disease and is evenly spread across the first three months of life, after which it becomes very uncommon. The incidence is about 1 in 300 babies.(19)(114) New parents should be advised that IAP for EOGBSD is not protective against LOGBSD, and babies remain at risk. Ongoing antibiotic prophylaxis is not effective at reducing the risk and should not be recommended (110). *[Evidence level 2++]*

The infecting organism may come from the mother or birthing person, other family members, friends or the care team. Therefore, recommending careful hygiene is important. LOGBSD presents a wider clinical spectrum than EOGBSD and is more likely to result in meningitis and long-term disability.

Parents and caregivers should therefore be advised to seek immediate medical advice if the following are observed(110)(from NICE [NG195]):

- mottled or ashen appearance
- cyanosis of skin, lips or tongue, non-blanching rash of skin
- baby appears ill or sleepy, does not wake at the time expected, or if roused does not stay awake
- weak high-pitched or continuous cry
- poor feeding
- raised respiratory rate: 60 breaths per minute or more
- grunting
- apnoea
- heart rate 160 beats per minute or more or heart rate less than 100 beats per minute
- temperature 38°C or more or less than 36°C, unexplained by environmental factors
- abdominal distension
- seizures, bulging fontanelle.

## 10.What is the current and future role of vaccines against GBS?

| Recommendation | Evidence quality | Strength | Rationale for the recommendation |
|---|---|---|---|
| **Clinicians should be aware of ongoing vaccine trials and facilitate them when possible.** | **2** | **C** | Vaccines are likely to be effective and are likely to be introduced in the next decade. |

An important role of a vaccine against GBS disease has been identified for many years, because of the potential advantages. As well as early onset disease, a vaccine is expected to prevent maternal invasive disease, stillbirths caused by GBS, and late-onset disease. It may also reduce preterm labour. It would replace IAP, avoiding the effects of antibiotics on the microbiome and is likely to be cheaper than IAP.

One issue in developing a vaccine is the need for it to be active against multiple GBS serotypes causing perinatal disease: type III/CC17 (about 40%); Ia/CC23 (17%); III/CC19 (15%); Ib/CC8-10 (7%) and V/CC1 (6%).(115) Current vaccines are either hexavalent polysaccharide-protein conjugates or protein-based candidates and both have completed phase 2 trials and other candidates are at pre-clinical or phase I stages. Numbers of pregnancies studied remain relatively small. It is anticipated that vaccines will be licensed based on a serocorrelate of protection, i.e. an immune marker that has been shown to correlate with protection against invasive disease, coupled with large-scale effectiveness and safety (phase 4) studies. This is because traditional phase 3 randomised controlled efficacy trials are not realistic given that the numbers required are unfeasibly large.

## 11. Recommendations for future research

- Studies of the virulence of specific strains identified using genetic markers, which may allow a more targeted approach to GBS prophylaxis.
- Studies of serocorrelates of protection against GBS to facilitate the licensure of a GBS vaccine without the need for large-scale prelicensure efficacy trials in pregnant women and people.
- Studies of the proportion of pregnant women and people given high-quality patient information about GBS.
- Studies of the percentage of professionals with knowledge and understanding of GBS carriage and EOGBSD.
- Studies of the influence of ethnicity and socioeconomic status on the prevalence and outcomes of GBS carriage and infection among pregnant women and people and their babies.

## 12. Auditable topics

Audits should evaluate the structure (organisation or provision) of services, the process of care or the outcome of care against an agreed standard based on evidence and recommendations of this guideline. Suggested topics include:

1. Proportion of pregnant women and persons who are given the GBS information leaflet.
2. Ability of the relevant laboratory to provide accurate detection of GBS (using an ECM or PCR test).
3. Local incidence of positive GBS cultures.
4. Incidence of early and late onset GBS disease.
5. Rate of admission to the neonatal unit with GBS infection.

6. Length of time taken to inform women of a positive GBS culture (should be as soon as possible to enable prophylaxis/appropriate treatment).
7. Appropriate use of IAP in labour in women with risk factors/known GBS colonisation.

## 13. Infographics, useful links and support groups

Summary infographics are appended to this guideline.

Group B Strep Support: a charity that works to stop group B Strep infection in babies, www.gbss.org.uk

Bliss: a charity that supports parents and families of premature or sick babies, https://www.bliss.org.uk/

The Royal College of Obstetricians and Gynaecologists' patient information leaflet, Group B Streptococcus (GBS) in Pregnancy and Newborn Babies, https://www.rcog.org.uk/media/xtmfktbh/pi-gbs-pregnancy-newbornnewlogo21.pdf

## References

1. Easmon CSF, Hastings MJG, Deeley J, Bloxham B, Marwood R. The effect of intrapartum chemoprophylaxis on the vertical transmission of group B streptococci. Br J Obstet Gynaecol. 1983;90:633–5.

2. Steer PJ, Russell AB, Kochhar S, Cox P, Plumb J, Gopal Rao G. Group B streptococcal disease in the mother and newborn—A review. European Journal of Obstetrics and Gynecology and Reproductive Biology. 2020 Sep 1;252:526–33. doi:10.1016/j.ejogrb.2020.06.024 PubMed PMID: 32586597.

3. Russell NJ, Seale AC, O'Sullivan C, Le Doare K, Heath PT, Lawn JE, et al. Risk of Early-Onset Neonatal Group B Streptococcal Disease with Maternal Colonization Worldwide: Systematic Review and Meta-analyses. Clinical Infectious Diseases. 2017;65(suppl_2):S152–9. doi:10.1093/cid/cix655 PubMed PMID: 29117325.

4. Seale AC, Bianchi-Jassir F, Russell NJ, Kohli-Lynch M, Tann CJ, Hall J, et al. Estimates of the Burden of Group B Streptococcal Disease Worldwide for Pregnant Women, Stillbirths, and Children. Clinical Infectious Diseases. 2017;65(suppl_2):S200–19. doi:10.1093/cid/cix664 PubMed PMID: 29117332.

5. Cailes B, Kortsalioudaki C, Buttery J, Pattnayak S, Greenough A, Matthes J, et al. Epidemiology of UK neonatal infections: The neonIN infection surveillance network. Arch Dis Child Fetal Neonatal Ed. 2018 Nov 1;103(6). doi:10.1136/archdischild-2017-313203 PubMed PMID: 29208666.

6. Jamrozy D, Gopal Rao G, Feltwell T, Lamagni T, Khanna P, Efstratiou A, et al. Population genetics of group B Streptococcus from maternal carriage in an ethnically diverse community in London. Front Microbiol. 2023 May 18;14:1185753. doi:10.3389/fmicb.2023.1185753

7. Madrid L, Seale AC, Kohli-Lynch M, Edmond KM, Lawn JE, Heath PT, et al. Infant Group B Streptococcal Disease Incidence and Serotypes Worldwide: Systematic Review and Meta-

analyses. Clinical Infectious Diseases. Oxford University Press; 2017. p. S160–72. doi:10.1093/cid/cix656 PubMed PMID: 29117326.

8. Gonçalves BP, Procter SR, Paul P, Chandna J, Lewin A, Seedat F, et al. Group B streptococcus infection during pregnancy and infancy: estimates of regional and global burden. Lancet Glob Health. 2022 Jun 1;10(6):e807–19. doi:10.1016/S2214-109X(22)00093-6 PubMed PMID: 35490693.

9. Seale AC, Bianchi-Jassir F, Russell NJ, Kohli-Lynch M, Tann CJ, Hall J, et al. Estimates of the Burden of Group B Streptococcal Disease Worldwide for Pregnant Women, Stillbirths, and Children. Clinical Infectious Diseases. 2017;65(suppl_2):S200–19. doi:10.1093/cid/cix664 PubMed PMID: 29117332.

10. Gopal RG, 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. 2019 Oct;126(1470-0328 (Linking)):1347–53. PubMed PMID: 30734508.

11. Nanduri SA, Petit S, Smelser C, Apostol M, Alden NB, Harrison LH, et al. Epidemiology of Invasive Early-Onset and Late-Onset Group B Streptococcal Disease in the United States, 2006 to 2015: Multistate Laboratory and Population-Based Surveillance. JAMA Pediatr. 2019 Mar 1;173(2168-6203 (Linking)):224–33. PubMed PMID: 30640366.

12. Collin SM, Demirjian A, Swann C, Lamagni T. Race and Ethnicity in Neonatal Group B Streptococcal Disease in England: 2016-2020. Pediatrics. 2022 Sep 1;150(3). doi:10.1542/PEDS.2021-056080 PubMed PMID: 35979728.

13. Mahtab S, Madewell ZJ, Madhi SA, Wise A, Swart PJ, Velaphi S, et al. Stillbirths and Neonatal Deaths Caused by Group B Streptococcus in Africa and South Asia Identified Through Child Health and Mortality Prevention Surveillance (CHAMPS). Open Forum Infect Dis. 2023 Sep 1;10(9). doi:10.1093/ofid/ofad356

14. Nanduri SA, Petit S, Smelser C, Apostol M, Alden NB, Harrison LH, et al. Epidemiology of Invasive Early-Onset and Late-Onset Group B Streptococcal Disease in the United States, 2006 to 2015: Multistate Laboratory and Population-Based Surveillance. JAMA Pediatr. 2019 Mar 1;173(2168-6203 (Linking)):224–33. PubMed PMID: 30640366.

15. Gopal RG, 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. 2019 Oct;126(1470-0328 (Linking)):1347–53. PubMed PMID: 30734508.

16. 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. 2020 Dec 1;29(12):1507–12. doi:10.1089/jwh.2019.8139 PubMed PMID: 32364822.

17. Villamor E, Norman M, Johansson S, Cnattingius S. Maternal Obesity and Risk of Early-onset Neonatal Bacterial Sepsis: Nationwide Cohort and Sibling-controlled Studies. Clinical Infectious Diseases. 2021 Nov 1;73(9):E2656–64. doi:10.1093/cid/ciaa783 PubMed PMID: 32770206.

18. Khalil MR, Hartvigsen CM, Thorsen PB, Møller JK, Uldbjerg N. Maternal age and body mass index as risk factors for rectovaginal colonization with group B streptococci. International

Journal of Gynecology and Obstetrics. 2023 Apr 1;161(1):303–7. doi:10.1002/ijgo.14449 PubMed PMID: 36086996.

19. O'Sullivan CP, Lamagni T, Patel D, Efstratiou A, Cunney R, Meehan M, et al. Group B streptococcal disease in UK and Irish infants younger than 90 days, 2014-15: a prospective surveillance study. Lancet InfectDis. 2019 Jan;19(1473-3099 (Linking)):83–90. PubMed PMID: 30497953.

20. Carstensen H, Christensen KK, Grennert L, Persson K, Polberger S. Early-onset neonatal group B streptococcal septicaemia in siblings. J Infect. 1988;17(3):201–4. doi:10.1016/S0163-4453(88)96426-2 PubMed PMID: 3063756.

21. Faxelius G, Bremme K, Kvist-Christensen K, Christensen P, Ringertz S. Neonatal septicemia due to group B streptococci--perinatal risk factors and outcome of subsequent pregnancies. J Perinat Med. 1988;16(5–6):423–30. doi:10.1515/JPME.1988.16.5-6.423 PubMed PMID: 3071602.

22. Tam T, Bilinski E, Lombard E. Recolonization of group B Streptococcus (GBS) in women with prior GBS genital colonization in pregnancy. J MaternFetal Neonatal Med. 2012 Oct;25(1476-4954 (Electronic)):1987–9. PubMed PMID: 22384795.

23. Page-Ramsey SM, Johnstone SK, Kim D, Ramsey PS. Prevalence of group B Streptococcus colonization in subsequent pregnancies of group B Streptococcus-colonized versus noncolonized women. AmJ Perinatol. 2013 May;30(1098-8785 (Electronic)):383–8. PubMed PMID: 23023558.

24. Colicchia LC, Lauderdale DS, Du H, Adams M, Hirsch E. Recurrence of group B streptococcus colonization in successive pregnancies. J Perinatol. 2015 Mar;35(1476-5543 (Electronic)):173–6. PubMed PMID: 25321646.

25. Turrentine MA, Colicchia LC, Hirsch E, Cheng PJ, 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. 2016 Apr;33(1098-8785 (Electronic)):510–7. PubMed PMID: 26683604.

26. Rottenstreich M, Rotem R, Srebnik N, Farkash R, Samueloff A, Grisaru-Granovsky S. The recurrence risk of group B Streptococcus in consecutive deliveries. J Matern Fetal Neonatal Med. 2020 Jul 2;33(13):2263–8. doi:10.1080/14767058.2018.1548596 PubMed PMID: 30614306.

27. Russell NJ, Seale AC, O'Sullivan C, Le Doare K, Heath PT, Lawn JE, et al. Risk of Early-Onset Neonatal Group B Streptococcal Disease with Maternal Colonization Worldwide: Systematic Review and Meta-analyses. Clinical Infectious Diseases. 2017;65(suppl_2):S152–9. doi:10.1093/cid/cix655 PubMed PMID: 29117325.

28. 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. ObstetGynecol. 1996 Nov;88(5):811–5.

29. 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. 2019 Apr 1;98(4):494–9. doi:10.1111/AOGS.13522 PubMed PMID: 30578547.

30. Allen VM, Yudin MH, Bouchard C, Boucher M, Caddy S, Castillo E, et al. Management of group B streptococcal bacteriuria in pregnancy. J Obstet Gynaecol Can. 2012 May;34(5):482–6. doi:10.1016/S1701-2163(16)35246-X PubMed PMID: 22555143.

31. Pérez-Moreno MO, Picó-Plana E, Grande-Armas J, Centelles-Serrano MJ, Arasa-Subero M, Colomé- Ochoa N. Group B streptococcal bacteriuria during pregnancy as a risk factor for maternal intrapartum colonization: a prospective cohort study. J Med Microbiol. 2017 Apr 1;66(4):454–60. doi:10.1099/JMM.0.000465 PubMed PMID: 28463661.

32. Khalil MR, Thorsen PB, Møller JK, Uldbjerg N. Number of colony forming units in urine at 35–37 weeks' gestation as predictor of the vaginal load of Group B Streptococci at birth. European Journal of Obstetrics and Gynecology and Reproductive Biology. 2018 Apr 1;223:68–71. doi:10.1016/j.ejogrb.2018.02.013 PubMed PMID: 29500947.

33. Devabhaktuni A, Silverman NS, Bastian IN, Turrentine MA. Trends in Perinatal Group B Streptococcal Disease After Updated Screening Recommendations in the United States. O&G open. 2025 Aug;2(4):e094. doi:10.1097/OG9.0000000000000094 PubMed PMID: 41001188.

34. Colbourn TE, Asseburg C, Bojke L, Philips Z, Welton NJ, Claxton K, et al. Preventive strategies for group B streptococcal and other bacterial infections in early infancy: cost effectiveness and value of information analyses. BMJ. 2007 Sep 29;335(7621):655.

35. Schrag SJ, Zywicki S, Farley MM, Reingold AL, Harrison LH, Lefkowitz LB, et al. Group B Streptococcal Disease in the Era of Intrapartum Antibiotic Prophylaxis. New England Journal of Medicine. 2000 Jan 6;342(1):15–20. doi:10.1056/nejm200001063420103 PubMed PMID: 10620644.

36. Baecher L, Grobman W. Prenatal antibiotic treatment does not decrease group B streptococcus colonization at delivery. IntJ GynaecolObstet. 2008 May;101(0020-7292 (Print)):125–8. PubMed PMID: 18082163.

37. Preterm labour and birth NICE guideline. 2015.

38. Kenyon SL, Taylor DJ, Tarnow-Mordi W. Broad-spectrum antibiotics for preterm, prelabour rupture of fetal membranes: the ORACLE I randomised trial. ORACLE Collaborative Group. Lancet. 2001 Mar 31;357(9261):979–88.

39. Fitzgibbon A, Clooney L, Broderick D, Eogan M, McCallion N, Drew RJ. Erythromycin compared to amoxicillin and azithromycin for antimicrobial prophylaxis for preterm premature rupture of the membranes: a retrospective study. J Obstet Gynaecol. 2021;41(4):569–72. doi:10.1080/01443615.2020.1786806 PubMed PMID: 32799726.

40. Quist-Nelson J, De Ruigh AA, Seidler AL, Van Der Ham DP, Willekes C, Berghella V, et al. Immediate delivery compared with expectant management in late preterm prelabor rupture of membranes: An individual participant data meta-analysis. Obstetrics and Gynecology. Lippincott Williams and Wilkins; 2018. p. 269–79. doi:10.1097/AOG.0000000000002447 PubMed PMID: 29324621.

41. van der Ham DP, Vijgen SM, Nijhuis JG, van Beek JJ, Opmeer BC, Mulder AL, et al. Induction of labor versus expectant management in women with preterm prelabor rupture of membranes

between 34 and 37 weeks: a randomized controlled trial. PLoSMed. 2012;9(1549-1676 (Electronic)):e1001208. PubMed PMID: 22545024.

42. Morris JM, Roberts CL, Bowen JR, Patterson JA, Bond DM, Algert CS, et al. Immediate delivery compared with expectant management after preterm pre-labour rupture of the membranes close to term (PPROMT trial): a randomised controlled trial. Lancet. 2016 Jan 30;387(1474-547X (Electronic)):444–52. PubMed PMID: 26564381.

43. Recommendations | Neonatal infection: antibiotics for prevention and treatment | Guidance | NICE [Internet]. [cited 2024 Oct 10]. Available from: https://www.nice.org.uk/guidance/ng195/chapter/Recommendations#intrapartum-antibiotics

44. de Ruigh AA, Pajkrt E, Mol BW. Against: Expectant management for women with prelabour rupture of membranes in the presence of GBS at 34–37 weeks' gestation. BJOG: An International Journal of Obstetrics and Gynaecology. John Wiley and Sons Inc; 2023. p. 685–6. doi:10.1111/1471-0528.17387 PubMed PMID: 36808422.

45. Seaward PG, Hannah ME, Myhr TL, Farine D, Ohlsson A, Wang EE, et al. International Multicentre Term Prelabor Rupture of Membranes Study: evaluation of predictors of clinical chorioamnionitis and postpartum fever in patients with prelabor rupture of membranes at term. Am J Obstet Gynecol. 1997 Nov;177(5):1024–9.

46. Goodman JR, Berg RL, Gribble RK, Meier PR, Fee SC, Mitchell PD. Longitudinal Study of Group B Streptococcus Carriage in Pregnancy. Infect Dis Obstet Gynecol. 1997;5(3):237. doi:10.1155/S1064744997000409 PubMed PMID: 18476144.

47. Jung E, Romero R, Suksai M, Gotsch F, Chaemsaithong P, Erez O, et al. Clinical chorioamnionitis at term: definition, pathogenesis, microbiology, diagnosis, and treatment. American Journal of Obstetrics and Gynecology. Elsevier Inc.; 2024. p. S807–40. doi:10.1016/j.ajog.2023.02.002 PubMed PMID: 38233317.

48. Banerjee S, Cashman P, Yentis SM, Steer PJ. Maternal Temperature Monitoring During Labor: Concordance and Variability Among Monitoring Sites. Obstet Gynecol. 2004 Feb;103(2):287–93.

49. Morton S, Kua J, Mullington CJ. Epidural analgesia, intrapartum hyperthermia, and neonatal brain injury: a systematic review and meta-analysis. British Journal of Anaesthesia [Internet]. Elsevier Ltd; 2021 [cited 2022 May 15]. p. 500–15. Available from: https://pubmed.ncbi.nlm.nih.gov/33218673/ doi:10.1016/j.bja.2020.09.046 PubMed PMID: 33218673.

50. Lukanović D, Batkoska M, Kavšek G, Druškovič M. Clinical chorioamnionitis: where do we stand now? Front Med (Lausanne). 2023;10. doi:10.3389/FMED.2023.1191254 PubMed PMID: 37293298.

51. Law MR, Palomaki G, Alfirevic Z, Gilbert R, Heath P, McCartney C, et al. The prevention of neonatal group B streptococcal disease: a report by a working group of the Medical Screening Society. J MedScreen. 2005;12(2):60–8.

52. Hasperhoven GF, Al-Nasiry S, Bekker V, Villamor E, Kramer BWW. 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. 2020 May 1;127(6):680–91. doi:10.1111/1471-0528.16085 PubMed PMID: 31913562.

53. Benitz W, Gould J, Druzin M. Risk factors for early-onset group B streptococcal sepsis: estimation of odds ratios by critical literature review. Pediatrics. 1999 Jun 1;103(6):e77. doi:10.1542/peds.103.6.e77 PubMed PMID: 10353974.

54. Schrag S, Gorwitz R, Fultz-Butts K, Schuchat A. Prevention of perinatal group B streptococcal disease. Revised guidelines from CDC. MMWR RecommRep. 2002 Aug 16;51(RR-11):1–22.

55. McGuire E, Ready D, Ellaby N, Potterill I, Pike R, Hopkins KL, et al. A case of penicillin-resistant group B Streptococcus isolated from a patient in the UK. J Antimicrob Chemother. 2024 Nov 15. doi:10.1093/JAC/DKAE419 PubMed PMID: 39545469.

56. Samb A, Dierikx TH, Bijleveld YA, de Haan TR, Hodiamont CJ, van Leeuwen E, et al. Benzylpenicillin concentrations in umbilical cord blood and plasma of premature neonates following intrapartum doses for group B streptococcal prophylaxis. Matern Health Neonatol Perinatol. 2023 Jul 1;9(1). doi:10.1186/S40748-023-00163-3 PubMed PMID: 37391853.

57. Nielsen SY, Hoffmann-Lücke E, Henriksen TB, Hartvigsen CM, Helmig RB, Khalil MR, et al. Timing and dosage of intrapartum prophylactic penicillin for preventing early-onset group B streptococcal disease: Assessing maternal and umbilical cord blood concentration. Arch Dis Child Fetal Neonatal Ed. 2024. doi:10.1136/archdischild-2024-326986 PubMed PMID: 38729749.

58. BNF. BNF-NICE [Internet]. 2026 [cited 2026 Feb 25]. Cefuroxime/Drugs/BNF-NICE. Available from: https://bnf.nice.org.uk/drugs/cefuroxime/

59. Hsu CY, Moradkasani S, Suliman M, Uthirapathy S, Zwamel AH, Hjazi A, et al. Global patterns of antibiotic resistance in group B Streptococcus: a systematic review and meta-analysis. Front Microbiol. 2025;16:1541524. doi:10.3389/FMICB.2025.1541524/FULL

60. Nair LG, Mustafa SS, Ramsey A. Obstetric penicillin allergy evaluations. Journal of Allergy and Clinical Immunology: Global. 2025 Feb 1;4(1). doi:10.1016/j.jacig.2024.100376

61. Gill MM, Gasner S, Banken A, Park M, Weaver A, Sharpe E, et al. Improving routine prenatal penicillin allergy testing for reported penicillin allergy. BMJ Open Qual. 2022 Jul 29;11(3). doi:10.1136/BMJOQ-2022-001859 PubMed PMID: 35906008.

62. Barber EL, Zhao G, Buhimschi IA, Illuzzi JL. Duration of intrapartum prophylaxis and concentration of penicillin G in fetal serum at delivery. Obstetrics and gynecology. 2008;112(2 Pt 1):265–70. doi:10.1097/AOG.0B013E31817D0246 PubMed PMID: 18669721.

63. Berardi A, Pietrangiolillo Z, Reggiani MLB, Bianco V, Gallesi D, Rossi K, et al. Are postnatal ampicillin levels actually related to the duration of intrapartum antibiotic prophylaxis prior to delivery? A pharmacokinetic study in 120 neonates. Arch Dis Child Fetal Neonatal Ed. 2018 Mar 1;103(2):F152–6. doi:10.1136/ARCHDISCHILD-2016-312546 PubMed PMID: 28663282.

64. McCall SJ, Bunch KJ, Brocklehurst P, D'Arcy R, Hinshaw K, Kurinczuk JJ, et al. The incidence, characteristics, management and outcomes of anaphylaxis in pregnancy: a population-based descriptive study. BJOG. 2018 Jul;125(1470-0328 (Linking)):965–71. PubMed PMID: 29193647.

65. Leech SM, Borg DJ, Rae KM, Kumar S, Clifton VL, Nitert MD. Delivery mode is a larger determinant of infant gut microbiome composition at 6 weeks than exposure to peripartum antibiotics. Microb Genom. 2024;10(7). doi:10.1099/mgen.0.001269 PubMed PMID: 38995243.

66. Corvaglia L, Tonti G, Martini S, Aceti A, Mazzola G, Aloisio I, et al. Influence of Intrapartum Antibiotic Prophylaxis for Group B Streptococcus on Gut Microbiota in the First Month of Life. J PediatrGastroenterolNutr. 2016 Feb;62(1536-4801 (Electronic)):304–8. PubMed PMID: 26237371.

67. Stearns JC, Simioni J, Gunn E, McDonald H, Holloway AC, Thabane L, et al. Intrapartum antibiotics for GBS prophylaxis alter colonization patterns in the early infant gut microbiome of low risk infants. SciRep. 2017 Nov 28;7(2045-2322 (Linking)):16527. PubMed PMID: 29184093.

68. Wong WSW, Sabu P, Deopujari V, Levy S, Shah AA, Clemency N, et al. Prenatal and peripartum exposure to antibiotics and cesarean section delivery are associated with differences in diversity and composition of the infant meconium microbiome. Microorganisms. 2020 Feb 1;8(2). doi:10.3390/microorganisms8020179

69. Patangia D V., Grimaud G, O'Shea CA, Ryan CA, Dempsey E, Stanton C, et al. Early life exposure of infants to benzylpenicillin and gentamicin is associated with a persistent amplification of the gut resistome. Microbiome. 2024 Dec 1;12(1). doi:10.1186/s40168-023-01732-6 PubMed PMID: 38310316.

70. Sandall J, Tribe RM, Avery L, Mola G, Visser GH, Homer CS, et al. Short-term and long-term effects of caesarean section on the health of women and children. The Lancet. Lancet Publishing Group; 2018. p. 1349–57. doi:10.1016/S0140-6736(18)31930-5 PubMed PMID: 30322585.

71. Mukhopadhyay S, Bryan M, Dhudasia MB, Quarshie W, Gerber JS, Grundmeier RW, et al. Intrapartum group B Streptococcal prophylaxis and childhood weight gain. Arch Dis Child Fetal Neonatal Ed. 2021 Nov 1;106(6):F649–56. doi:10.1136/archdischild-2020-320638 PubMed PMID: 33958387.

72. Metz TD, McKinney J, Allshouse AA, Knierim SD, Carey JC, Heyborne KD. Exposure to group B Streptococcal antibiotic prophylaxis and early childhood body mass index in a vaginal birth cohort. J MaternFetal Neonatal Med. 2019 Feb 7;(1476-4954 (Linking)):1–6. PubMed PMID: 30651010.

73. Dhudasia MB, Spergel JM, Puopolo KM, Koebnick C, Bryan M, Grundmeier RW, et al. Intrapartum group b streptococcal prophylaxis and childhood allergic disorders. Pediatrics. 2021 May 1;147(5). doi:10.1542/peds.2020-012187 PubMed PMID: 33833072.

74. Moradi M, Grieger JA, Teong XT, Heilbronn LK. Intrapartum Antibiotic Prophylaxis and Child Health Outcomes: A Systematic Review and Meta-Analysis of Observational Studies. BJOG. 2025. doi:10.1111/1471-0528.70015 PubMed PMID: 40999925.

75. Catassi G, Aloi M, Giorgio V, Gasbarrini A, Cammarota G, Ianiro G. The Role of Diet and Nutritional Interventions for the Infant Gut Microbiome. Nutrients. Multidisciplinary Digital Publishing Institute (MDPI); 2024. doi:10.3390/nu16030400 PubMed PMID: 38337684.

76. NHS. Benefits of breast-feeding [Internet]. [cited 2025 Jan 26]. Available from: https://www.nhs.uk/conditions/baby/breastfeeding-and-bottle-feeding/breastfeeding/benefits/

77. Breastfeeding - Best Start in Life - NHS [Internet]. [cited 2026 Mar 18]. Available from: https://www.nhs.uk/best-start-in-life/baby/feeding-your-baby/breastfeeding/

78. Korpela K, Salonen A, Vepsäläinen O, Suomalainen M, Kolmeder C, Varjosalo M, et al. Probiotic supplementation restores normal microbiota composition and function in antibiotic-treated and in caesarean-born infants. Microbiome. 2018 Oct 16;6(1). doi:10.1186/s40168-018-0567-4 PubMed PMID: 30326954.

79. 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. 2019 Apr 1;11(4). doi:10.3390/nu11040810 PubMed PMID: 30974819.

80. Menichini D, Chiossi G, Monari F, De Seta F, Facchinetti F. Supplementation of Probiotics in Pregnant Women Targeting Group B Streptococcus Colonization: A Systematic Review and Meta-Analysis. Nutrients. 2022 Nov 1;14(21). doi:10.3390/NU14214520 PubMed PMID: 36364782.

81. Jois RS, Tan JK, Silva D. Do probiotics in pregnancy reduce the risk of group B streptococcal colonisation? J Paediatr Child Health. 2020 Sep 1;56(9):1468–72. doi:10.1111/jpc.15021 PubMed PMID: 32949211.

82. 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. Journal of Maternal-Fetal and Neonatal Medicine. 2021;34(11):1814–21. doi:10.1080/14767058.2019.1650907 PubMed PMID: 31362572.

83. Kasai Y, Komatsu M, Toyama Y, Nakano S, Hisata K, Yamada M, et al. Effect of probiotics on mother-to-neonate vertical transmission of group B streptococci: A prospective open-label randomized study. Pediatr Neonatol. 2024 Mar 1;65(2):145–51. doi:10.1016/J.PEDNEO.2023.07.004 PubMed PMID: 37684161.

84. Moore RL, Feehily C, Killeen SL, Yelverton CA, Geraghty AA, Walsh CJ, et al. Ability of Bifidobacterium breve 702258 to transfer from mother to infant: the MicrobeMom randomized controlled trial. Am J Obstet Gynecol MFM. 2023 Jul 1;5(7). doi:10.1016/J.AJOGMF.2023.100994 PubMed PMID: 37142190.

85. Place K, Rahkonen L, Nupponen I, Kruit H. Vaginal streptococcus B colonization is not associated with increased infectious morbidity in labor induction. Acta Obstet Gynecol Scand. 2021 Aug 1;100(8):1501–10. doi:10.1111/AOGS.14154 PubMed PMID: 33768531.

86. Kabiri D, Hants Y, Yarkoni TR, Shaulof E, Eventov Friedman S, Paltiel O, et al. Antepartum Membrane Stripping in GBS Carriers, Is It Safe? (The STRIP-G Study). 2015. doi:10.1371/journal.pone.0145905

87. Gill P, Sobeck J, Jarjoura D, Hillier S, Benedetti T. Mortality from early neonatal group B streptococcal sepsis: Influence of obstetric factors. J Matern Fetal Med. 1997 Jan;6(1):35–9. doi:10.1002/(sici)1520-6661(199701/02)6:1<35::aid-mfm7>3.0.co;2-t

88. Adair CE, Kowalsky L, Quon H, Ma D, Stoffman J, McGeer A, et al. Risk factors for early-onset group B streptococcal disease in neonates: A population-based case-control study. CMAJ Canadian Medical Association Journal. 2003 Aug 5;169(3):198–203. PubMed PMID: 12900477.

89. Kawakita T, Reddy UM, Landy HJ, Iqbal SN, Huang CC, Grantz KL. Neonatal complications associated with use of fetal scalp electrode: a retrospective study. BJOG. 2016 Oct 1;123(11):1797–803. doi:10.1111/1471-0528.13817 PubMed PMID: 26643181.

90. Prevention of Group B Streptococcal Early-Onset Disease in Newborns: ACOG Committee Opinion, Number 797. ObstetGynecol. 2020 Feb;135(0029-7844 (Linking)):e51–72. PubMed PMID: 31977795.

91. Shrag S, Gorwitz R, Fultz-Butts K, Schuchat A. Prevention of Perinatal Group B Streptococcal Disease. MMWR. 2002;51 (RR11):1–22.

92. Overview | Caesarean birth | Guidance | NICE [Internet]. [cited 2024 Nov 30]. Available from: https://www.nice.org.uk/guidance/ng192

93. Overview | Intrapartum care | Guidance | NICE [Internet]. [cited 2024 Nov 30]. Available from: https://www.nice.org.uk/guidance/ng235

94. Seedat F, Geppert J, Stinton C, Patterson J, Freeman K, Johnson SA, et al. Universal antenatal screening for group B streptococcus may cause more harm than good. Br Med J. 2019 Feb 20;364(0959-8138 (Linking)):l463. PubMed PMID: 30787018.

95. Bevan D, White A, Marshall J, Peckham C. Modelling the effect of the introduction of antenatal screening for group B Streptococcus (GBS) carriage in the UK. BMJ Open. 2019 Mar 1;9(3). doi:10.1136/bmjopen-2018-024324 PubMed PMID: 30904850.

96. Daniels JP, Gray J, Pattison HM, Gray R, Hills RK, Khan KS. Intrapartum tests for group B streptococcus: accuracy and acceptability of screening. BJOG. 2011 Jan;118(2):257–65.

97. 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. ObstetGynecol. 1996 Nov;88(5):811–5.

98. B58. UK Standards for Microbiology Investigations Detection of Carriage of Group B Streptococci (Streptococcus agalactiae) [Internet]. 2018 [cited 2024 Nov 30]. Available from: https://www.google.co.uk/search?q=Detection+of+carriage+of+Group+B+Streptococci+B%25*&sca_esv=3837dfeb0f430c76&sxsrf=ADLYWIIoY7XwaWPJtmKqO74CUl1yVpdV3Q%3A1732964677136&source=hp&ei=RfFKZ9vdBeGshbIPhvis-Ac&iflsig=AL9hbdgAAAAAZ0r_VTOCHZcZNg0TcHeh7Hvefjw2xO5

99. Health Security Agency U. UK Standards for Microbiology Investigations Detection of carriage of group B streptococci (Streptococcus agalactiae). 2026.

100. Verani JR, McGee L, Schrag SJ. Prevention of perinatal group B streptococcal disease--revised guidelines from CDC, 2010. MMWR RecommRep. 2010 Nov;%19;59(RR-10):1–36.

101. Prevention of Group B Streptococcal Early-Onset Disease in Newborns: ACOG Committee Opinion Summary, Number 797. Obstetrics and gynecology. 2020 Feb 1;135(2):489–92. doi:10.1097/AOG.0000000000003669 PubMed PMID: 31977793.

102. El Aila NA, Tency I, Claeys G, Saerens B, Cools P, Verstraelen H, et al. Comparison of different sampling techniques and of different culture methods for detection of group B streptococcus carriage in pregnant women. BMC Infect Dis. 2010 Sep 29;10:285. doi:10.1186/1471-2334-10-285 PubMed PMID: 20920213.

103. Odubamowo K, Garcia M, Muriithi F, Ogollah R, Daniels JP, Walker KF. Self-collected versus health-care professional taken swab for identification of vaginal-rectal colonisation with group B streptococcus in late pregnancy: a systematic review. Eur J Obstet Gynecol Reprod Biol. 2023 Jul 1;286:95–101. doi:10.1016/J.EJOGRB.2023.05.027 PubMed PMID: 37229964.

104. Nadeau HCG, Bisson C, Chen X, Zhao YD, Williams M, Edwards RK. Vaginal-perianal or vaginal-perineal compared with vaginal-rectal culture-based screening for Group B Streptococci (GBS) colonization during the third trimester of pregnancy: a systematic review and meta-analysis. BMC Pregnancy Childbirth. 2022 Dec 1;22(1). doi:10.1186/S12884-022-04546-W PubMed PMID: 35287615.

105. Helmig RB, Gertsen JB. Diagnostic accuracy of polymerase chain reaction for intrapartum detection of group B streptococcus colonization. Acta Obstet Gynecol Scand. 2017 Sep 1;96(9):1070–4. doi:10.1111/AOGS.13169 PubMed PMID: 28504863.

106. Costa SC, Machado AP, Teixeira C, Cerqueira L, Rodrigues T, Ribeiro M, et al. Group B Streptococcus rectovaginal colonization screening on term pregnancies: culture or polymerase chain reaction? Journal of Maternal-Fetal and Neonatal Medicine. 2023;36(2). doi:10.1080/14767058.2023.2262078 PubMed PMID: 37766418.

107. Helmig RB, Gertsen JB. Intrapartum PCR-assay for detection of Group B Streptococci (GBS). EurJObstetGynecolReprodBiolX. 2019 Oct;4(2590-1613 (Linking)):100081. PubMed PMID: 31673691.

108. AW V van den B, Houtman-Roelofsen RL, Oostvogel PM, Dekker FW, Dorr PJ, Sprij AJ. Timing of group B streptococcus screening in pregnancy: a systematic review. GynecolObstetInvest. 2010;69(1423-002X (Electronic)):174–83. PubMed PMID: 20016190.

109. Lin FYC, Brenner RA, Johnson YR, Azimi PH, Philips JB, Regan JA, et al. The effectiveness of risk-based intrapartum chemoprophylaxis for the prevention of early-onset neonatal group B streptococcal disease. Am J Obstet Gynecol. 2001;184(6):1204–10. doi:10.1067/mob.2001.113875 PubMed PMID: 11349189.

110. Overview | Neonatal infection: antibiotics for prevention and treatment | Guidance | NICE [Internet]. [cited 2024 Nov 30]. Available from: https://www.nice.org.uk/guidance/ng195

111. Infection Probability Calculator - Neonatal Sepsis Calculator [Internet]. [cited 2024 Nov 30]. Available from: https://neonatalsepsiscalculator.kaiserpermanente.org/

112. Heath PT, Balfour GF, Tighe H, Verlander NQ, Lamagni TL, Efstratiou A. Group B streptococcal disease in infants: a case control study. ArchDisChild. 2009 Sep;94(1468-2044 (Electronic)):674–80. PubMed PMID: 19457879.

113. 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. 2004 Jan 24;363(9405):292–4. doi:10.1016/S0140-6736(03)15389-5 PubMed PMID: 14751704.

114. Berardi A, Trevisani V, Di Caprio A, Bua J, China M, Perrone B, et al. Understanding factors in group b streptococcus late-onset disease. Infection and Drug Resistance. Dove Medical Press Ltd; 2021. p. 3207–18. doi:10.2147/IDR.S291511

115. Andersen M, Smith B, Murra M, Nielsen SY, Slotved HC, Henriksen TB. Invasive group B Streptococcus strains and clinical characteristics in Danish infants from 1999 to 2009. Front Microbiol. 2022 Sep 28;13. doi:10.3389/fmicb.2022.1001953

## Appendix A: Explanation of Grades and Evidence Levels

### Classification of evidence levels

| | |
|---|---|
| 1++ | High-quality meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a very low risk of bias |
| 1+ | Well-conducted meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a low risk of bias |
| 1– | Meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a high risk of bias |
| 2++ | High-quality systematic reviews of case–control or cohort studies or high-quality case–control or cohort studies with a very low risk of confounding, bias or chance and a high probability that the relationship is causal |
| 2+ | Well-conducted case–control or cohort studies with a low risk of confounding, bias or chance and a moderate probability that the relationship is causal |
| 2– | Case–control or cohort studies with a high risk of confounding, bias or chance and a significant risk that the relationship is not causal |
| 3 | Non-analytical studies, e.g. case reports, case series |
| 4 | Expert opinion |

### Grades of Recommendation

**A** At least one meta-analysis, systematic review or RCT rated as 1++, and directly applicable to the target population; or a systematic review of RCTs or a body of evidence consisting principally of studies rated as 1+, directly applicable to the target population and demonstrating overall consistency of results

**B** A body of evidence including studies rated as 2++ directly applicable to the target population, and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 1++ or 1+

**C** A body of evidence including studies rated as 2+ directly applicable to the target population, and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 2++

**D** Evidence level 3 or 4; or extrapolated evidence from studies rated as 2+

### Good Practice Points

**GPP** Recommended best practice based on the clinical experience of the guideline development group.*

*on the occasion when the guideline development group find there is an important practical point that they wish to emphasise but for which there is not, nor is there likely to be any research evidence. This will typically be where some aspect of treatment is regarded as such sound clinical practice that nobody is likely to question it. These are marked in the guideline, and are indicated by GPP. It must be emphasised that these are NOT an alternative to evidence-based recommendations, and should only be used where there is no alternative means of highlighting the issue.

## Appendix B: Glossary of Abbreviations

| | |
|---|---|
| CI | Confidence interval |
| ECM | Enriched culture medium |
| EOGBSD | Early-onset neonatal Group B streptococcal disease |
| FSE | Fetal scalp electrode |
| GBS | Group B streptococcus |
| IAP | Intravenous intrapartum antibiotic prophylaxis |
| LOGBSD | Late-onset Group B streptococcal disease |
| NICE | National Institute for Health and Care Excellence |
| OR | Odds ratio |
| PCR | Polymerase chain reaction |
| PPROM | Preterm prelabour rupture of membranes |
| PROM | Prelabour rupture of membranes |
| RR | Relative risk |

## Appendix C: How Should a Newborn Baby be Managed?

Red and non-red flag risk factors (Box 1) and red and non-red flag clinical indicators (Box2) from NICE guidance NG195.

**Box 1 Risk factors for early-onset neonatal infection, including 'red flags'**

Red flag risk factor:

- Suspected or confirmed infection in another baby in the case of a multiple pregnancy.

Other risk factors:

- Invasive group B streptococcal infection in a previous baby or maternal group B streptococcal colonisation, bacteriuria or infection in the current pregnancy.
- Pre-term birth following spontaneous labour before 37 weeks' gestation.
- Confirmed rupture of membranes for more than 18 hours before a pre-term birth.
- Confirmed prelabour rupture of membranes at term for more than 24 hours before the onset of labour.
- Intrapartum fever higher than 38°C if there is suspected or confirmed bacterial infection.
- Clinical diagnosis of chorioamnionitis.

**Box 2 Clinical indicators of possible early-onset neonatal infection (observations and events in the baby), including 'red flags'**

Red flag clinical indicators:

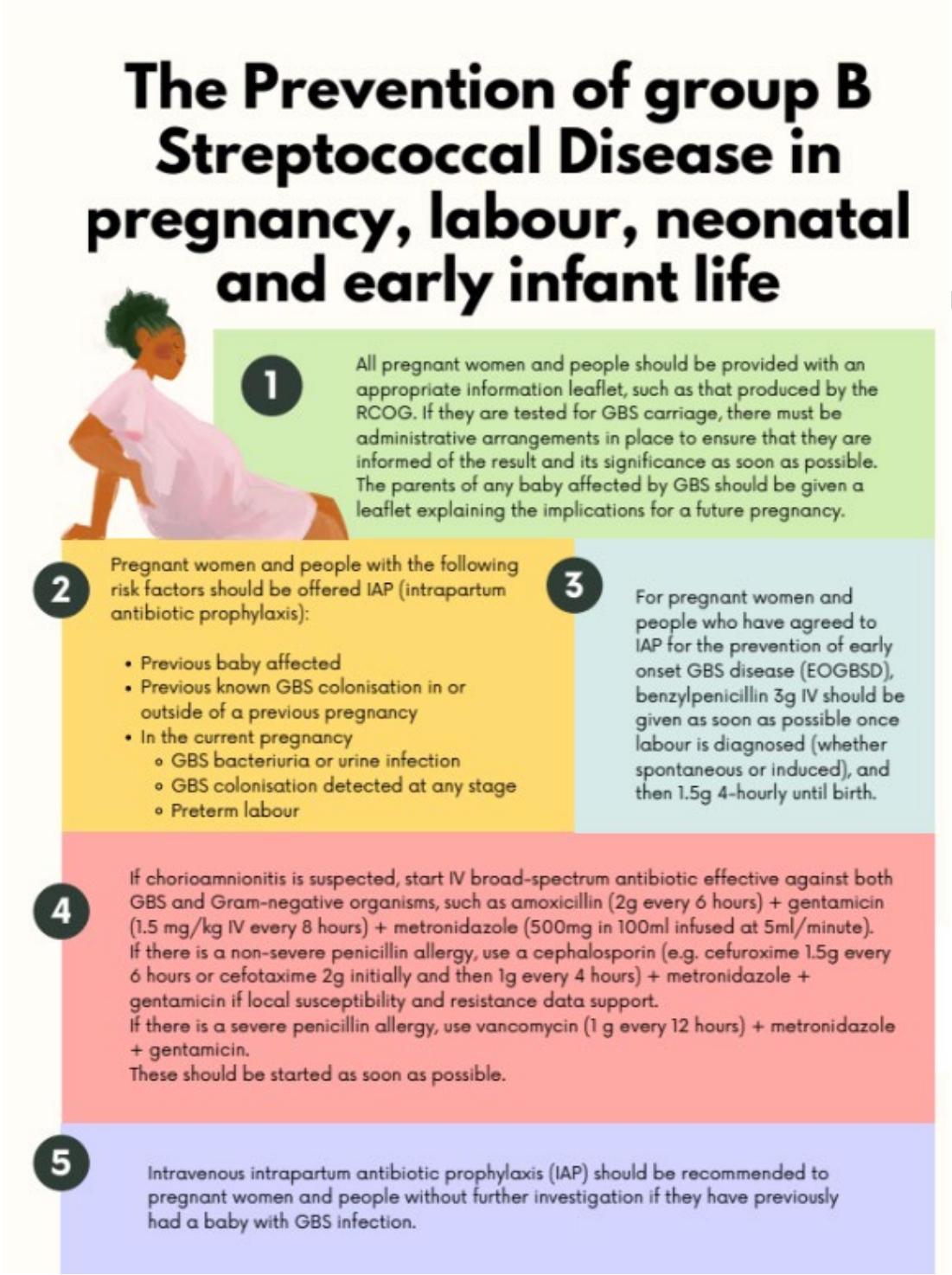
- Apnoea (temporary stopping of breathing)
- Seizures
- Need for cardiopulmonary resuscitation
- Need for mechanical ventilation
- Signs of shock

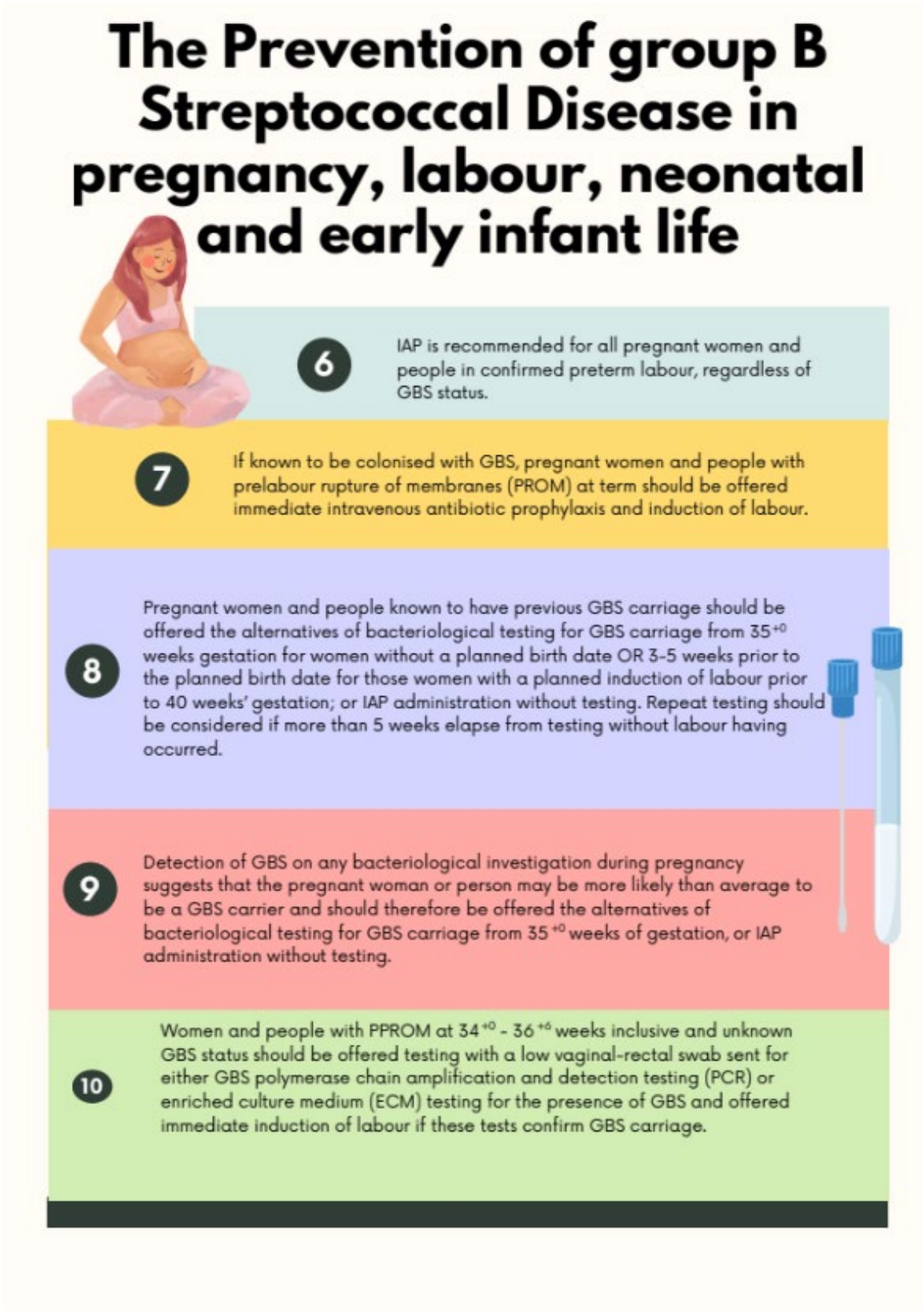
Other clinical indicators:

- Altered behaviour or responsiveness
- Altered muscle tone (for example, floppiness)
- Feeding difficulties (for example, feed refusal)
- Feed intolerance, including vomiting, excessive gastric aspirates and abdominal distension
- Abnormal heart rate (bradycardia or tachycardia)
- Signs of respiratory distress (including grunting, recession, tachypnoea)
- Hypoxia (for example, central cyanosis or reduced oxygen saturation level)
- Persistent pulmonary hypertension of newborns
- Jaundice within 24 hours of birth
- Signs of neonatal encephalopathy
- Temperature abnormality (lower than 36°C or higher than 38°C) unexplained by environmental factors
- Unexplained excessive bleeding, thrombocytopenia, or abnormal coagulation
- Altered glucose homeostasis (hypoglycaemia or hyperglycaemia)
- Metabolic acidosis (base deficit of 10 mmol/litre or greater)

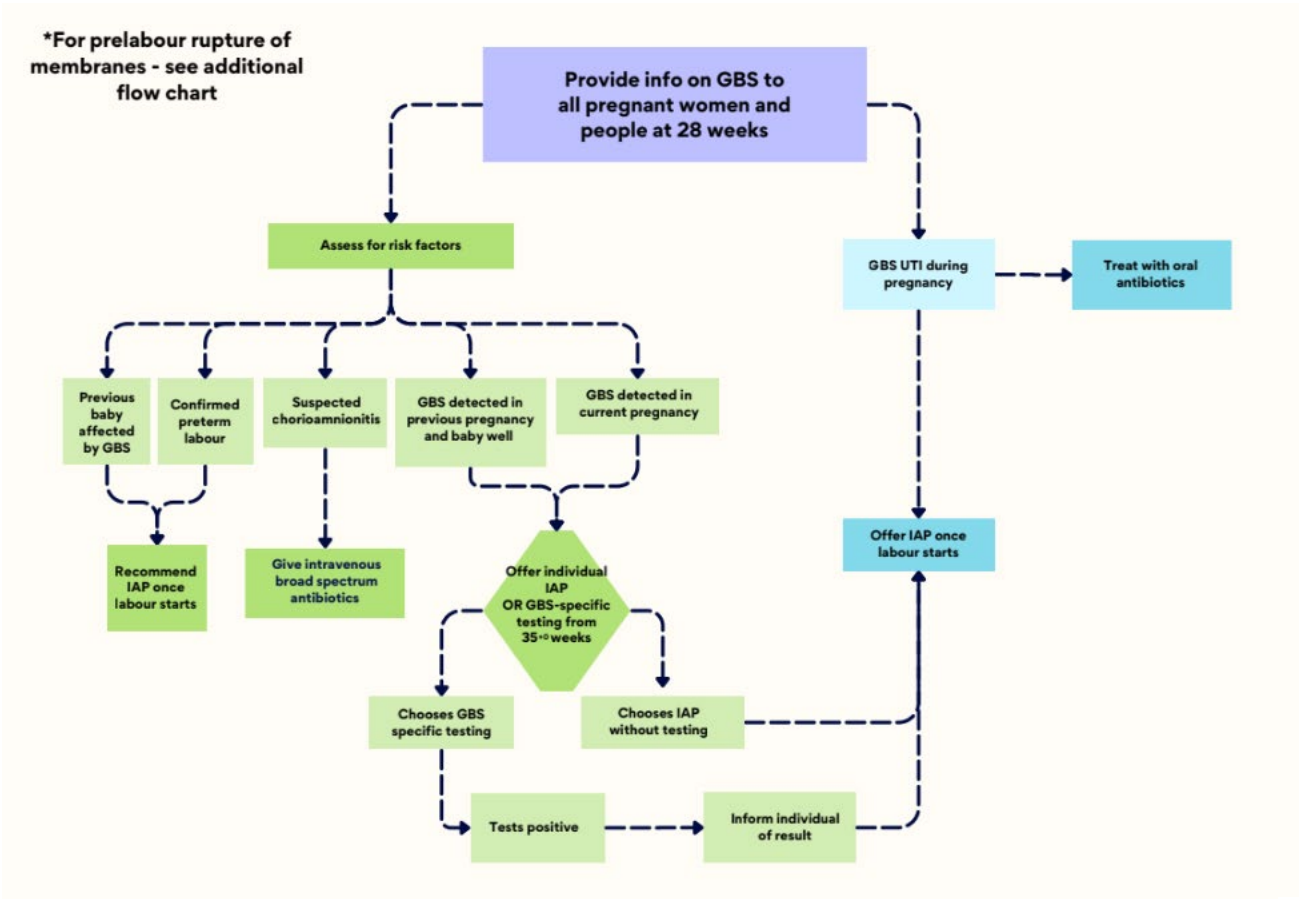
 

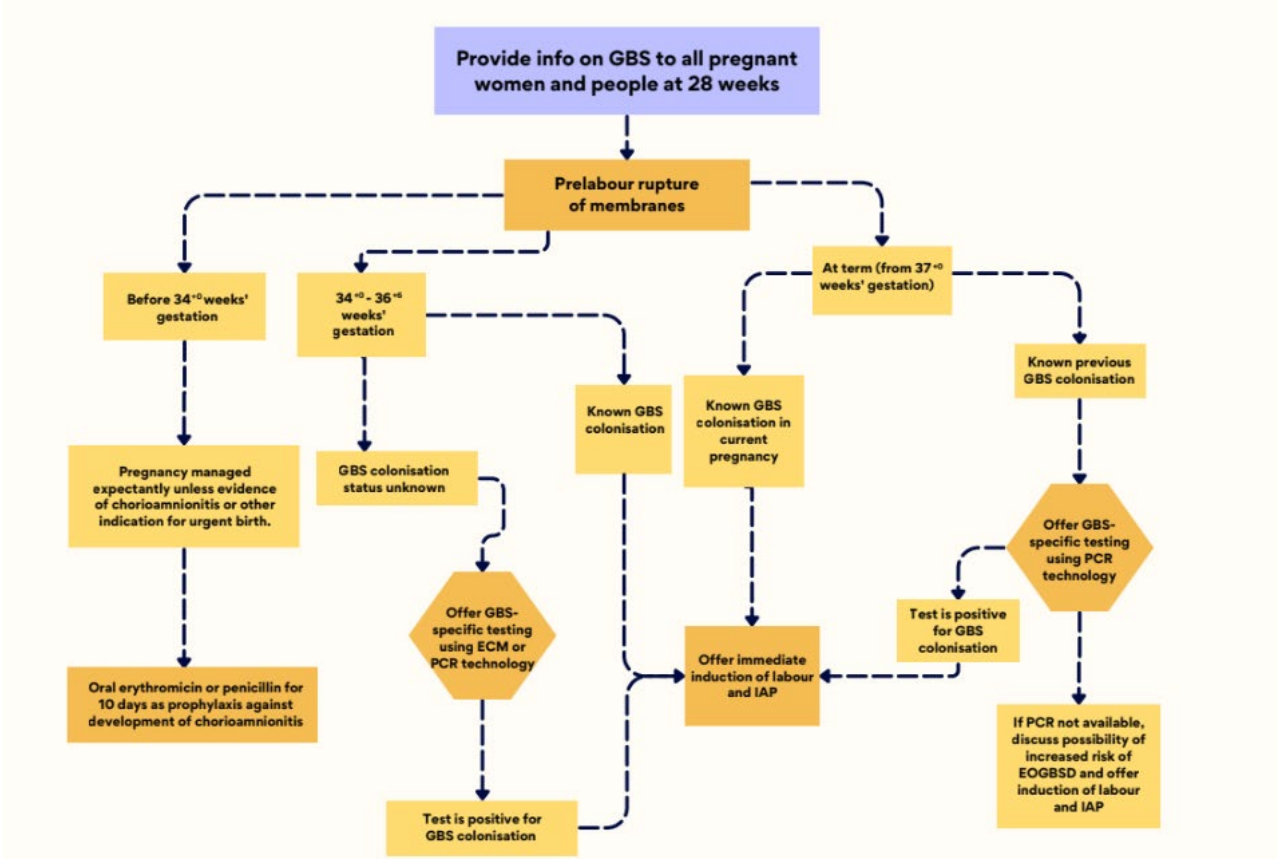
**Appendix D: The Prevention of Group B Streptococcal Disease in Pregnancy, Labour, Neonatal and Early Infant Life**

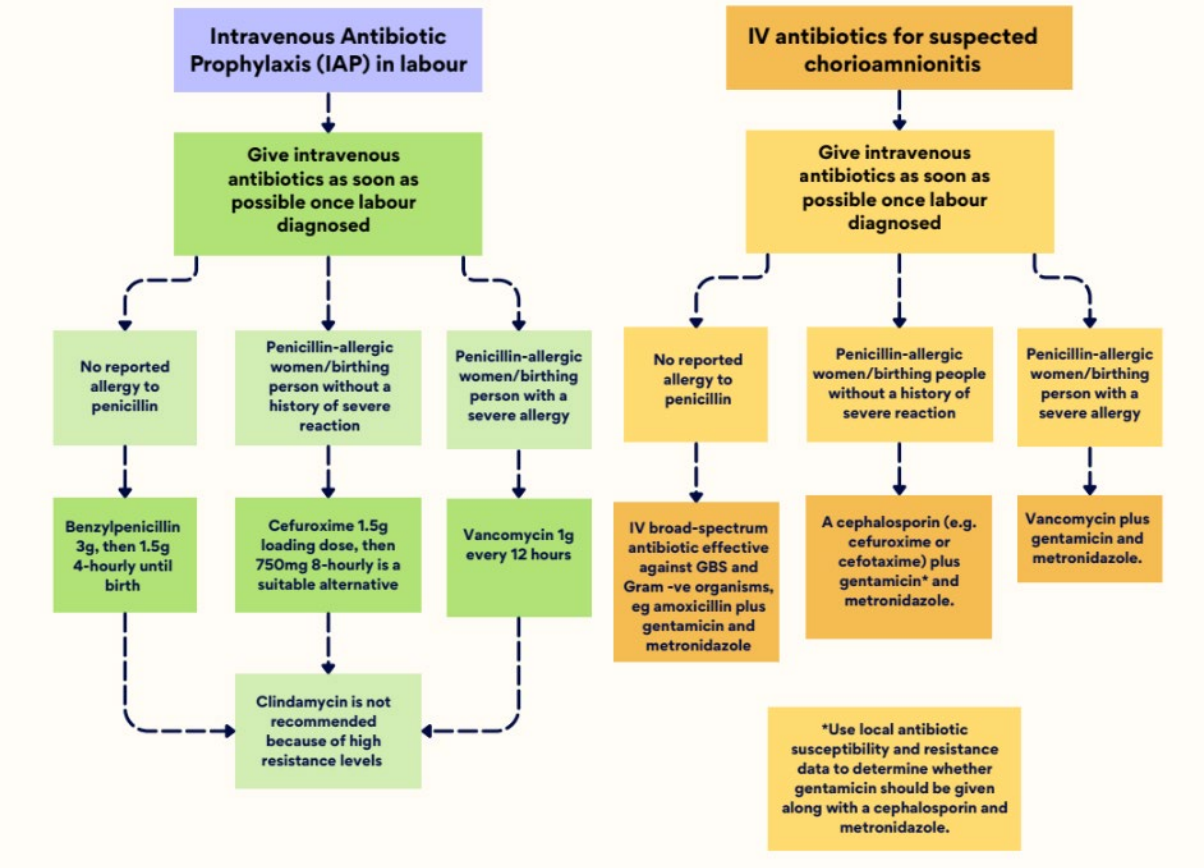


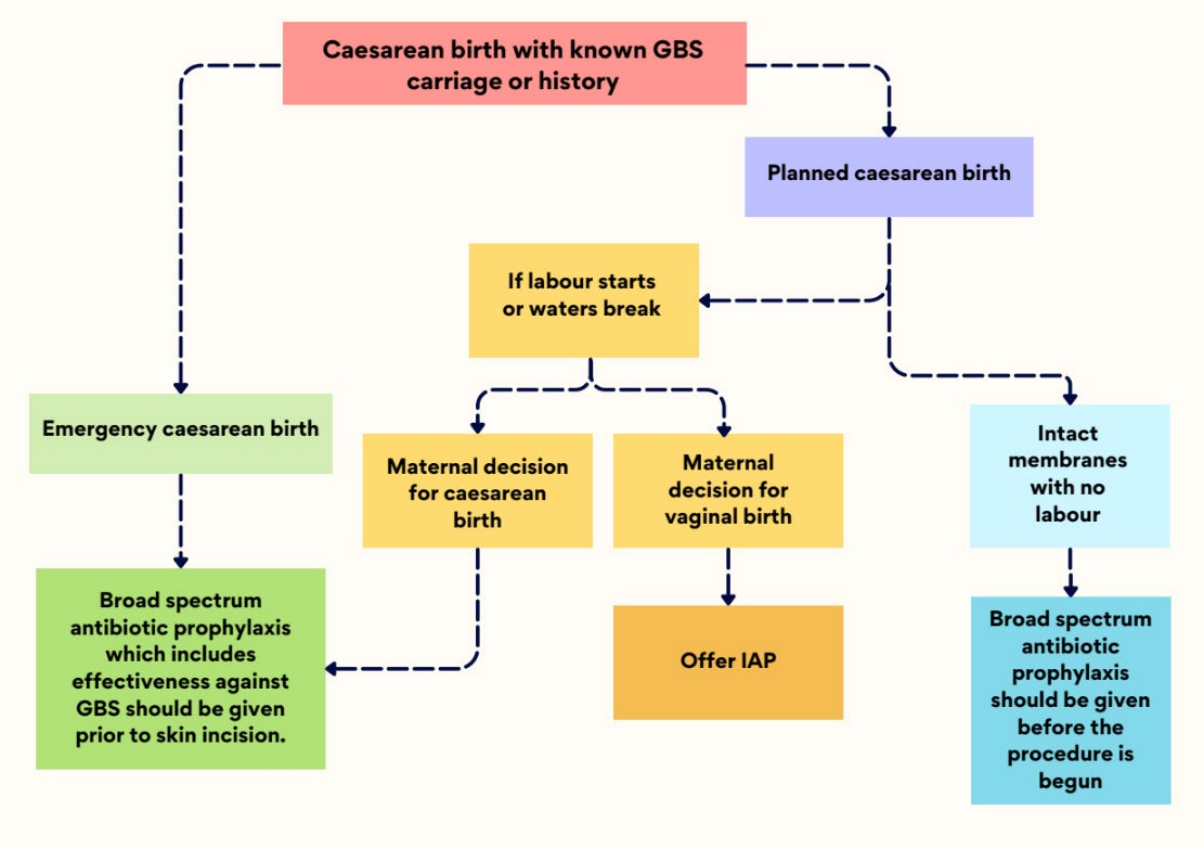

The Prevention of group B Streptococcal Disease in pregnancy, labour, neonatal and early infant life
6
IAP is recommended for all pregnant women and people in confirmed preterm labour, regardless of GBS status.
7
If known to be colonised with GBS, pregnant women and people with prelabour rupture of membranes (PROM) at term should be offered immediate intravenous antibiotic prophylaxis and induction of labour.
8
Pregnant women and people known to have previous GBS carriage should be offered the alternatives of bacteriological testing for GBS carriage from 35 +0 weeks gestation for women without a planned birth date OR 3-5 weeks prior to the planned birth date for those women with a planned induction of labour prior to 40 weeks' gestation; or IAP administration without testing. Repeat testing should be considered if more than 5 weeks elapse from testing without labour having occurred.
9
Detection of GBS on any bacteriological investigation during pregnancy suggests that the pregnant woman or person may be more likely than average to be a GBS carrier and should therefore be offered the alternatives of bacteriological testing for GBS carriage from 35 +0 weeks of gestation, or IAP administration without testing.
10
Women and people with PPROM at 34 +0 - 36 +6 weeks inclusive and unknown GBS status should be offered testing with a low vaginal-rectal swab sent for either GBS polymerase chain amplification and detection testing (PCR) or enriched culture medium (ECM) testing for the presence of GBS and offered immediate induction of labour if these tests confirm GBS carriage.

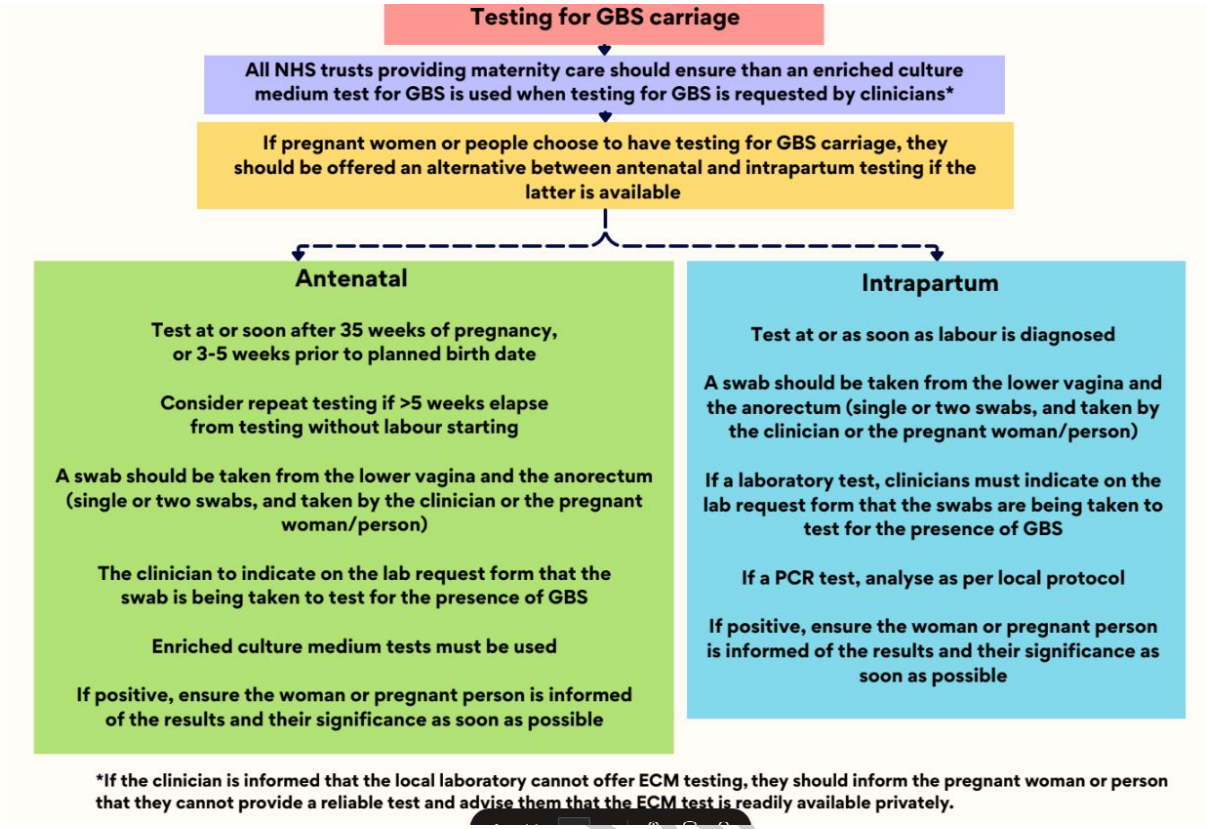
## Appendix E: Flowcharts

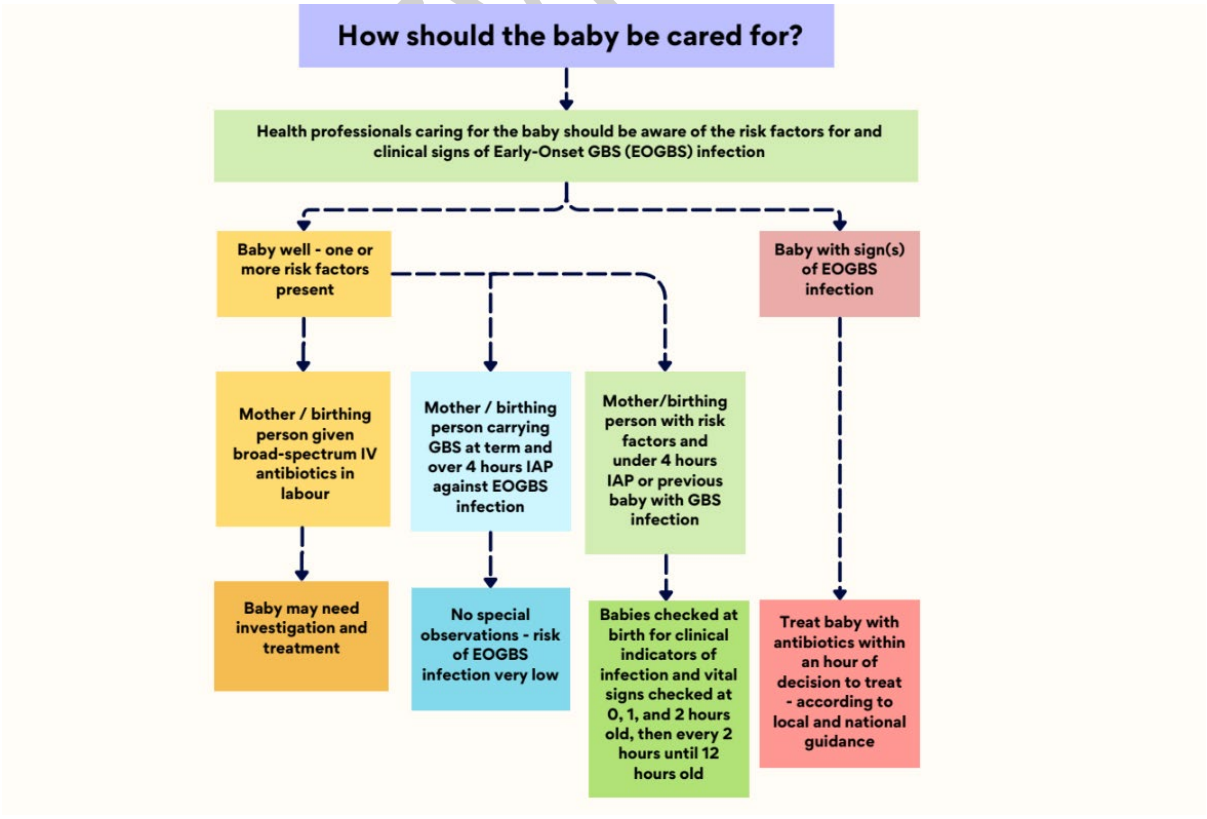



Intravenous Antibiotic Prophylaxis (IAP) in labour
Give intravenous antibiotics as soon as possible once labour diagnosed
No reported allergy to penicillin
Penicillin-allergic women/birthing person without a history of severe reaction
Penicillin-allergic women/birthing person with a severe allergy
Benzylpenicillin 3g, then 1.5g 4-hourly until birth
Cefuroxime 1.5g loading dose, then 750mg 8-hourly is a suitable alternative
Vancomycin 1g every 12 hours
Clindamycin is not recommended because of high resistance levels
IV antibiotics for suspected chorioamnionitis
Give intravenous antibiotics as soon as possible once labour diagnosed
No reported allergy to penicillin
Penicillin-allergic women/birthing people without a history of severe reaction
Penicillin-allergic women/birthing person with a severe allergy
IV broad-spectrum antibiotic effective against GBS and Gram -ve organisms, eg amoxicillin plus gentamicin and metronidazole
A cephalosporin (e.g. cefuroxime or cefotaxime) plus gentamicin* and metronidazole.
Vancomycin plus gentamicin and metronidazole.
*Use local antibiotic susceptibility and resistance data to determine whether gentamicin should be given along with a cephalosporin and metronidazole.


Caesarean birth with known GBS carriage or history
Planned caesarean birth
If labour starts or waters break
Emergency caesarean birth
Maternal decision for caesarean birth
Maternal decision for vaginal birth
Intact membranes with no labour
Broad spectrum antibiotic prophylaxis which includes effectiveness against GBS should be given prior to skin incision.
Offer IAP
Broad spectrum antibiotic prophylaxis should be given before the procedure is begun


Testing for GBS carriage
All NHS trusts providing maternity care should ensure than an enriched culture medium test for GBS is used when testing for GBS is requested by clinicians*
If pregnant women or people choose to have testing for GBS carriage, they should be offered an alternative between antenatal and intrapartum testing if the latter is available
Antenatal
Test at or soon after 35 weeks of pregnancy, or 3-5 weeks prior to planned birth date
Consider repeat testing if >5 weeks elapse from testing without labour starting
A swab should be taken from the lower vagina and the anorectum (single or two swabs, and taken by the clinician or the pregnant woman/person)
The clinician to indicate on the lab request form that the swab is being taken to test for the presence of GBS
Enriched culture medium tests must be used
If positive, ensure the woman or pregnant person is informed of the results and their significance as soon as possible
Intrapartum
Test at or as soon as labour is diagnosed
A swab should be taken from the lower vagina and the anorectum (single or two swabs, and taken by the clinician or the pregnant woman/person)
If a laboratory test, clinicians must indicate on the lab request form that the swabs are being taken to test for the presence of GBS
If a PCR test, analyse as per local protocol
If positive, ensure the woman or pregnant person is informed of the results and their significance as soon as possible
*If the clinician is informed that the local laboratory cannot offer ECM testing, they should inform the pregnant woman or person that they cannot provide a reliable test and advise them that the ECM test is readily available privately.


How should the baby be cared for?
Health professionals caring for the baby should be aware of the risk factors for and clinical signs of Early-Onset GBS (EOGBS) infection
Baby well - one or more risk factors present
Baby with sign(s) of EOGBS infection
Mother / birthing person given broad-spectrum IV antibiotics in labour
Mother / birthing person carrying GBS at term and over 4 hours IAP against EOGBS infection
Mother/birthing person with risk factors and under 4 hours IAP or previous baby with GBS infection
Baby may need investigation and treatment
No special observations - risk of EOGBS infection very low
Babies checked at birth for clinical indicators of infection and vital signs checked at 0, 1, and 2 hours old, then every 2 hours until 12 hours old
Treat baby with antibiotics within an hour of decision to treat - according to local and national guidance

This guideline was produced on behalf of the Royal College of Obstetricians and Gynaecologists by: **Professor PJ Steer FRCOG, London; Dr C Battersby FRCPCH, London; Professor P Heath FRCPCH, London; Mrs J Plumb FRCOG, Haywards Heath; Ms A Stanley, Haywards Heath; Professor KF Walker MRCOG, Nottingham.**

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The final version is the responsibility of the Guidelines Committee of the RCOG.

The guideline will be considered for update 3 years after publication, with an intermediate assessment of the need to update 2 years after publication.

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The Royal College of Obstetricians and Gynaecologists produces guidelines as an educational aid to good clinical practice. They present recognised methods and techniques of clinical practice, based on published evidence, for consideration by obstetricians and gynaecologists and other relevant health professionals. The ultimate judgement regarding a particular clinical procedure or treatment plan must be made by the doctor or other attendant in the light of clinical data presented by the patient and the diagnostic and treatment options available.

This means that RCOG Guidelines are unlike protocols or guidelines issued by employers, as they are not intended to be prescriptive directions defining a single course of management. Departure from the local prescriptive protocols or guidelines should be fully documented in the patient's case notes at the time the relevant decision is taken.