Audit of current practice in preventing early-onset neonatal group B streptococcal disease in the UK

First report

March 2015
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Acknowledgements

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## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>EOGBS</td>
<td>early-onset neonatal group B streptococcal disease</td>
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<tr>
<td>g</td>
<td>grams</td>
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<td>GBS</td>
<td>group B streptococcus</td>
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<tr>
<td>GBSS</td>
<td>Group B Strep Support, a UK charity that aims to offer information and support to families affected by GBS, to inform health professionals about how EOGBS can be prevented, and to support research into EOGBS prevention</td>
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<tr>
<td>HES</td>
<td>Hospital Episode Statistics</td>
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<tr>
<td>IAP</td>
<td>intrapartum antibiotic prophylaxis (against early-onset neonatal group B streptococcal disease)</td>
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<tr>
<td>ICD-10</td>
<td><em>International Statistical Classification of Diseases and Related Health Problems 10th Revision</em></td>
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<tr>
<td>MIS</td>
<td>Maternity Information Systems project, Royal College of Obstetricians and Gynaecologists</td>
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<td>MLU</td>
<td>midwifery-led unit</td>
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<tr>
<td>NHS</td>
<td>National Health Service</td>
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<td>NICE</td>
<td>National Institute for Health and Care Excellence</td>
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<td>RCM</td>
<td>Royal College of Midwives</td>
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<td>RCOG</td>
<td>Royal College of Obstetricians and Gynaecologists</td>
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<tr>
<td>ROM</td>
<td>rupture of membranes</td>
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<td>UK NSC</td>
<td>UK National Screening Committee</td>
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Alongside midwifery unit
Care for women with straightforward pregnancies during labour and birth. Alongside midwifery units are situated in the same hospital or the same site as an obstetric unit, with access to obstetric, neonatal or anaesthetic care on site. If obstetric care is required, transfer is usually by trolley, bed or wheelchair to the obstetric unit. Midwives have primary professional responsibility for labour care.1,2

Freestanding midwifery unit
Care for women with straightforward pregnancies during labour and birth. Freestanding midwifery units are not situated on the same site as an obstetric unit or neonatal unit. Diagnostic and treatment medical services, including obstetric, neonatal and anaesthetic care, are not available immediately. Midwives have primary professional responsibility for labour care.1,2

Hospital Episode Statistics
Hospital Episode Statistics is the national warehouse of data for all episodes of care received at hospitals in the National Health Service. Data are collected on all inpatient admissions, outpatient appointments and Accident & Emergency Department attendances.

Obstetric unit
Care for low- to high-risk women, provided by a team in hospital. Diagnostic and treatment medical services, including obstetric, neonatal and anaesthetic care, are available on site. Obstetricians have primary professional responsibility for women at high risk of complications during labour and birth, and for women who develop complications during labour and birth.1,2

Selective testing (for group B streptococcus carriage during pregnancy)
Testing of some pregnant women for group B streptococcus carriage based on the presence of selective (risk) factors.

Universal screening (for group B streptococcus carriage during pregnancy)
Screening of all pregnant women for group B streptococcus carriage as part of routine maternity care.
Foreword

This report on current practice in preventing early-onset neonatal group B streptococcal disease (EOGBS) in the UK is an important contribution to efforts in maternity services on reducing neonatal infections. Group B streptococcus (GBS), or Streptococcus agalactiae, is the most common cause of severe infection in babies during the first three months of life. Although EOGBS is rare, the mortality rate associated with the infection is high (approximately 5% to 10%). While babies with the disease may also develop long-term complications, such as cerebral palsy, deafness, blindness and learning difficulties, relatively little is known about the long-term effects of EOGBS. National guidelines on the topic have been developed which recommend a risk-based approach to EOGBS prevention. Maternity services should follow these guidelines, including the RCOG Green-top Guideline No. 36 (2003, 2012). As the audit spanned across six components, the findings will be presented in two reports. In this first report, we present the results from a survey of all NHS obstetric units in the UK and analyses of maternity data. We are encouraged that almost all obstetric units have a written protocol for preventing EOGBS and provide written information on GBS to patients. However, it is of concern that much of this information is not provided by guideline-making bodies but by a charity that campaigns for all women to be offered testing for GBS carriage at 35 to 37 weeks of pregnancy. This position is inconsistent with national guidelines.

The RCOG guidelines for GBS-specific intrapartum antibiotic prophylaxis (IAP) continue to be well adhered to. However, we found lower reported adherence for the RCOG guidelines for broad-spectrum IAP. This finding may not necessarily indicate inconsistent practice but may reflect participants’ interpretation of the survey question, which emphasised GBS-specific IAP. Nevertheless, we identified discrepancies in reported practice from obstetricians and midwives working in the same unit, and between units. This includes the practice of selective, swab-based testing in pregnant women in over half of units, which is contrary to RCOG guidance. The Medical Director should work with the Lead Clinician to ensure that good practice is adhered to and audited regularly.

We also describe our feasibility study of using existing maternity data for active surveillance of EOGBS. Rates of EOGBS calculated using Hospital Episode Statistics (HES) were two to three times higher than rates previously estimated using national surveillance of laboratory reporting. Our estimates may include false cases that could not be excluded due to limitations in clinical coding of data in HES. In the second part of the study, data from eight NHS providers were analysed as part of the RCOG Maternity Information Systems pilot project. Fields on GBS were poorly completed but many other data fields were highly complete. Given this finding, resources such as a national maternity care database and a national maternity audit may provide essential information for monitoring EOGBS, other neonatal infections and for additional quality improvement purposes.

This report highlights the need to improve the consistency of preventive care for EOGBS in UK maternity units. In the second report from the audit, to be published later in 2015, we will describe findings on midwifery-led care, patient information on GBS infection, local protocols on preventing EOGBS and the influence of patient risk factors on clinical decision making. Drawing from all components of the audit, we will then make recommendations on improving adherence to guidelines and practice.

Anne Mackie, Director, UK National Screening Committee
David Richmond, President, Royal College of Obstetricians and Gynaecologists

March 2015
Executive summary

This audit on current practice in preventing early-onset neonatal group B streptococcal disease (EOGBS) was commissioned by the UK National Screening Committee and launched in 2013. Its aims were to investigate the implementation of the Royal College of Obstetricians and Gynaecologists (RCOG) Green-top Guideline No. 36 in NHS obstetric units, examine variations in preventive care for EOGBS across the UK, and identify areas for improving adherence to the Guideline and practice. The UK National Screening Committee also funded the previous RCOG audit on the prevention and management of GBS disease in obstetric units across the UK (2007). Two of the six components of the audit feature in this report: the survey of obstetric units; and the analysis of maternity data. The remaining four components will be addressed in the second report that will be published later in 2015: a survey of midwifery-led units; review of local protocols for preventing EOGBS; review of patient information on GBS infection; and case vignettes to examine the impact of risk factors on practice. In the second report, we will make recommendations on improving adherence to guidelines and practice.

Current practice

In the survey of obstetricians and midwives in 190 eligible NHS units across the UK, there were inconsistent responses within and between units to questions about obstetric practice. Survey responses were received from at least one of two participants from 84.7% of units.

- Most obstetric units reported having a written protocol for preventing EOGBS (99.4%) and provided written patient information on GBS (94.4%).
- The most frequently reported sources of information on GBS infection provided to patients was the UK charity Group B Strep Support (GBSS), which includes information on the GBSS campaign for universal GBS screening, and the RCOG (in 37.5% and 36.8% of units, respectively). A detailed review of patient information will be presented in the second report.
- Universal screening of all pregnant women is not recommended by the UK National Screening Committee or the RCOG, reflected by few units (3.7%) reporting this practice. Selective testing for GBS carriage during pregnancy is also not recommended by either organisation, yet over half of units (55.9%) offered selective, swab-based testing to pregnant women guided by risk factors or maternal request.
- The RCOG recommends a risk-based approach and advises that intrapartum antibiotic prophylaxis (IAP) should be offered to pregnant women with at least one of five clinical indications: GBS-specific IAP for a previous baby with invasive GBS infection, GBS bacteriuria in the current pregnancy, or vaginal swab positive for GBS in the current pregnancy; and broad-spectrum IAP for pyrexia (above 38 °C) in labour or chorioamnionitis. The survey demonstrated that IAP was offered to women according to the RCOG advice in most units, with greater reported adherence for GBS-specific IAP than broad-spectrum IAP.
- However, it was also reported that IAP was offered for indications not supported by the RCOG. For example, at least one respondent in 41.2% of the units reported that GBS-specific IAP was offered to women with preterm prelabour rupture of membranes. According to the 2010 RCOG Green-top Guideline No. 44, these women should have received prophylactic antibiotics for 10 days after diagnosis of preterm prelabour rupture of membranes.
- It is a concern that there is a discrepancy between the RCOG Guideline (above) and the National Institute for Health and Care Excellence (NICE) (2012) guidance that IAP for early-onset neonatal infections should be considered for women with preterm prelabour rupture of membranes.
In addition the RCOG, supported by evidence from the Oracle II study, does not advocate the use of antibiotics in women with preterm labour (less than 37 weeks of gestation) and intact membranes, yet this practice was reported to occur in 15.0% of units.

**Analysis of maternity data**

Existing patient-level data from two sources were applied to explore the feasibility of using currently available maternity data for active surveillance of EOGBS in England and to measure the incidence of EOGBS. We used Hospital Episode Statistics (HES) to identify all live births in NHS hospitals in England between April 2004 and March 2012.

- The estimated rate of EOGBS in these hospitals was 1.2 to 1.4 cases per 1000 live births. This rate is at least double to treble that of earlier estimates and likely to be attributable to the coding of suspected but unconfirmed cases in HES records. We also reviewed maternity information systems data from eight NHS providers for all births between April 2012 and March 2013, as part of the RCOG Maternity Information Systems (MIS) pilot project. Data were collected in the MIS pilot for indicator development and service evaluation, and used in this audit to determine the quality and content of clinical and administrative data collected by maternity services.

- We found that data fields on GBS were poorly completed in local maternity information systems.
- However, given the high completeness (up to 100%) of many other data fields in this database, there is potential to improve the completeness and range of data fields about GBS for building a national database on EOGBS, and other areas in maternity care. A key example of such a database is the Maternity Services Data Set, while a national maternity audit may also provide essential information for active surveillance of neonatal infections.

**Recommendations**

We found that adherence to the RCOG recommendations for GBS-specific IAP has remained stable since the first RCOG (2007) audit, but there continue to be variations in practice. There were discrepancies in responses from obstetricians and midwives working in the same unit and differences between units in the reported use of, and reasons for, testing for GBS carriage during pregnancy. Based on these findings, we make the following recommendations:

1. Medical Directors of NHS hospital trusts should ensure that local guidelines on prevention of EOGBS in obstetric units are reviewed regularly and that they reflect national guidelines and are fit for purpose.
2. Medical Directors of NHS hospital trusts should ensure that information on GBS provided to patients in obstetric units is reviewed regularly and that it reflects national recommendations.
3. Reviews of practice on preventing EOGBS and other neonatal infections should be regularly undertaken in all obstetric units to ensure high-quality and consistent care.
4. Guidance on non-GBS-specific indications for prophylaxis (such as the use of broad-spectrum antibiotics) should continue, supported by evidence.
5. National guidelines, including those published by the RCOG, must be clear, coherent and consistent with other guidance.
6. Inconsistencies in practice or knowledge about EOGBS prevention among staff in the same unit or provider should be challenged, and education and communication between all staff improved.
This is the first report from the audit of current practice in preventing early-onset neonatal group B streptococcal disease (EOGBS) in the UK. The report presents the results from two of the six components of the audit: the survey of NHS obstetric units in the UK; and analysis of routinely collected NHS maternity data. The remaining four components will be addressed in the second and final report (publication later in 2015). In this introductory chapter, the background and rationale for the current audit are explained. The second chapter provides an overview of the audit, while the third and fourth chapters feature the results of the two audit components.

1.1 Group B streptococcal disease

Group B streptococcus (GBS) or *Streptococcus agalactiae* is the most common cause of severe infection in babies during the first three months of life. GBS disease can be defined as early-onset (before seven days old) or late-onset (7 to 90 days old). EOGBS is most often caused by transmission from mother to baby around the time of birth. Late-onset GBS disease is more commonly caused by infection from other sources, acquired in hospital or in the community.

1.1.1 Early-onset neonatal group B streptococcal disease

In the UK, between 5% and 30% of pregnant women are colonised with GBS, but for most of these women there are no complications to themselves or their babies. EOGBS typically occurs within the first 24 hours of life (90% of cases) and accounts for approximately 30% to 50% of neonatal infections. The rate of infection varies by the presence of individual risk factors, but the incidence of EOGBS in the UK is estimated to be at least 1 case per 2000 live births, with a mortality rate between 5% and 10%. This equates to between 350 and 400 cases and between 25 and 40 neonatal deaths due to EOGBS per year. There is a lack of evidence on morbidity due to EOGBS, but infected babies can develop meningitis, sepsis and pneumonia, and can experience long-term complications such as cerebral palsy, deafness, blindness and learning difficulties.

1.1.2 Preventing early-onset neonatal group B streptococcal disease

Screening of all pregnant women for GBS carriage, or selective (risk-based) testing as part of routine care, occurs in many countries such as the USA, Australia, Canada and Sweden. The UK National Screening Committee (UK NSC) reviewed the national policy for preventing EOGBS in 2003, 2008 and 2012, and concluded that in the UK, it is inappropriate to introduce universal screening in pregnant women. Instead, a risk based approach is in place, and the Royal College of Obstetricians and Gynaecologists (RCOG) recommends the use of intrapartum antibiotic prophylaxis (IAP) in women who are at increased risk of exposing their baby to maternal GBS around the time of birth, with at least one of the following risk factors:

- previous baby with invasive GBS infection (GBS-specific IAP)
- GBS bacteriuria in the current pregnancy (GBS-specific IAP)
- vaginal swab positive for GBS in current pregnancy (GBS-specific IAP)
- pyrexia (above 38 °C) in labour (broad-spectrum IAP with GBS cover)
- chorioamnionitis (broad-spectrum IAP with GBS cover).

The RCOG advises against adopting the following practices:

- routine bacteriological screening of all pregnant women for antenatal GBS carriage
- testing for GBS or the administration of IAP to women in whom GBS carriage was detected in a previous pregnancy.
• antenatal treatment with benzylpenicillin
• GBS-specific antibiotic prophylaxis in women with any of the following presentations:
  o undergoing planned caesarean section in the absence of labour and with intact membranes
  o with term prelabour rupture of membranes, unless there is known GBS colonisation in which case immediate induction of labour and IAP should be offered
  o in established preterm labour with intact membranes, unless there is known GBS colonisation
  o with preterm rupture of membranes (to be managed according to the RCOG Green-top Guideline No. 44 and the NICE Clinical Guideline CG149).6,7

1.2 The first RCOG audit
During 2005 and 2006, the RCOG led an audit on the prevention and management of GBS disease in obstetric units across the UK.5 The first RCOG audit consisted of three components:
• an evaluation of international and national guidelines on preventing early-onset GBS disease
• review of local clinical protocols on preventing neonatal GBS disease
• survey of obstetric units to evaluate practice on preventing neonatal GBS disease against the RCOG Guideline.

The audit found that the majority of obstetric units (78%) had a documented risk-based IAP strategy.28 Yet there continues to be variation in practice, with inconsistent adherence to local policies and the RCOG Green-top Guideline No. 36.5,28 However, there is a lack of information about the nature and extent of this variation, and appropriateness of preventive care.

Since the first audit, the RCOG issued a revised edition of its GBS disease guideline in 2012.3 The updated guidance broadly reflects the first (2003) version of the Guideline, with the exception of more prescriptive advice for IAP in women with an incidental diagnosis of GBS carriage (for example, urine sample during routine antenatal assessment) and pyrexia during labour.3,4 NICE also published clinical guidance on the use of antibiotics for early-onset neonatal infection in the same year.7 Similar to findings from the Netherlands, a 2013 review of EOGBS in England and Wales did not show any reduction in the incidence of EOGBS after the RCOG Guideline was introduced in 2003.29,30
2 The new RCOG audit

Given the need for up-to-date data about care, the UK NSC suggested ‘a formal audit’ of practice on preventing neonatal GBS disease and to establish the extent that the updated RCOG Guideline is implemented across the UK.  

2.1 Aims of the audit

The current audit was intended to provide a comprehensive picture of current practice and policy on preventing EOGBS in the UK, taking into account recommendations from the first RCOG audit and the RCOG 2012 revised Guideline. 

The three aims of the audit were to:

1. Investigate the implementation of the 2012 RCOG Green-top Guideline No. 36 in obstetric units in the UK
2. Examine variation in preventive care for EOGBS in the UK
3. Identify areas for improving Guideline adherence and practice.

2.2 Structure of the audit

Typically, recommendations from a guideline or standard of practice form the basis of an audit tool. This instrument would then be used in obstetric units to assess their practice by review of sequential births. However, there are methodological limitations to patient-level audits. First, implementing an audit where data on individual births are collected in each obstetric unit would place a considerable burden on hospital staff. Second, significant input would be required nationally to coordinate and manage data collected in each unit. Third, the results would be affected by variation in completeness of case ascertainment and data quality between units.

Taking these factors into consideration, an alternative method that combined data collection, without requiring patient data, and analyses of existing data was considered to be more appropriate and feasible. This pragmatic approach capitalised on the experience gained from the first audit and reduced the burden of data collection on hospital staff. The one-year project began in October 2013. The project group consisted of a lay adviser, clinicians, academic researchers and advisers from the RCOG.

2.3 Audit topics

The first RCOG audit in 2007 had a broader remit that included the evaluation of EOGBS prevention and management. The current audit has a narrower focus on improving the prevention of EOGBS, and does not include the original topic of ‘management of neonates at risk of EOGBS’. These changes reflect the expectations of the audit’s funder, the UK NSC.

There were four key topics of investigation in this audit, as follows.

1. **Written protocol on preventing early-onset neonatal group B streptococcal disease**
   
   Locally relevant guidelines that reflect national recommendations support staff to deliver consistently good-quality care. Written protocols with defined standards of care are essential for monitoring the performances of individual clinicians, hospital units and providers (hospital trusts and health boards).

2. **Written patient information on group B streptococcus infection**

   The General Medical Council recommends that doctors provide patients with 'information
they want or need to know in a way they can understand’. Written patient information is a useful resource for patients to aid decision making and to reinforce, and expand on, information provided during their hospital appointment. However, for this material to be of value to patients, the information must be accurate and presented in accessible formats.

3. Testing for group B streptococcus carriage in pregnant women

Although universal screening and selective testing for GBS carriage during pregnancy are not recommended in the UK, there is known variation in practice. It is important to understand the extent of, and the reasons for, deviations from recommended practice so that all pregnant women in the UK receive appropriate care.

4. Intrapartum antibiotic prophylaxis against early-onset neonatal group B streptococcal disease

The RCOG recommends that IAP should be offered to pregnant women with at least one of five clinical indications. However, the 2007 RCOG audit highlighted that women with other presentations are offered GBS-specific IAP. Despite the introduction of national guidelines, inconsistent practice continues. A detailed description of how GBS-specific antibiotic prophylaxis is currently used will help to standardise care and inform future revisions of national and local policies on preventing EOGBS.

2.4 Components of the audit

The four key topics are investigated over six components. The results of the first two components are presented in the first report:

1. Survey of all NHS obstetric units in the UK
2. Analysis of routinely collected maternity data.

Included in the second report:

3. Survey of NHS midwifery-led units in the UK
4. Review of local protocols for preventing EOGBS
5. Review of patient information on GBS infection
6. Case vignettes to examine the impact of risk factors on practice.

Work on the six components was staggered over 2013 and 2014. Details of each component will be described in the relevant sections of this report and the second report (publication expected later in 2015). Data collected in this audit were stored centrally at the RCOG. Microsoft Excel 2013 and Stata (version 11) were used for data management and analyses.
3 Survey of obstetric units in the UK

Although all obstetric units (NHS and independent sector) in the UK were invited to take part in the first RCOG audit, a poor response was received from independent sector units.²⁸ As only 0.4% of births in England take place in private hospitals or obstetric units, we excluded non-NHS obstetric units from the current audit.² This exclusion improved the homogeneity of systems and processes investigated, and improved the generalisability of our findings to NHS obstetric units.

3.1 Sample of obstetric units

The unit of measurement in this audit was the obstetric unit, as practice and/or policy in units within a hospital trust or health board may differ. In addition, unit-level analyses will facilitate comparisons with the first RCOG audit and other published data.⁵ For clarity, most results in this report are presented at the level of the obstetric unit, although data were collected from obstetricians and midwives. Discrepancies between the responses of obstetricians and midwives are highlighted in the Results section (3.5), where appropriate.

The first RCOG audit had a sample of 227 obstetric units in the UK.²⁸ Since the audit was completed, the number of obstetric units has decreased while the number of midwifery-led units (MLUs), both alongside and freestanding, continue to increase.³² There were 190 obstetric units at 156 providers in the UK that were eligible to participate in the current audit (that is, NHS-funded units that were open to patients during February 2014). A list of participating providers and hospitals can be found in Appendix 1.

3.2 Recruitment of participants

An up-to-date contact list of clinical directors for maternity services at all eligible NHS providers was extracted from the RCOG Members database and used for all audit communication, along with additional local contacts identified during the audit. We asked the clinical directors to act as local coordinators, including the nomination of a senior midwife and a consultant obstetrician at each obstetric unit to participate in the audit. Nominated staff were sent instructions by email, including a weblink to the survey. Based on the results from the first audit, we anticipated a response rate of 80% from obstetric units in the UK.²⁸

3.3 Development of survey questions

Survey questions were adapted from the 2007 RCOG audit,⁵ relevant published literature and input from the project group. Feedback from participants of the pilot study was considered in creating the final set of questions for the full survey. The online pilot (Appendix 2) and full survey (Appendix 3) of obstetric units were created and administered using the SurveyMonkey platform. The surveys were also available as Microsoft Word files.

3.4 Pilot study

A pilot study was used to determine the clinical appropriateness and clarity of the survey material. The study was also used to check the consistency and validity of responses, the feasibility and resource requirements of the audit, and solutions to potential logistical problems. We sent an email to all clinical directors in November 2014, inviting their obstetric units to participate in this phase of the audit. The pilot consisted of an online survey of current practice in preventing
EOGBS (Appendix 2), which consisted of 19 questions and a free text comments section, and a review of local protocols on preventing EOGBS. The results of the pilot review of protocols will be presented in the second audit report, along with the results of the full review of protocols.

3.4.1 Eligibility of obstetric units
We excluded MLUs (alongside and freestanding) from the pilot study and did not consider care relating to home births. A separate feasibility study of MLUs (brief online survey) was conducted, and will be described in the second audit report. Obstetric units from all four countries of the UK were included in the pilot and participation in the pilot did not bar units from taking part in the full survey.

3.4.2 Implementing the pilot study
Clinical directors (and clinical leads) who agreed to participate in the pilot study were provided with instructions by email a week before the pilot study began in December 2013. They were asked to nominate a lead senior midwife and a lead consultant obstetrician at each obstetric unit to complete the online pilot survey, to submit the current protocol on preventing EOGBS electronically and to provide additional data (contact details of the nominated staff and the numbers of obstetric, midwifery and private units). Nominated participants were then sent instructions by email for completing the pilot survey. A standardised form was used by the audit lead to obtain feedback from participants by telephone. Multiple attempts were made to contact each participant.

3.4.3 Pilot survey results
The pilot study ran for two weeks in December 2013. Five providers in England (n = 2), Scotland (n = 1), Wales (n = 1) and Northern Ireland (n = 1) participated in the pilot. Eleven participants from six obstetric units submitted data. Feedback from 10 participants was obtained during December 2013 and January 2014. Of the 10 participants, 10 reported that the pilot survey was easy to navigate, 10 that the question order made sense, and 9 that the questions were clear.

3.4.4 Recommendations for the full survey
The pilot participants suggested the following improvements to the survey:
- clearer instructions that no additional material is required to complete the survey (n = 5)
- clearer instructions that the survey should be completed in one sitting (n = 2)
- clearer information about how long the survey will take to complete (n = 2)
- clearer information about the time periods (months) that the survey refers to (n = 1).

Pilot participants suggested two new questions for inclusion in the full survey. These questions asked about the incidence of late-onset GBS and the source(s) of data on estimated cases. The project group rejected both questions because data to answer the questions were not collected or not readily available in most units.

3.5 Results of the full survey of NHS obstetric units
3.5.1 Participants
Participants of the full survey were first contacted by email on 3 February 2014 and were sent email reminders up to four times between February and March 2014. Responses to the survey of obstetric units (Appendix 3) were received between February and May 2014. All 156 providers (190 eligible obstetric units) were contacted.

Responses were excluded if they were:
- incomplete (n = 7)
- answers for the hospital trust rather than obstetric unit (responses for more than one unit) (n = 3)
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• participants who were not obstetricians or midwives (managerial or clinical governance roles) \( (n = 4) \).

After exclusions (including units excluded for more than one reason), there were valid responses from 161 obstetric units (Appendix 1):

• Two surveys (from an obstetrician and a midwife) were received from 131 units.
• One survey (from an obstetrician or a midwife) was received from 30 units.
• No survey was received from 29 units.

A total of 292 eligible surveys were received: 145 from midwives and 147 from obstetricians. Almost all surveys were completed by the intended participants: senior midwives employed at bands 7 or 8 (88.3%, \( n = 128/145 \)) and consultant obstetricians (98.6%, \( n = 145/147 \)).

3.5.2 Local protocols

On the first of the four topics of the audit, all except one of the participating obstetric units were reported to have a written protocol for preventing EOGBS (99.4%, \( n = 160/161 \)). However, disagreement about the availability of a protocol was found in 10.7% (\( n = 14/131 \)) of obstetric units with completed surveys from an obstetrician and a midwife. In 12 of these units, the obstetrician reported that a protocol was available while the midwife reported that a protocol was currently in development (\( n = 2 \)), not available at all (\( n = 6 \)) or did not know whether a protocol was available (\( n = 4 \)).

3.5.3 Written patient information

On the second of the four audit topics, the majority of participating obstetric units (94.4%, \( n = 152/161 \)) were reported to provide written information. Table 3.1 shows that GBSS was the most frequently reported source of written information on GBS infection provided to patients in participating obstetric units (37.5%, \( n = 57/152 \)). Original or adapted material from the RCOG was also frequently reported as a source of information provided to women (36.8%, \( n = 56/152 \)). A number of units reported that written material was developed by the provider rather than an external source (9.9%, \( n = 15/152 \)).

Table 3.1 Types of written information about GBS provided to women (\( n = 152 \) obstetric units)

<table>
<thead>
<tr>
<th>Type of written information</th>
<th>( n )</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>GBSS material</td>
<td>57</td>
<td>37.5</td>
</tr>
<tr>
<td>Adapted RCOG patient information leaflet</td>
<td>35</td>
<td>23.0</td>
</tr>
<tr>
<td>RCOG (2013) patient information leaflet on GBS infection in newborn babies</td>
<td>21</td>
<td>13.8</td>
</tr>
<tr>
<td>Trust-developed material</td>
<td>15</td>
<td>9.9</td>
</tr>
<tr>
<td>Other</td>
<td>12</td>
<td>7.9</td>
</tr>
<tr>
<td>Information from multiple sources</td>
<td>11</td>
<td>7.2</td>
</tr>
<tr>
<td>Don’t know</td>
<td>1</td>
<td>0.7</td>
</tr>
</tbody>
</table>

In units that reported providing written information about GBS infection to women, 94.7% of units (\( n = 144/152 \)) offered material to some patients only. The most common reasons obstetricians and midwives gave for providing written information selectively (\( n = 222 \)) were:

• known GBS carriage in current pregnancy – test positive or incidental finding (60.8%, \( n = 135/222 \))
• women with at least one RCOG clinical indication for IAP (32.0%, \( n = 71/222 \)).

Fewer obstetricians (51.9%, \( n = 56/108 \)) than midwives (69.3%, \( n = 79/114 \)) reported that written information was provided to women with known GBS carriage in their current pregnancy. In contrast, more obstetricians (38.9%, \( n = 42/108 \)) than midwives (25.4%, \( n = 29/114 \)) reported that information was provided to patients with at least one RCOG indication for IAP.
Most units (90.7%, n = 146/161) reported that they did not provide written information about private testing for GBS carriage to pregnant women.

### 3.5.4 Testing for group B streptococcal carriage in pregnant women

In the third of the four audit topics, routine (universal) or selective testing for GBS carriage in pregnant women was reported to occur in 59.6% of participating obstetric units (n = 96/161):

- England and Isle of Man, n = 81 obstetric units
- Wales, n = 3 units
- Scotland, n = 9 units
- Northern Ireland, n = 3 units.

The RCOG does not support universal bacteriological screening of pregnant women for antenatal GBS carriage, which is reflected in few obstetric units reporting that testing for GBS carriage was offered to all pregnant women (3.7%, n = 6/161). There has been little change in the proportion of units that offer universal screening, compared with previous studies: 3% of units in 1999, 4% in 2001, 3% in 2007, and 4% in 2014.

Just over half of the units (55.9%, n = 90/161) were reported to offer swab-based testing to some women according to selective factors. In addition, there were conflicting responses from nearly half of units (47.3%) where responses were provided by an obstetrician and a midwife (n = 62/131), with one participant reporting that testing was not offered at all while the other participant indicated that either universal screening or selective testing was available.

#### 3.5.4.1 Factors for selective testing for GBS carriage

The RCOG does not recommend testing for GBS or the administration of IAP to women in whom GBS carriage was detected in a previous pregnancy. Despite this guidance, the reason most frequently reported by participants for selective testing (n = 115 units) was GBS carriage in a previous pregnancy (15.7%, n = 18/115). Other reported reasons for testing were:

- vaginal discharge in the current pregnancy (14.8%, n = 17/115)
- preterm labour (12.2%, n = 14/115)
- maternal request (9.6%, n = 11/115).

All reported reasons for testing based on selective factors are listed in Appendix 4.

Among units where universal screening or selective testing was reported to occur, 76.0% (n = 73/96) were reported to sometimes or always accept maternal requests for testing. This included 25 units that were reported to always accept maternal requests.

#### 3.5.4.2 Timing of testing for GBS carriage

The reported timing of testing for GBS carriage in pregnancy varied considerably (Figure 3.1). Few time ranges were reported by more than one participant. The most frequently reported time period was between 36 and 37 weeks of gestation (n = 9/123), followed by between 35 and 37 weeks (n = 8/123), and between 12 and 42 weeks (n = 6/123). After excluding participants who reported that only urine specimens were tested in their unit and participants who did not know the types of specimens tested (n = 20), the most frequently reported timing of testing remained between 36 and 37 weeks of gestation (n = 8/103) (Figure 3.1).

Compared with the 2007 RCOG audit, similarly low numbers of midwives (n = 2 in 2014 versus n = 1 in 2007) and obstetricians (n = 5 versus n = 4) reported testing between 35 and 37 weeks of gestation. Testing for GBS carriage in pregnancy is not recommended in the UK. However, in the USA where screening is recommended nationally, the Centers for Disease Control and Prevention recommends that testing for GBS takes place between 35 and 37 weeks of gestation to ensure the best predictive value (true positive cases) of maternal GBS colonisation at birth.

Determining whether practice was consistent with national guidelines in units where swab-based
selective testing was reported to be offered, by examining the associations between reported reasons for selective testing and the timings of testing, was not possible because of the design of the survey.

3.5.4.3 Test specimens, method and availability of results

There was wide variation in the sites from which samples were taken to test for GBS carriage in pregnant women (n = 123). Urine was the most frequently reported type of sample, compared with vaginal, endocervical, rectal and other swabs (25.2%, n = 31/123). These reports are likely to represent incidental findings during routine antenatal assessments or tests for urinary infections. The RCOG does not recommend taking vaginal swabs during pregnancy without a clinical indication. Despite this guidance, over half of reported specimens (56.9%, n = 70/123) for testing GBS carriage in pregnant women were vaginal, including self-swab. Where there is indication to test, Public Health England advises that vaginal and rectal swabs are used to identify GBS colonisation in pregnant women. Reflecting this advice, 8.9% of reported specimens (n = 11/123) were a combination of lower vaginal and rectal, while a further 3.3% of reported swabs (n = 4/123) were endocervical.

There were few units where responses were received from an obstetrician and a midwife and where testing by vaginal swabs (including self-swab) was reported to be offered (n = 9). Among these units, the same sample sites were reported by both participants in just over half of the units (55.6%, n = 5/9). Compared with the previous RCOG audit, fewer midwives (18.8% versus 34.4%) and obstetricians (24.6% versus 31.1%) reported the use of high vaginal swabs to test for GBS carriage in pregnant women but this sample site was still frequently reported (21.5%, n = 26/121).

Where testing was reported to occur, one or both participants reported that non-enriched culture medium was used in 61.5% of units (n = 59/96). The testing method was unknown in 32.5% of units (n = 27/83) with one participant or where both participants provided the same response.
In 76.9% of units \((n = 10/13)\) where testing was reported to occur and there were responses from an obstetrician and a midwife, one participant reported that non-enriched culture medium was used while the other participant reported the use of enriched culture medium or didn’t know the testing method.

In two-thirds of units \((66.7\%, n = 64/96)\), one or both participants reported that results were available between 24 and 48 hours after testing. The availability of results within 24 hours was only reported by at least one participant from 14.6% of units \((n = 14/96)\).

### 3.5.5 Antibiotic prophylaxis

On the fourth and final audit topic, the reasons for offering antibiotic prophylaxis against EOGBS and the drugs administered were explored.

#### 3.5.5.1 Timing of antibiotic prophylaxis

The RCOG does not support antenatal treatment with benzylpenicillin for GBS detected incidentally before the onset of labour.\(^3\) Antenatal antibiotic (drug not specified) prophylaxis against EOGBS was reported to be offered in fewer than five units. In another five units, antibiotic prophylaxis was reported to not be offered at all. Most obstetric units \((95.0\%, n = 153/161)\) offered antibiotic prophylaxis against EOGBS during the intrapartum period, as reported by 95.2% of obstetricians \((n = 140/147)\) and 84.8% of midwives \((n = 123/145)\).

Conflicting reports were received from a small number of units with responses from an obstetrician and a midwife. In nine units, there were reports that prophylaxis was offered versus not offered at all. In eight other units, there were conflicting reports about the timing of prophylaxis (antenatal versus intrapartum periods).

#### 3.5.5.2 Indications for intrapartum antibiotic prophylaxis

The 2007 RCOG audit reported that more obstetric units followed RCOG guidelines for preventing EOGBS compared with previous studies that measured adherence.\(^5\) For the two clinical situations with comparable data from previous studies, almost all obstetric units continued to offer IAP to pregnant women who had a previous baby with neonatal GBS disease or with an incidental finding of GBS in their current pregnancy (Table 3.2).

The 2007 RCOG audit reported that more obstetric units followed RCOG guidelines for preventing EOGBS compared with previous studies that measured adherence.\(^5\) For the two clinical situations with comparable data from previous studies, almost all obstetric units continued to offer IAP to pregnant women who had a previous baby with neonatal GBS disease or with an incidental finding of GBS in their current pregnancy (Table 3.2).

<table>
<thead>
<tr>
<th>RCOG recommended clinical indication</th>
<th>1999</th>
<th>2001</th>
<th>2007</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Obstetric units ((n))</td>
<td>Offer IAP (%)</td>
<td>Obstetric units ((n))</td>
<td>Offer IAP (%)</td>
</tr>
<tr>
<td>Previous baby with neonatal GBS disease</td>
<td>207</td>
<td>85</td>
<td>203</td>
<td>95</td>
</tr>
<tr>
<td>Incidental finding of GBS in current pregnancy</td>
<td>207</td>
<td>86</td>
<td>203</td>
<td>95</td>
</tr>
</tbody>
</table>

(Adapted from Royal College of Obstetricians and Gynaecologists, 2007.\(^5\))

At least one participant in most units \((70.2\%, n = 113/161)\) identified all five RCOG clinical indications for IAP. However, in almost half of these units \((46.9\%, n = 53/113)\) where responses were received from an obstetrician and a midwife, the indications were only identified by one of the two participants. More obstetricians \((66.4\%, n = 93/140)\) than midwives \((51.2\%, n = 63/123)\) reported all five RCOG indications for IAP. Obstetricians and midwives most frequently reported confirmed GBS bacteriuria, previous baby with neonatal GBS disease and vaginal swab positive for GBS in the current pregnancy (Table 3.3).

In line with the RCOG recommendation that IAP is offered to women with GBS bacteriuria identified during the current pregnancy, at least one participant reported this practice from 98.0%
of units \((n = 150/153)\) where women with an incidental finding of GBS bacteriuria or urinary tract infection (due to GBS) in their current pregnancy were reported to be offered IAP.\(^3\) Table 3.3 shows that this finding was reported by similar percentages of obstetricians (98.6%) and midwives (96.7%).

The RCOG guidelines state that IAP should be offered to women who had a previous baby with neonatal GBS disease. Most units (98.7%, \(n = 151/153\)) were reported to offer IAP to this patient group and this response was received from more obstetricians (97.9%) than midwives (94.3%) (Table 3.3).\(^3\)

The RCOG does not support taking of vaginal swabs during pregnancy unless there is a clinical indication to do so.\(^3\) However, if GBS is detected on a vaginal swab during pregnancy, IAP should be offered.\(^3\) In line with this recommendation, at least one participant in 97.4% of units \((n = 149/153)\) (95.0% of obstetricians and 91.9% of midwives) where IAP was offered stated that women who have a vaginal swab positive test result for GBS in their current pregnancy were offered IAP (Table 3.3).

For women with pyrexia in labour (above 38 °C), the RCOG recommends that broad-spectrum antibiotic therapy (including an agent active against GBS) should be offered to treat potential infection.\(^3\) In 86.3% of units offering IAP \((n = 132/153)\) (76.4% of obstetricians and 76.4% of midwives), women with intrapartum pyrexia (above 38 °C) were reported to be offered prophylaxis (Table 3.3). Relatively fewer participants reported that they would offer IAP for intrapartum pyrexia and chorioamnionitis compared with the other three RCOG indications. This finding may be because of the wording of the survey question, which asked about GBS-specific IAP, hence some participants may have omitted to report on broad-spectrum IAP with GBS cover for these two indications.

The RCOG recommends that if chorioamnionitis is suspected, broad-spectrum antibiotic therapy (including an agent active against GBS) should be offered to treat maternal infection, and induction of labour should be considered.\(^3\) In accordance with this guideline, 83.7% of units \((n = 128/153)\) (72.9% of obstetricians and 63.4% of midwives) stated that IAP was offered to women with suspected or confirmed chorioamnionitis (Table 3.3).

Although the RCOG does not recommend that GBS-specific antibiotic prophylaxis be offered to women undergoing planned caesarean section (if the planned mode of delivery is prelabour lower segment caesarean section with intact membranes),\(^3\) 13.1% of units \((n = 20/153)\) (3.6% of obstetricians and 12.2% of midwives) were reported to offer IAP to this patient group (Table 3.4).

The RCOG also does not recommend that GBS-specific antibiotic prophylaxis be offered to women with preterm prelabour rupture of membranes but at least one participant in 41.2% of units \((n = 63/153)\) (24.3% of obstetricians and 32.5% of midwives) stated that it was offered to this patient group (Table 3.4). However, NICE has published guidance on antibiotics for early-onset neonatal infection that recommends consideration of IAP for this group.\(^7\)

Similarly, the RCOG does not recommend that IAP is offered to women in preterm labour with intact membranes with no risk factors for GBS, supported by evidence from the Oracle II study.\(^8\) Despite this, at least one participant in 15.0% of units \((n = 23/153)\) (10.7% of obstetricians and 8.9% of midwives) where IAP was reported to be offered stated that prophylaxis was offered to women in this clinical situation (Table 3.4).

### Table 3.3 RCOG clinical indications for IAP \((n = 263)\) (multiple choice)

<table>
<thead>
<tr>
<th>Clinical indication</th>
<th>Obstetrician ((n = 140))</th>
<th>Midwife ((n = 123))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidental finding of GBS bacteriuria in current pregnancy</td>
<td>138 (98.6%)</td>
<td>119 (96.7%)</td>
</tr>
<tr>
<td>Previous baby with neonatal GBS disease</td>
<td>137 (97.9%)</td>
<td>116 (94.3%)</td>
</tr>
<tr>
<td>Vaginal swab positive for GBS in current pregnancy</td>
<td>133 (95.0%)</td>
<td>113 (91.9%)</td>
</tr>
<tr>
<td>Intrapartum pyrexia (&gt;38 °C)</td>
<td>107 (76.4%)</td>
<td>94 (76.4%)</td>
</tr>
<tr>
<td>Chorioamnionitis</td>
<td>102 (72.9%)</td>
<td>78 (63.4%)</td>
</tr>
</tbody>
</table>

IAP = intrapartum antibiotic prophylaxis.
Drugs for intrapartum antibiotic prophylaxis

In accordance with the RCOG guidelines, at least one participant in all units where IAP was reported to be offered stated that benzylpenicillin was the first-line drug ($n=153$).

### 3.5.6.1 Benzylpenicillin regimen

Adherence to the RCOG guidelines to administer 3 g intravenous benzylpenicillin as soon as possible after the onset of labour and 1.5 g 4-hourly until delivery was only reported by at least one participant in 63.4% of units ($n=97/153$). Compared with the 2007 RCOG audit, fewer obstetricians (48% versus 61%) and midwives (49% versus 68%) reported that the recommended regimen was followed.

In only 39.9% of units ($n=61/153$) where benzylpenicillin was reported to be offered for GBS-specific IAP did at least one participant report that the drug was given at least 2 hours before delivery, which is the minimum time specified in the RCOG guidelines to maximise treatment efficacy. A greater percentage of midwives (41.8%) than obstetricians (26.6%) reported a minimum administration time of 2 hours, but some participants reported that no minimum length of time before delivery was required for administering IAP (16.4%, $n=39/238$).

### 3.5.6.2 Alternative drug regimen

Reflecting the RCOG guidelines, at least one participant in all but one unit where IAP was reported to be offered to pregnant women against EOGBS stated that clindamycin (alone or in conjunction with another drug) was offered as an alternative to the first-line drug ($n=152/153$). Compared with the 2007 RCOG audit, more midwives (94% versus 91%) and obstetricians (97% versus 86%) reported the use of clindamycin as an alternative antibiotic regimen.

### 3.5.7 Comments from participants

Participants of the survey acknowledged that there was variation in practice and suggested that clearer guidance would be helpful to standardise care within and between hospitals. Support for universal screening was also reported, and that IAP should be offered to women who are not considered to be at increased risk according to the current RCOG Guideline (for example, GBS carriage in previous pregnancy). Differing opinions about the definition of appropriate preventive care was reported to hinder development of local guidelines. Participants also suggested that constraints on services may contribute to practice that is not in line with national guidance.
3.5.8 Summary

In the survey of obstetric units, we examined all four topics of the audit: the availability of a written protocol on preventing EOGBS, written patient information on GBS, testing for GBS carriage in pregnant women and IAP against EOGBS. Almost all participating units were reported to have a written protocol for preventing EOGBS (99.4%). In the second report of this audit, we will present the results of a review of local protocols, including detailed assessments of provider-level guidance to clinical staff.

We found that most units (94.4%) were reported to provide written information about GBS to patients, with material from GBSS most frequently cited (37.5%). The GBSS material includes recommendations, inconsistent with national guidelines, for testing of GBS carriage in pregnant women at low risk of their babies having EOGBS and IAP for women at higher risk. Few units (3.7%) were reported to offer universal screening for GBS carriage to pregnant women but despite the RCOG guidance on withholding GBS-specific testing, over half of units (55.9%) were reported to offer selective, swab-based testing to some women. Some of these tests may be due to maternal requests as 76% of units that offered testing were reported to accept some or all maternal requests for testing.

The majority of units were reported to provide IAP based on the five RCOG clinical indications. Adherence to recommendations for GBS-specific IAP was reportedly greater than for broad-spectrum IAP. The percentage of units reported to offer IAP ranged from 83.7% (chorioamnionitis) to 98.7% (previous baby with neonatal GBS disease). Other indications for GBS-specific IAP reported by participants but not supported by the RCOG were preterm prelabour rupture of membranes (41.2%) and preterm labour (<37 weeks of gestation) with intact membranes (15.0%). However, preterm prelabour rupture of membranes is included in the 2012 NICE Clinical Guideline CG149 and thus highlights a discrepancy between two sources of national guidance. While all units were aware of the guidance on providing benzylpenicillin as the first-line drug for GBS-specific IAP, participants from far fewer units (63.4%) reported compliance with this regimen.

The results from the first audit and current audit were relatively similar for the three RCOG indications for GBS-specific IAP. There has been a slight decrease in reports of GBS-specific IAP being offered to pregnant women who had a previous baby with neonatal GBS disease (decrease from 100% to 98% among obstetricians and 100% to 94% among midwives, respectively). In the current audit, more midwives reported that IAP was offered to women with a vaginal swab positive test result for GBS in their current pregnancy (increase from 80% to 92%). However, compared with the first audit, fewer obstetricians and midwives reported that broad-spectrum IAP was offered for pyrexia during labour (decrease from 87% to 76% and 82% to 76%, respectively). Comparable data from the first audit were unavailable for suspected or confirmed chorioamnionitis.

Although the RCOG does not support IAP for women who have planned caesarean sections, at least one participant in 13.1% of units reported that this patient group was offered prophylaxis. This finding may be due to different interpretations of the survey question, which referred to GBS-specific IAP, but some participants may have included antibiotics to prevent wound infections in their answers. In line with RCOG guidance for withholding IAP, in the current audit fewer obstetricians and midwives reported that IAP was offered to women who had GBS carriage in a previous pregnancy (decrease from 75% to 26% and 70% to 29%, respectively) or who are in preterm (less than 37 weeks of gestation) labour (decrease from 43% to 21% and 31% to 20%, respectively).

There was marked disagreement between obstetricians and midwives on some elements of practice and policy. For example, more obstetricians (66.4%) than midwives (51.2%) reported all five RCOG indications for IAP. Also, in 10.7% of obstetric units with completed surveys from an obstetrician and a midwife, the obstetrician reported that a protocol was available while the midwife reported that there was no protocol or did not know whether a protocol was available.
4 Analyses of maternity data in England

4.1 Introduction
The first GBS surveillance study in the UK and Ireland (2000–01) found an incidence of 0.50 cases of EOGBS per 1000 live births (95% CI 0.48 to 0.56) in England. The most recent national study on the incidence of EOGBS in the UK only included data up to 2010, therefore more up-to-date information on GBS is needed. Routinely collected national and local data may provide alternative sources of information for patient-level data on EOGBS and other neonatal infections. These data sets could also be used for improving the quality of care, research and audit, service commissioning, policy revision and potentially for public health surveillance. While the use of existing data is often more resource-efficient than primary data collection, especially for health service research, a potential limitation is that they may lack certain clinical information and other data of interest to the current study. In England, the rollout of the Maternity Services Data Set has been delayed, with central submissions not expected to begin until May 2015. In the absence of the Maternity Services Data Set, we used two existing routinely collected data sources (see below) to:

- describe the incidence of EOGBS in England
- describe the incidence of neonatal infections in England
- explore the feasibility of using currently available maternity data for active surveillance of EOGBS in England.

4.2 Data sources
4.2.1 Hospital Episode Statistics
Hospital Episode Statistics (HES) is a national data warehouse of patient contact with hospitals providing care within the NHS in England. Information is available on inpatient admissions, outpatient appointments and Accident & Emergency Department attendances. These data are collected monthly by the Health and Social Care Information Centre and are primarily used administratively for payment purposes. Diagnoses are coded using the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) and procedures using the Office of Population, Censuses and Surveys Classification of Interventions and Procedures 4th revision. An advantage of HES data is that individual patients can be identified by their unique HESID, by which their use of health services can be tracked. This data source is also useful for investigating temporal trends.

4.2.2 RCOG Maternity Information Systems project
The RCOG launched a pilot project on Maternity Information Systems (MIS) in 2012. In the pilot, routinely collected maternity data were requested from 17 NHS providers in the UK for all registerable births (live births at any gestation and stillbirths after 24 weeks of gestation) during the financial year 2012/13 (1 April 2012 to 31 March 2013). The MIS project therefore represented an opportunity to assess the uniformity of maternity data collected across the UK and also to explore the feasibility of ‘secondary uses’ of data that are currently collected to investigate neonatal infections. MIS may potentially capture data across the entire maternity care pathway, from the antenatal to the postnatal periods.
4.3 Incidence of EOGBS in England, Hospital Episode Statistics

4.3.1 Methods
ICD-10 diagnosis codes were used to identify potential cases of neonatal infections, including EOGBS (Appendix 5). As there is no ICD-10 code for GBS diagnosis, EOGBS was identified by proxy using the ICD-10 code P36.0 for ‘sepsis of newborn due to streptococcus, group B’ and where the first record of this code was within six days of the birth date. Patient records from financial years 2004/05 to 2011/12 (1 April 2004 to 31 March 2012) were analysed. Cases of live births were included in the analyses if a relevant diagnosis code was recorded up to and including 90 days after birth.

4.3.2 Results
There were 5,090,827 live births recorded in HES during 2004/05 to 2011/12. Out of these births, 156,111 babies (31 per 1000 live births) were diagnosed in hospital with a neonatal infection within 3 months (up to and including 90 days) after birth.

The incidence of sepsis due to GBS was 1.3 per 1000 live births. The number of cases of early- and late-onset GBS (defined as diagnosed before 7 days after birth and between 7 and 90 days after birth, respectively) is provided in Figure 4.1. The incidence of EOGBS fluctuated between 1.2 and 1.4 cases per 1000 live births during the study period.

4.3.3 Summary
The incidence of GBS in England estimated using HES (1.2 to 1.4 cases per 1000 live births) is likely to be an overestimation of the true national incidence as we were unable to exclude false-positive (suspected but unconfirmed) cases. We found approximately double to treble the rate reported in the first GBS surveillance study (2000–01). Our analyses were hindered by the lack of a specific ICD-10 code for GBS diagnosis (early- or late-onset). Validation of the results was restricted by limited clinical data in HES, especially on laboratory tests and results, and timing of diagnoses.
4.4 Incidence of EOGBS in England, RCOG Maternity Information Systems project

4.4.1 Methods

Data were accessed in April 2014 from eight NHS providers in the UK as part of the RCOG MIS project. Participating providers were asked to submit data in a standardised Microsoft Excel spreadsheet. Data items about the mother and baby requested from participating providers included:

- maternal demographics (e.g. date of birth and ethnicity)
- obstetric history (e.g. parity and gravida)
- antenatal care (e.g. complications and pre-existing clinical conditions)
- labour and delivery (e.g. delivery location, birthweight, gestational age, Apgar score and neonatal procedures and diagnoses)
- discharge (e.g. date and time of death, date of discharge).

There were two data fields relating specifically to GBS: screening for GBS (yes or no) and antibiotic treatment for GBS (yes or no).

4.4.2 Results

Records were available for 52,192 live births at the eight providers in total. Overall, the completeness of data fields was good. At least 90% of records from each trust contained valid data for key fields including mother’s date of birth (100% complete), gravida (99.2%), parity (97.8%), intended delivery location (99.9%), birthweight (99.9%), gestational age (99.8%) and Apgar score at 5 minutes (98.0%).

The recording of GBS screening was less complete. Only two of the eight providers had entered data into their MIS about whether GBS screening took place. Three other providers indicated that data about GBS may be recorded as free text in their information system. Two providers submitted data on antibiotic prophylaxis against EOGBS (yes/no response to whether prophylaxis was provided to a patient).

4.4.3 Summary

The two fields on screening and antibiotic treatment for GBS were poorly completed in the records from the eight providers participating in the MIS project. However, other fields on maternal demographics, obstetric history and maternity care up to discharge from hospital had a high level of completeness. This indicates that there is potential to improve the completeness of all data fields, with the addition of fields specifically on GBS diagnosis to support future investigations.
5 Conclusions

5.1 Contextualising the findings

This report features the findings from two of the six components of the audit. Results from the survey of midwifery-led units, review of local protocols for preventing EOGBS, review of patient information on GBS infection and case vignettes to examine the impact of risk factors on practice will be required to inform the provision of feedback to individual participating units, and to fully address the aims of the audit.

In the survey of obstetric units and analysis of maternity data, we found the following.

- Most obstetric units (99.4%) had a written protocol for preventing EOGBS.
- Most obstetric units (94.4%) provided written patient information on GBS. Material from GBSS was provided as often as material from the RCOG (in 37.5% and 36.8% of units, respectively).
- More than half of units (55.9%) offered selective, swab-based testing to some women, while only 3.7% of units offered universal screening.
- Most units offered IAP for RCOG indications for prophylaxis, ranging from 83.7% of units for chorioamnionitis to 98.7% of units for previous baby with neonatal GBS disease. Compared with the other three RCOG indications, there were relatively fewer reports of IAP being offered for intrapartum pyrexia and chorioamnionitis. This may be due to how participants interpreted the survey question and may reflect practice consistent with the RCOG Guideline, which advocates the use of broad-spectrum IAP rather than GBS-specific IAP for these two indications. Nevertheless, adherence to the RCOG guidance on the indications for GBS-specific IAP has remained stable since the first RCOG audit.
- IAP was offered for clinical scenarios not supported by the RCOG, such as preterm prelabour rupture of membranes (41.2%) – which reflects the NICE guideline on the use of antibiotics for early-onset infections – and preterm labour with intact membranes (15.0%).
- While there was good agreement between obstetricians and midwives in general, more obstetricians than midwives (66.4% compared with 51.2%, respectively) reported all five RCOG indications for IAP. In 10.7% of units with two participants, only the obstetrician reported that a written protocol for preventing EOGBS was available.

In the analysis of maternity data, we found the following.

- The estimated rate of EOGBS using HES was 1.2 to 1.4 cases per 1000 live births between the financial years 2004/05 and 2011/12. These rates are much higher than previous national estimates and may be due to the inability to eliminate suspected but unconfirmed cases in our analyses because of coding in HES.
- Data fields on GBS are currently poorly completed in local maternity information systems but there is potential to use these systems to build a national database on maternity care given the high level of completeness (up to 100%) of many key fields.

By incorporating multiple components into the audit, in the absence of a patient-level investigation, we compensated for weaknesses inherent to individual data sources and audit techniques. Nevertheless, some methodological considerations may affect the interpretation of the results and these are outlined in the following sections.

5.2 Strengths and limitations of the survey of obstetric units

The results from the survey could be considered to be representative of NHS obstetric units in the UK given the high response rate (84.7% of eligible obstetric units). Since the first audit, variation in
practice has continued despite a revision of the RCOG Guideline and even though most obstetric units (99.4%) are reported to have a local protocol on the prevention of EOGBS.

Some answers may reflect expected rather than actual practice but the presence and extent of response bias could not be measured. There may have also been non-random differences between participants and non-participants. The survey in the first RCOG audit had a response rate of more than 70%.\(^5\) As a higher response rate was achieved in this audit (84.7%), it is even less likely that the results were affected by sampling bias. Variation in intra-unit care may not be captured in the survey. Responses from a maximum of two staff (nominated by the clinical director for maternity services) may not reflect the knowledge or practice of other staff in the obstetric unit.

Additionally, the interpretation of conflicting answers to a question from a midwife and an obstetrician working in the same unit is not straightforward. These answers may reflect true disparities in care but they may also highlight differences in awareness of national and local guidelines. Improvements to education and communication about EOGBS prevention could be facilitated by the creation of a local GBS guideline group, with representation from obstetric, midwifery, microbiology and neonatal staff. The survey of MLUs and case vignette components of the audit will provide additional insights into reported practice. These components will feature in the second report of the audit to be published later in 2015.

5.3 Strengths and limitations of the analyses of maternity data

Secondary uses of routinely collected data rely on the completeness and quality of the original data.\(^41\) As HES is used for financial payments, the quality of the data is relatively good compared with other hospital administrative data. Unfortunately, no ICD-10 diagnosis code exists for GBS infection, therefore the estimated incidence of EOGBS was based on proxy diagnoses for sepsis due to GBS and resulted in higher rates compared with estimates based on confirmed diagnoses.\(^16\) Data from laboratory tests and procedures used to differentially diagnose EOGBS were unavailable and so we could not restrict the study sample to confirmed cases of infection only.

A second surveillance study of GBS in the UK and Ireland was launched in April 2014, and will provide an updated estimate of incidence.\(^42\) The study will provide further evidence on trends in the rate of EOGBS in England and Wales over time, and establish which GBS serotypes are most frequently accountable for EOGBS.\(^39,42\) Future audit and research using HES should consider triangulation with data from primary care, such as from the Clinical Practice Research Datalink, to improve the validity of case identification for EOGBS and other neonatal infections.

Despite the voluntary nature of participation in the RCOG MIS project, data have been submitted from 15 providers (as of August 2014). These data cover approximately 105 000 births in the UK, equivalent to 14% of all births in the UK during 2012.\(^43,44\) This brief review suggests that there is an existing infrastructure at individual obstetric units to collect, process and disseminate electronic maternity data. Furthermore, 88.2% of participating units of the survey of obstetric units were reported to have an electronic maternity information system.\(^43,44\)

The MIS project will facilitate the systematic recording of maternity data in the UK and help to identify data fields that merit future inclusion and efforts to improve completeness. It was not possible to address two of the three aims of the analyses using data from the MIS project (describe the incidence of EOGBS and the incidence of neonatal infections in England). Some providers already routinely collect information about GBS. With national and local support to improve the quality and range of data, a UK-wide electronic maternity information system could be used for active surveillance of EOGBS and other neonatal infections. One source of information may be the Maternity Services Data Set, but a national maternity audit may provide greater clinical detail, and more quickly, to support active surveillance.
5.4 Gaps in knowledge

More evidence is needed about the care women receive across the maternity pathway in the UK to refine the national policy on prevention of EOGBS, to standardise local guidelines and, ultimately, to reduce the incidence of the disease. Further development of electronic systems that capture information on maternal antibiotic use and neonatal clinical infections is to be encouraged.

Other issues are beyond the scope of this audit but warrant investigation. In particular, the care of neonates with suspected or confirmed EOGBS was examined in the first RCOG audit but the topic was not included in the current audit because of our narrower remit. As NICE guidelines on antibiotic use for preventing and treating early-onset neonatal infection were introduced in 2012, future audit and research should examine adherence to these guidelines, including the impact of local demands for postnatal and neonatal care on services. Not least, reviews of national guidelines must ensure that guidance from different organisations is consistent.

Data on home births were not captured in this audit. In 2012, 2.3% of births in England and Wales took place at home, accounting for over 16,700 births. With known variation in practice, the relationships between planned location of birth and antenatal to postnatal care should be explored, especially the interactions with patient choice and decisions about prophylaxis against neonatal infections.

5.5 Recommendations

1. Medical Directors of NHS hospital trusts should ensure that local guidelines on prevention of EOGBS in obstetric units are reviewed regularly and that they reflect national guidelines and are fit for purpose.

2. Medical Directors of NHS hospital trusts should ensure that information on GBS provided to patients in obstetric units is reviewed regularly and that they reflect national recommendations.

3. Reviews of practice on preventing EOGBS and other neonatal infections should be undertaken regularly in all obstetric units to ensure high-quality and consistent care.

4. Guidance on non-GBS-specific indications for prophylaxis (such as the use of broad-spectrum antibiotics) should continue, supported by evidence.

5. National guidelines, including those published by the RCOG, must be clear, coherent and consistent with other guidance.

6. Inconsistencies in practice or knowledge about EOGBS prevention among staff in the same unit or provider should be challenged, and education and communication between all staff improved.
References


42. Royal College of Paediatrics and Child Health. *Group B Streptococcal Disease in UK & Irish Infants Less Than 90 Days of Age*. [http://www.rcpch.ac.uk/GBS].


## Appendix 1

### List of participating providers

Providers and hospitals are listed by their status at the time of the audit. The list does not reflect provider changes since February 2014. For example, Barnet and Chase Farm Hospitals NHS Trust merged with Royal Free London NHS Foundation Trust in July 2014.

Hospitals shown in italics only participated in the pilot study or were excluded from the analyses for reasons reported in section 3.5.

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Appendix 2

Pilot survey of obstetric units

Background

Group B Streptococcal (GBS) disease is the most frequent cause of severe early-onset infection in newborns (<7 days old).

The Royal College of Obstetricians and Gynaecologists is undertaking an audit on improving the prevention of early-onset neonatal Group B Streptococcal (EOGBS) disease. This work is conducted in partnership with the London School of Hygiene and Tropical Medicine and funded by the UK National Screening Committee.

This questionnaire is about screening and managing GBS disease in pregnant women. Your answers will help us to evaluate current practice in preventing EOGBS disease and to identify areas for improving care. The results of the audit will be fed back to participating maternity units.

Your answers to this questionnaire will be treated confidentially. No data on individual participants or organisations will be published.

Instructions

We have asked your Clinical Director to nominate a senior midwife and consultant obstetrican to complete questionnaires in each maternity unit in your trust.

• The questionnaire has 20 questions and will take approximately 10 minutes to complete.
• Please answer the questions for your maternity unit, NOT your trust.
• Please answer all questions unless instructed to “Go to question XX”.
• You do not need to refer to other material to complete the questionnaire.
• The deadline for submitting the completed questionnaire is Friday 20th December 2013.

If you have problems completing this survey or if you have any questions about the audit, please contact Dr Carmen Tsang (GBS Audit Lead) at ctsang@rcog.org.uk or on 020 7927 2782 (N.B. this phone number is external to the RCOG).

Thank you for your help and support.
Professor Alan Cameron, FRCOG, Vice President (Clinical Quality) and Dr Rhona Hughes, FRCOG, Audit Clinical Lead.

GBS Audit, Office for Research and Clinical Audit, Royal College of Obstetricians and Gynaecologists, 27 Sussex Place, Regent’s Park, London NW1 4RG.

About you

1. What is the name of your trust?

2. What is the name of your maternity unit?
3. What is your job title/role?
   - a. Obstetrician
   - b. Midwife
   - c. Other (please specify)  

4. What grade are you employed at?

About your maternity unit

5. In the last 12 months, how many women delivered in your unit (all deliveries)? If you do not know the actual number of women, please give an estimated number.
   - a. Actual number
   - b. Estimated number (to nearest 500 women)

6. In the last 12 months, how many babies who were delivered in your unit developed early-onset GBS? If you do not know the actual number of babies, please give an estimated number.
   - a. Actual number
   - b. Estimated number

7. Where did you obtain the actual/estimated number of babies who were delivered in your unit and developed early-onset GBS (data source)?

Screening for Group B Streptococcal (GBS) disease
8. Do you routinely offer testing for GBS carriage to pregnant women?
- a. No
- b. Yes - Universal
- c. Yes - Selective, based on risk factors (please specify all risk factors below)
- d. Yes - Selective, based on other factors (please specify all factors below)

9. Do you routinely agree to maternal requests to test for GBS carriage in pregnancy?
- a. Yes - Always
- b. Yes - Sometimes
- c. No

10. When do you routinely test for GBS carriage in pregnancy (range in gestational weeks)?
Between (weeks) ____________ and (weeks) ____________
11. What specimens do you routinely take? (select all that apply)

- a. Lower vagina only
- b. Upper vagina only
- c. Whole vagina only
- d. Endocervical
- e. Rectum only
- f. Whole vagina and rectum
- g. Lower vagina and rectum
- h. Upper vagina and rectum
- i. Urine
- j. Vaginal self-swab
- k. Lower vagina and rectal self-swab
- l. Don't know
- m. Other (please specify)
12. Which method do you routinely use to test for GBS carriage?

- a. Routine (non-enriched) culture medium
- b. Enriched culture medium (ECM)
- c. Non-culture, "rapid" test (e.g. PCR or OIA)
- d. Don't know
- e. Other (please specify)

13. How quickly do you routinely receive results for GBS specimens (hours)?

Risk factors and antibiotic prophylaxis

14. If you offer antibiotic prophylaxis to pregnant women, when do you routinely offer it?

- a. Antenatally, irrespective of whether testing offered
- b. Antenatally, if test +ve or incidental finding of GBS in current pregnancy
- c. Intrapartum, irrespective of whether testing offered
- d. Intrapartum, if test +ve or incidental finding of GBS in current pregnancy
- e. Not offered at all

Risk factors and antibiotic prophylaxis (continued)
15. For which clinical situations do you routinely offer intrapartum antibiotic prophylaxis against EOGBS disease? (select all that apply)

- a. Previous baby with neonatal GBS disease
- b. GBS bacteriuria or urinary tract infection (due to GBS) in current pregnancy (determined incidentally)
- c. Vaginal swab positive for GBS in current pregnancy
- d. Vaginal discharge (in association with GBS) in current pregnancy
- e. Intrapartum pyrexia (>38 degrees °C)
- f. Chorioamnionitis (suspected or confirmed)
- g. Preterm labour (<35 weeks gestation)
- h. Preterm labour (<37 weeks gestation)
- i. Preterm labour (<37 weeks gestation) with intact membranes
- j. Preterm prelabour (<37 weeks gestation) rupture of membranes
- k. Preterm labour (<37 weeks gestation) rupture of membranes
- l. Term prelabour rupture of membranes
- m. Preterm (<37 weeks gestation) prolonged rupture of membranes (≥18 hours)
- n. Term prolonged rupture of membranes (≥18 hours)
- o. Preterm (<37 weeks gestation) prolonged rupture of membranes (≥24 hours)
- p. Term prolonged rupture of membranes (≥24 hours)
- q. Previous pregnancy with GBS carriage
- r. Planned caesarean delivery
- s. Maternal request
- t. Other (please specify)
16. Which drug do you routinely administer to pregnant women for IAP against EOGBS disease?

<table>
<thead>
<tr>
<th>a. Drug name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>b. Loading dose (quantity in g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>c. Maintenance dosage (quantity and frequency in g per hourly)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>d. Route</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>e. Minimum length of time before delivery that you administer this drug (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

17. What alternative drugs do you administer to pregnant women for IAP against EOGBS disease, e.g. if patient is allergic to your 1st line? (please list the names of ALL alternative drugs that you administer)

**Local protocol for prevention of early-onset Group B Streptococcal (EOGBS) disease**

18. Does your maternity unit have a written protocol for the prevention of early-onset Group B Streptococcal (EOGBS) disease?

- a. Yes
- b. No - Currently in development
- c. No
- d. Don't know

**Recording of data in your maternity unit**

19. Does your maternity unit have an electronic maternity information system (to collect data routinely for all patients in your unit)?

- a. Yes
- b. No - Currently in development
- c. No
- d. Don't know

**Additional comments**
20. Please provide any comments about this survey in the space below.

Pilot study task 2. Feedback from you

We are asking all pilot participants for feedback to help us improve the audit material (maximum 30 minutes required).

*21. Please provide the best phone number to reach you on, and some dates and times between now and Friday 20th December for us to call you and collect your feedback.

a. Telephone number

b. Option 1. Date, time (up to Friday 20th December)

c. Option 2. Date, time (up to Friday 20th December)

d. Option 3. Date, time (up to Friday 20th December)
Dear Colleague,

Group B Streptococcal (GBS) disease is the most frequent cause of severe early-onset infection in newborns (<7 days old).

The Royal College of Obstetricians and Gynaecologists is undertaking an audit on current practice in preventing early-onset neonatal Group B Streptococcal (EOGBS) disease. This work is conducted in partnership with the London School of Hygiene and Tropical Medicine, supported by the Royal College of Midwives and funded by the UK National Screening Committee.

This survey is about testing pregnant women for GBS carriage and prevention strategies against EOGBS disease in infants. Your answers will help us to evaluate current practice in preventing EOGBS disease and to identify areas for improving care. The results of the audit will be fed back to participating maternity units.

Your answers to this survey will be treated confidentially, individual participants will not be identified. All data collected in this audit will be treated in accordance to data management and security policies at the Royal College of Obstetricians and Gynaecologists and the London School of Hygiene and Tropical Medicine.

We asked your Clinical Director to nominate a senior midwife and a consultant obstetrician in each maternity (obstetrician-led) unit in your trust to individually complete the survey.

1. The survey has 24 questions.
2. It should take no more than 10 minutes to complete the survey.
3. You do not need to refer to other material to complete the survey.
4. You should be able to complete the survey in one sitting. If you leave the survey incomplete and return to it later, you may need to restart the survey from the beginning (depending on your internet browser’s cookie settings).
5. Please answer the questions for your maternity unit, NOT your trust.
6. Please try to answer all questions unless instructed to “Go to question...”.
7. The deadline for submitting the completed questionnaire is Friday 28th February 2014.

If you have problems completing this survey or have questions about the audit, please contact Dr Carmen Tsang (GBS Audit Lead) at GBSaudit@rcog.org.uk or on 020 7927 2782 (N.B. this phone number is external to the RCOG).

Thank you for your help and support.
Professor Alan Cameron, Vice President (Clinical Quality) and Dr Rhona Hughes, Audit Clinical Lead.

GBS Audit, Office for Research and Clinical Audit, Royal College of Obstetricians and Gynaecologists, 27 Sussex Place, Regent’s Park, London NW1 4RG.

About you

1. What is the name of your trust?

2. What is the name of your maternity unit?
3. What is your job title/role?
   - a. Obstetrician
   - b. Midwife
   - c. Other (please specify)

4. Data will be anonymised, individual participants will not be identified. What grade are you employed at?

About your maternity unit

5. You do not need any additional information to answer this question. If you do not know the actual number of women, please give an estimated number. How many women delivered in your unit (all deliveries) between 1st January and 31st December 2013?
   - a. Actual number
   - b. Estimated number (to nearest 500 women)

Written patient information

6. Do you provide written information about Group B Streptococcal (GBS) infection to patients?
   - a. Yes
   - b. No

Written patient information (continued)

7. What written information about Group B Streptococcal (GBS) infection do you provide to patients? (select all that apply)
   - a. RCOG patient information leaflet on Group B Streptococcus (GBS) infection in newborn babies (2013)
   - b. Adapted RCOG patient information leaflet on Group B Streptococcus (GBS) infection in newborn babies
   - c. Other (please specify)
8. Which patients do you provide written information about Group B Streptococcus (GBS) infection to?

- a. All patients
- b. Some patients

Written patient information (continued)

9. If you provide written information about Group B Streptococcus (GBS) infection to SOME patients only, which patients do you provide the material to? (select all that apply)

- a. Only patients with at least one clinical indication* for intrapartum antibiotic prophylaxis (IAP) against EOGBS disease according to the RCOG Guideline (2003, 2012) *previous baby with GBS infection, GBS bacteriuria in current pregnancy, vaginal swab positive for GBS in current pregnancy, pyrexia (>38°C) in labour, or chorioamnionitis
- b. Only patients with known GBS carriage (test +ve or incidental finding in current pregnancy)
- c. Other (please specify)

10. Do you give pregnant women written information about private testing for Group B Streptococcal (GBS) carriage?

- a. Yes
- b. No
11. Do you offer testing for Group B Streptococcal (GBS) carriage to pregnant women?
   - a. No
   - b. Yes - Universal
   - c. Yes - Selective, based on risk factors (please specify all risk factors below)
   - d. Yes - Selective, based on other factors (please specify all factors below)

12. Do you agree to maternal requests to test for Group B Streptococcal (GBS) carriage in pregnancy?
   - a. Yes - Always
   - b. Yes - Sometimes
   - c. No

13. When do you test for Group B Streptococcal (GBS) carriage in pregnancy (range in gestational weeks)?
   - Between (weeks) ____________________________
   - and (weeks) ____________________________
14. What specimens do you routinely take? (select all that apply)

- [ ] a. Lower vagina only
- [ ] b. Upper vagina only
- [ ] c. Whole vagina only
- [ ] d. Endocervical
- [ ] e. Rectum only
- [ ] f. Whole vagina and rectum
- [ ] g. Lower vagina and rectum
- [ ] h. Upper vagina and rectum
- [ ] i. Urine
- [ ] j. Vaginal self-swab
- [ ] k. Lower vagina and rectal self-swab
- [ ] l. Don't know
- [ ] m. Other (please specify)
15. Which method do you use to test for Group B Streptococcal (GBS) carriage?
   - a. Routine (non-enriched) culture medium
   - b. Enriched culture medium (ECM)
   - c. Non-culture, "rapid" test (e.g. PCR or OIA)
   - d. Don't know
   - e. Other (please specify)

16. How quickly do you receive results for Group B Streptococcal (GBS) specimens (hours)?

Risk factors and antibiotic prophylaxis

17. If you offer antibiotic prophylaxis to some or all pregnant women against EOGBS disease (e.g. because of previous baby with neonatal EOGBS disease), when do you routinely offer it?
   - a. Antenatal period
   - b. Intrapartum period
   - c. Not applicable - Not offered at all

Risk factors and antibiotic prophylaxis (continued)
18. For which clinical situations do you routinely offer intrapartum antibiotic prophylaxis (IAP) against EOGBS disease? (select all that apply)

- [] a. Previous baby with neonatal GBS disease
- [] b. GBS bacteriuria or urinary tract infection (due to GBS) in current pregnancy (determined incidentally)
- [] c. Vaginal swab positive for GBS in current pregnancy
- [] d. Vaginal discharge (in association with GBS) in current pregnancy
- [] e. Intrapartum pyrexia (>38 degrees °C)
- [] f. Chorioamnionitis (suspected or confirmed)
- [] g. Preterm labour (<35 weeks gestation)
- [] h. Preterm labour (<37 weeks gestation)
- [] i. Preterm labour (<37 weeks gestation) with intact membranes
- [] j. Preterm prelabour (<37 weeks gestation) rupture of membranes
- [] k. Preterm labour (<37 weeks gestation) rupture of membranes
- [] l. Term prelabour rupture of membranes
- [] m. Preterm (<37 weeks gestation) prolonged rupture of membranes (≥18 hours)
- [] n. Term prolonged rupture of membranes (≥18 hours)
- [] o. Preterm (<37 weeks gestation) prolonged rupture of membranes (≥24 hours)
- [] p. Term prolonged rupture of membranes (≥24 hours)
- [] q. Previous pregnancy with GBS carriage
- [] r. Planned caesarean delivery
- [] s. Maternal request
- [] t. Other (please specify)
19. Which drug do you routinely administer to pregnant women for intrapartum antibiotic prophylaxis (IAP) against EOGBS disease?

- **a. Drug name**
- **b. Loading dose (quantity in g)**
- **c. Maintenance dosage (quantity and frequency in g per hourly)**
- **d. Route**
- **e. Minimum length of time before delivery that you administer this drug (hours)**

20. What alternative drugs do you administer to pregnant women for intrapartum antibiotic prophylaxis (IAP) against EOGBS disease (e.g. if patient is allergic to your 1st line)? (please list the name(s) of ALL alternative drug(s) that you administer)

21. Does your maternity unit have a written protocol for the prevention of early-onset neonatal Group B Streptococcal (EOGBS) disease?

- **a. Yes**
- **b. No - Currently in development**
- **c. No**
- **d. Don’t know**

22. Does your maternity unit have an electronic maternity information system (to collect data routinely for all patients in your unit)?

- **a. Yes**
- **b. No - Currently in development**
- **c. No**
- **d. Don’t know**

Additional comments
23. Please provide comments about this survey in the space below.

Case vignettes

24. In the next few months, a subset of participants will be asked to complete some case vignettes (short case scenarios).
If you DO NOT want to participate in the case vignettes exercise, please select the box.

☐ a. I do NOT want to complete case vignettes

Survey completed

Thank you for completing the survey. We are grateful for your help and support on this audit.

Your answers to this survey will be treated confidentially, individual participants will not be identified. Results of the audit will be published in late 2014.

If you have any questions about this survey or the audit, please contact Dr Carmen Tsang (GBS Audit Lead), GBSaudit@rcog.org.uk or 020 7927 2782 (N.B. this phone number is external to the RCOG).

GBS Audit, Office for Research and Clinical Audit, Royal College of Obstetricians and Gynaecologists, 27 Sussex Place, Regent’s Park, London NW1 4RG.
Appendix 4

Selective factors for testing of GBS carriage in pregnant women reported in the survey of obstetric units

The table below shows all reported reasons for testing of GBS carriage, based on selective factors. Responses were received from at least one participant in 115 obstetric units. Multiple answers were allowed for the corresponding question in the survey of obstetric units.

<table>
<thead>
<tr>
<th>Selective factor</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>GBS carriage in previous pregnancy</td>
<td>18</td>
<td>15.7</td>
</tr>
<tr>
<td>Vaginal discharge in current pregnancy</td>
<td>17</td>
<td>14.8</td>
</tr>
<tr>
<td>Preterm labour</td>
<td>14</td>
<td>12.2</td>
</tr>
<tr>
<td>Maternal request</td>
<td>11</td>
<td>9.6</td>
</tr>
<tr>
<td>Preterm prelabour rupture of membranes</td>
<td>11</td>
<td>9.6</td>
</tr>
<tr>
<td>Previous baby with neonatal GBS disease</td>
<td>11</td>
<td>9.6</td>
</tr>
<tr>
<td>GBS in current pregnancy</td>
<td>10</td>
<td>8.7</td>
</tr>
<tr>
<td>Spontaneous rupture of membranes</td>
<td>10</td>
<td>8.7</td>
</tr>
<tr>
<td>Opportunistic testing not specifically for GBS</td>
<td>10</td>
<td>8.7</td>
</tr>
<tr>
<td>Preterm spontaneous rupture of membranes</td>
<td>9</td>
<td>7.8</td>
</tr>
<tr>
<td>Intrapartum pyrexia (&gt;38 °C)</td>
<td>7</td>
<td>6.1</td>
</tr>
<tr>
<td>Pelvic bleeding or discharge</td>
<td>7</td>
<td>6.1</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>6</td>
<td>5.2</td>
</tr>
<tr>
<td>Prelabour spontaneous rupture of membranes (prolonged or not prolonged)</td>
<td>5</td>
<td>4.3</td>
</tr>
<tr>
<td>Term spontaneous rupture of membranes, prolonged rupture of membranes, vaginal infection or bleeding, chorioamnionitis (suspected or confirmed), loss of previous pregnancy due to GBS, poor previous obstetric history, previous preterm labour, previous preterm prelabour rupture of membranes, previous chorioamnionitis, previous use of intrauterine device, sepsis, consultant preference</td>
<td>all &lt;5</td>
<td>&lt;4.4</td>
</tr>
</tbody>
</table>
**Appendix 5**

*ICD-10 codes for neonatal infections*

<table>
<thead>
<tr>
<th>ICD 10 code</th>
<th>Type of infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>A32</td>
<td>Listeriosis</td>
</tr>
<tr>
<td>A39</td>
<td>Meningococcal infection</td>
</tr>
<tr>
<td>A40</td>
<td>Streptococcal sepsis</td>
</tr>
<tr>
<td>A41</td>
<td>Other sepsis</td>
</tr>
<tr>
<td>A48</td>
<td>Other bacterial diseases, not elsewhere classified</td>
</tr>
<tr>
<td>A49</td>
<td>Bacterial infection of unspecified site</td>
</tr>
<tr>
<td>B95&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Streptococcus and staphylococcus as the cause of diseases classified to other chapters</td>
</tr>
<tr>
<td>B96&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Other specified bacterial agents as the cause of diseases classified to other chapters</td>
</tr>
<tr>
<td>G00</td>
<td>Bacterial meningitis, not elsewhere classified</td>
</tr>
<tr>
<td>G01</td>
<td>Meningitis in bacterial diseases classified elsewhere</td>
</tr>
<tr>
<td>G03</td>
<td>Meningitis due to other and unspecified causes</td>
</tr>
<tr>
<td>G04</td>
<td>Encephalitis, myelitis and encephalomyelitis</td>
</tr>
<tr>
<td>G05</td>
<td>Encephalitis, myelitis and encephalomyelitis in diseases classified elsewhere</td>
</tr>
<tr>
<td>G06</td>
<td>Intracranial and intraspinal abscess and granuloma</td>
</tr>
<tr>
<td>G07</td>
<td>Intracranial and intraspinal abscess and granuloma in diseases classified elsewhere</td>
</tr>
<tr>
<td>G09</td>
<td>Sequelae of inflammatory diseases of central nervous system</td>
</tr>
<tr>
<td>P35</td>
<td>Congenital viral diseases</td>
</tr>
<tr>
<td>P36&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Bacterial sepsis of newborn</td>
</tr>
<tr>
<td>P37</td>
<td>Other congenital infectious and parasitic diseases</td>
</tr>
<tr>
<td>P38</td>
<td>Omphalitis of newborn with or without mild haemorrhage</td>
</tr>
<tr>
<td>P39</td>
<td>Other infections specific to the perinatal period</td>
</tr>
</tbody>
</table>

<sup>a</sup>Supplementary or additional codes for infectious agent(s) in diseases classified to other chapters.

<sup>b</sup>Includes ICD-10 code P36.0 for sepsis of newborn due to streptococcus, group B.