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MATERNITY & NEONATAL

Statewide Maternity and Neonatal **Clinical Guideline**

**Prevention of neonatal early onset
Group B streptococcal disease (EOGBSD)**



Queensland Government

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**Clinical Practice Guidelines
for the Prevention of Neonatal
Early Onset Group B Streptococcal
Disease (EOGBSD)**



Endorsement:

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9th September 2009. Minor amendments as follows:

Erratum: Page 15, 2.12, clindamycin dosage changed from 600mgs IV 8 hrly to 900mgs IV 8hrly. Lincomycin 600 mg IV every 8 hours is now included as an alternative for women with a history of penicillin allergy. This has resulted in edits to: the recommendations on pages 7 and 14; page 15, under item 2.12; and 4.1 Flowsheet for Maternal Management.

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IMPORTANT NOTICE

The objective of the guidelines is to assist clinicians and consumers in making decisions about appropriate health care for the prevention of neonatal Early Onset Group B Strep Disease.

The guidelines are not intended to be prescriptive, but are designed to provide reliable, up to date information enabling integration of best evidence, clinicians' judgement and individual choice in arriving at decisions about care. Clinical practice guidelines may be considered as generally recommended practice.

This is the fourth edition of the Clinical Practice Guidelines for the Prevention of Neonatal Group B Streptococcal Disease and replaces the third version released in 2005. It is planned to review this Clinical Practice Guideline on or before January 2010.

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FURTHER INFORMATION

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Copies may also be downloaded from the Queensland Health website:
http://www.health.qld.gov.au/cpic/resources/mat_guidelines.asp

Consumer brochures can be obtained directly from GoPrint.

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1.0 SUMMARY

Group B Streptococcus (*Streptococcus agalactiae*) is the leading cause of neonatal early onset infection. Early Onset Group B Streptococcal Disease (EOGBSD), although rare (approximately 0.5 – 1.0/1000 births), is a major public health problem due to the risk of mortality and morbidity for affected infants, and current preventive strategies which affect all pregnant women and result in widespread use of antibiotics for women in labour. Although EOGBSD is largely preventable with the use of intrapartum antibiotics for women with risk factors, the best strategy for determining women at risk remains controversial. This controversy is largely due to the lack of high quality evidence (from randomised controlled trials) on the effects of prevention strategies. Obtaining high level evidence is extremely problematic due to the very low incidence of EOGBSD.

Currently there are two commonly suggested strategies for prevention. Both strategies include administration of antibiotics to women in labour whose infant is at increased risk of EOGBSD.

The strategies are:

1. Universal antenatal screening for GBS carriage at 35-37 weeks gestation and treat all women with positive cultures and also women with a previous infant with EOGBSD or preterm birth where GBS carriage status is unknown.
2. No universal antenatal screening, treat all women with risk factors for EOGBSD. Risk factors are: GBS bacteriuria or GBS vaginal culture this pregnancy; Previous infant with EOGBSD; Maternal fever in labour (≥ 38 degrees); Rupture of the membranes ≥ 18 hrs before delivery, Preterm birth < 37 weeks.

1996: Guidelines for Queensland hospitals were produced by the Mater Perinatal Epidemiology Unit, Mater Health Services in collaboration with Royal Women's Hospital, Brisbane.

1999: Comprehensive guidelines for Queensland hospitals were developed by a Working Party (WP) recommending a risk factor based approach.

2002 - 2007: The Working Party was reconvened in October 2002 and reconvened via electronic communication in 2005 and 2007 to update the guidelines.

In light of the results of a Queensland study (Jenkins-Manning 2007), which showed the rate of EOGBSD in Queensland to be low (0.34/1000), the Working Party continues to recommend a modified risk factor based approach. However, results from the study showed 8 cases of EOGBSD in the 35-36 week gestational age group, giving a rate of 0.72 / 1000. This was 2.8 times the incidence of the term population with a mortality rate of 25% compared with 3% for the term population. For these reasons births in the 35-36 week gestational age group will now be considered preterm and women giving birth at 35-36 weeks gestation require intrapartum GBS prophylactic antibiotic cover. The WP acknowledges that the reported number of cases in this group was low and will therefore continue active surveillance in order to obtain more comprehensive data for this gestational age group.

1.1 Major Changes to the Guideline

Year	Change
2003	Intrapartum penicillin now recommended as the antibiotic of choice over ampicillin due to concerns about emergence of antibiotic resistance
2003	Risk factors of GBS colonisation and GBS bacteriuria changed from 'ever detected' to 'this pregnancy only'.
2005	For antenatal screening, the culture should be taken from the vaginal introitus and from the rectum (swab should be inserted through the anal sphincter) not just taken from the anorectal region.
2007	Births at 35 – 36 weeks gestation will now be considered as preterm and therefore as such are a risk factor for EOGBSD. Mothers giving birth at less than 37 weeks gestation require prophylactic intrapartum antibiotics.

1.2 Key recommendations for the prevention of neonatal EOGBSD

Recommendation	Level of evidence	Strength of recommendation	References
Antibiotic prophylaxis should be offered to women with intrapartum risk factors for EOGBSD. Risk factors are: Preterm birth <37 weeks Membranes ruptured \geq 18 hours prior to delivery Maternal temperature \geq 38°C GBS colonisation this pregnancy GBS bacteriuria this pregnancy Previous infant with EOGBSD	Level 1 Level III -2	B B	Small 2003 Jenkins-Manning and Flenady 2007 Boyer 1985 Flenady 1998 Benitz 1999
Penicillin is the antibiotic of choice for intrapartum chemoprophylaxis for women without penicillin allergy. For those women with a penicillin allergy clindamycin or lincomycin is the antibiotic of choice.	Level IV	C	CDC 2002
Prevention strategies should include a management protocol for the prevention and treatment of early onset sepsis in the neonate.	Level IV	C	Benitz 1999
Women should be given appropriate written information concerning GBS prevention strategies and an opportunity to discuss these with their midwife or doctor as a part of routine antenatal care.	Level IV	C	Lumley 2000

1.3 Levels of Evidence

As Defined By "A Guide to the Development, Implementation and Evaluation of Clinical Practice Guidelines" (National Health & Medical Research Council, Canberra, 1999):

Level I evidence obtained from a systematic review of all relevant randomised controlled trials.

Level II evidence obtained from at least one properly designed randomised controlled trial.

Level III-1 evidence obtained from well-designed pseudo-randomised controlled trials (alternate allocation or some other method).

Level III-2 evidence obtained from comparative studies with concurrent controls and allocation not randomised (cohort studies), case control studies, or interrupted time series with a control group.

Level III-3 evidence obtained from comparative studies with historical control, two or more single-arm studies, or interrupted time series without a parallel control group.

Level IV evidence obtained from case series, either post-test or pre-test and post-test.

1.4 Strength of recommendation grading

A grading for the overall strength of each recommendation which was modified from the grading system used by the Royal College of Obstetricians and Gynaecologists in the United Kingdom (www.rcog.org.uk) as follows:

Grade	Requirements
A	Requires at least one randomised controlled trial as part of a body of literature of overall good quality and consistency addressing the specific recommendation (Evidence Level I or II)
B	Requires the availability of well-conducted clinical studies on the topics of the recommendation (Evidence levels III-1, III-2, III-3 or Level I or II evidence where the dimensions of the evidence – internal validity, statistical precision, size of the effect and relevance are considered to limit the strength of the evidence)
C	Requires evidence obtained from expert committee reports or opinions and/or clinical experience of respected authorities. Indicates an absence of directly applicable clinical studies of good quality (i.e. where the dimensions of the evidence – internal validity, statistical precision, size of the effect and relevance are considered to limit the strength of the evidence)
Good practice points	
4	Recommended good practice based on the clinical experience of the Guideline Working Party.

2.0 CLINICAL PRACTICE GUIDELINES FOR THE PREVENTION OF NEONATAL EARLY ONSET GROUP B STREPTOCOCCAL DISEASE (EOGBSD)

2.1 Introduction

In 1996, clinical practice guidelines for the prevention of neonatal early onset Group B Streptococcal disease (EOGBSD) were developed and disseminated by the Mater Perinatal Epidemiology Unit (MPEU), now known as the Centre for Clinical Studies in collaboration with the Royal Women's Hospital, Brisbane.

In 1999, comprehensive clinical practice guidelines for the prevention of neonatal early onset Group B Streptococcal disease (EOGBSD) were developed and disseminated through a Working Party supported by the Mater Perinatal Epidemiology Unit (MPEU), now known as the Centre for Clinical Studies. The guidelines were developed as a part of an Evidence Based Clinical Practice Research Program (EBCPRP) funded by the National Health and Medical Research Council (NHMRC) through the Strategic Research Development Committee (SRDC).

In 2002, through additional funding made available by the NHMRC the Working Party was reconvened to update the guidelines. In updating the guidelines the Working Party drew on information synthesised by the Centre for Clinical Studies from several sources including: a systematic literature review; a survey of clinicians in maternity hospitals in Queensland about the previous version of the guidelines; and best available Queensland data on current EOGBSD incidence. The Centre for Clinical Studies has also updated the information pamphlet for women (also developed in 1999) in collaboration with consumers.

In 2005 the Centre for Clinical Studies, Mater Health Services Brisbane updated the systematic literature review and appraised the relevant new literature.

In 2007 the Centre for Clinical Studies in collaboration with the Mater/UQ Library, Mater Health Services Brisbane updated the systematic literature review and appraised the relevant new literature. Through additional funding from Queensland Health and the Neonatal Nurses Association of Queensland a retrospective clinical audit of EOGBSD cases in Queensland was undertaken to determine the rates of EOGBSD and to assess the areas for practice improvements.

These guidelines have been prepared according to the National Health and Medical Research Council's (NHMRC) Guidelines for the Development of Guidelines (NHMRC 1999).

2.2 Purpose of the Guidelines

The guidelines have been developed for clinicians and consumers to assist in making decisions about appropriate health care for the prevention of neonatal Early Onset Group B Strep Disease.

2.3 Aims of the Guidelines

The aims of the EOGBSD guidelines are to:

- have an achievable strategy;
- minimise the risk of infection to newborns;
- minimise exposure of women and babies to antibiotics;
- reduce anxiety in parents, doctors and midwives; and
- enable outcomes to be monitored.

2.4 Background

GBS is part of the normal bacterial flora of the gastro-intestinal tract and the lower vagina. Between 10% to 30% of pregnant women are colonised with GBS. GBS colonisation of the infant is acquired intrapartum from the maternal genital tract, in approximately 40% to 70% of culture-positive women. In the absence of antibiotic prophylaxis, approximately 1-2% of infants born to GBS colonised mothers will develop early onset infection (Gotoff 1997).

Little epidemiological information is available on GBS as a cause of maternal sepsis, but GBS is a relatively common cause of chorioamnionitis and post-partum endometritis (Locksmith 1999). However, the overall rate of maternal infection from GBS is low (0.3/1000 births) and usually does not result in serious infection for women (CDC 2002).

Group B Streptococcus (GBS) is the most common cause of early onset infection in infants (defined as either infection <48hrs or 7 days of age) accounting for approximately 60 to 80% of infections in newborns in industrialised countries (Baker 1995, Schuchat 1998). The incidence of Early Onset Group B Streptococcal Disease (EOGBSD) prior to the implementation of prevention strategies in 1996 - 1999 was approximately 1-3 per 1000 births (Isaacs 1999, Shah and Ohlsson 2001), and was considerably higher in Indigenous babies (Isaacs 1999). Although the incidence of early onset GBS infection is highest in babies born preterm, at least 50% of EOGBSD occurs in term infants (Flenady 1998, Jenkins-Manning and Flenady 2007).

The case fatality rate for EOGBSD has fallen from > 50% in the 1970s (Shah and Ohlsson 2001) to approximately 6-7% in reports (Zangwill 1992, Isaacs 1999). Long-term neurologic sequelae occur in approximately 15% to 30% of infants following GBS meningitis (Baker 1995).

Although intrapartum antibiotics for women at risk is effective in reducing EOGBSD the best method of detecting those at risk remains controversial. This controversy is largely due to the lack of high quality evidence (from randomised controlled trials) on the effects of prevention strategies. Obtaining high level evidence is extremely problematic due to the very low incidence of EOGBSD. In addition, although there have been calls for a randomised controlled trial comparing the strategies of universal screening with the risk factor approach it may be impossible to recruit sufficient women to answer the question to ensure sufficient power (Beal 2006).

No strategy for the selection of women for intrapartum chemoprophylaxis is ideal and none of the current strategies will prevent all cases of EOGBSD. In a recent study by Pinto, nine out of ninety two infants (9.8%) who developed EOGBSD were from mothers who had received appropriate intrapartum GBS chemoprophylaxis (Pinto 2003). EOGBSD can also still occur despite administration of IP antibiotics in infants of mothers who were negative on screening and where no risk factor was evident in labour (Menson 2004). However, if properly implemented, any strategy is cost effective compared to no prophylaxis. The effectiveness of any strategy depends on compliance with the protocols including laboratory methods and the correct administration of IP antibiotics (McIlwaine 2006, Merkitich 2006). Compliance will also depend on clarity and simplicity of the protocols, continuing staff education and regular audits (Gilbert 2002).

2.4.1 Risk Factors for EOGBSD

Approximately 75% of women whose babies develop EOGBSD have one or more of the following risk factors: Preterm birth <37 weeks; Membranes ruptured >18 hours; Maternal temperature >38°C during the intrapartum period; GBS positive vaginal culture; GBS bacteriuria; Previous infant with EOGBSD (Boyer 1985, Flenady 1998).

2.4.2 Detection of Carriage

An individual woman's colonisation status can fluctuate throughout pregnancy with results obtained at 35-37 weeks correlating best with culture status at birth (Gotoff 1997). The sensitivity and specificity of the test at 35-37 weeks is 87% and 96% (Yancey 1996). Culture specimens taken for the lower vaginal and anorectal region increases GBS isolation by 5% to 27% over vaginal culture alone (Boyer 1983, Philpson 1995).

In the absence of a reliable rapid test for detection of the onset of labour, a late gestation (35-37wks) low vaginal/anorectal culture is the most reliable method of predicting GBS status at the time of delivery (CDC 2002).

2.4.3 Strategies for prevention of EOGBSD: Antibiotic Prophylaxis

Intrapartum antibiotic prophylaxis for women identified at risk is the best currently available strategy for the prevention of EOGBSD. Intrapartum antibiotic prophylaxis has been shown to reduce the transmission of GBS to the infant (Smaill 2003, Shah and Ohlsson 2001).

Conversely, antenatal antibiotic prophylaxis is not effective in reducing maternal or infant colonisation GBS rates at the time of delivery (Boyer 1985). The use of postnatal intramuscular penicillin to neonates as prophylaxis for EOGBSD has also been proposed. However, this intervention may not adequately treat infection acquired in-utero, and may increase mortality from penicillin resistant organisms (Boyer 1985, Woodgate 2005).

2.4.4 Other prevention strategies

Ultimately, the development of an effective vaccine will enable universal protection against EOGBSD (Schuchat 1999). Although not currently available and unlikely to be available within the next five years, in the future GBS vaccines could be given to women of reproductive age before pregnancy occurs to provide protection (Heath 2005). This would alleviate the reluctance of women to accept administration of a vaccine during their pregnancy (Patten 2005). There are also concerns regarding the conducting of a Phase III trial during pregnancy and the liability issues surrounding immunisation of pregnant women (Baker 2003).

The ability to accurately detect GBS carriage at the onset of labour or rupture of the membranes may be superior to antenatal screening or risk factor approaches in identifying women at risk. Although a PCR test, which offers results in less than one hour with a sensitivity of 94% and a specificity of 96%, has now been approved for use in the USA and Canada by the FDA and Health Canada (IDI – Strep B, Infectious Diagnostic Inc, Quebec, Canada) this test is currently not available in Australia. This strategy may be considered by some hospitals however the costs of this technique could make this strategy prohibitive.

Vaginal irrigation with Chlorhexidine during labour has been suggested as a strategy for suppression of the Group B Streptococcus, However, in a meta analysis on vaginally administered chlorhexidine during labour no improvements in maternal and neonatal outcomes were shown in developed countries and therefore there is insufficient evidence to currently recommend this intervention for use in Australia (Goldenberg (2006). A recent Cochrane review showed vaginal chlorhexidine resulted in a statistically significant reduction in GBS colonisation of neonates, but was not associated with reductions in other outcomes and therefore the use of vaginal disinfection with chlorhexidine in labour for preventing early onset disease could not be supported (Stade 2004). Chlorhexidine may also result in adverse effects such as anaphylactic reactions (Pham 2000) and skin rashes in the adult.

2.5 Adverse effects of antibiotic use

2.5.1 Antibiotic allergy and anaphylaxis

The risk of maternal anaphylaxis resulting from intravenous antibiotic use is estimated as 1 in 10,000 and the risk of fatal anaphylaxis as 1 in 100,000 (CDC 2002). Babies may also die or be severely damaged by maternal anaphylaxis (Heim 1991) (See flow sheet for management). In addition, up to 10% of the adult population have a less severe penicillin allergy (Boyer 1985).

2.5.2 Emergence of antibiotic resistance and incidence of Non-GBS pathogens

Experience in the USA using universal screening indicates that up to one third of women are now receiving intrapartum prophylaxis (Tafari 1999), with the attendant risk of maternal anaphylaxis and increasing problems with bacterial resistance (Fernandez 1998).

Several studies have reported an association between broad spectrum intrapartum antibiotics exposure and ampicillin resistance in cases of *E. coli* or other non-GBS early onset sepsis and an increase in the numbers of *E. coli* early onset infections especially in preterm infants (Joseph 1998, Towers 1998, Hyde 2002, Stoll 2002, Alarcon 2004). However, studies have also reported stable (Baltimore 2001, Cordero 1999, Chen 2005) or decreasing (Isaacs 1999) rates of *E. coli* early onset infection associated with the introduction of prevention strategies for EOGBSD. Although invasive GBS isolates remain uniformly susceptible to penicillin (CDC 2002) there is some recent evidence of increasing GBS resistance to erythromycin and clindamycin (Grimwood 2002, Gibbs 2004, Edwards 2006), although there appears to be no evidence of this in Queensland (Tilse 2003).

2.6 Screening Versus Risk Factor Approach

Although EOGBSD is largely preventable with the use of intrapartum antibiotics for women with risk factors, the best strategy for determining women at risk remains controversial. The potential advantages and disadvantages of the two recommended strategies have been debated in the literature for some time. The debate stems from the lack of convincing high quality evidence from randomised controlled trials on the effects of either strategy. Obtaining high quality evidence is extremely problematic due to the very low incidence of EOGBSD. Thus development of recommendations for practice are largely based on less reliable evidence and often necessitate expert panel consensus.

Currently there are two commonly suggested strategies for prevention. Both strategies include administration of antibiotics to women in labour whose infant is at high risk of EOGBSD:

- Universal antenatal screening for GBS carriage at 35-37 weeks gestation and treat all women with positive cultures, women with a preterm birth where GBS carriage status is unknown or a previous infant with EOGBSD with intrapartum antibiotics.
- No universal antenatal screening, treat all women with risk factors for EOGBSD with intrapartum antibiotics. Risk factors are: GBS bacteriuria or GBS vaginal culture this pregnancy, previous infant with EOGBSD, maternal fever in labour (≥ 38 degrees), rupture of the membranes ≥ 18 hrs before delivery, or preterm birth < 37 weeks gestation.

2.6.1 Current status of guidelines for prevention of EOGBSD internationally

In 2002, on the basis of a large retrospective cohort study (Level III-2), (Schrag 2002), the CDC now recommends a universal screening based approach. However, although these recommendations appear to have been accepted in North America they have not been adopted in many countries.

The Royal College of Obstetricians and Gynaecologists UK, the National Institute for Clinical Excellence, UK and the Health Protection Agency, UK all recommend pregnant women should not be offered routine antenatal screening for GBS because evidence of its clinical effectiveness and cost effectiveness remains uncertain (RCOG 2003, NICE 2003, Health Protection Agency 2004). These organisations all recommend judicious use of intrapartum antibiotics following a risk factor based strategy.

A survey conducted in the United Kingdom (UK) concluded that although intrapartum antibiotic prophylaxis for women at high risk of giving birth to babies with GBS is widely practiced in the

UK, a programme of antenatal screening for GBS has not been adopted (Kenyon 2004). In addition, a recent survey of 29 European countries reported only 4 out of the 29 countries with any nationwide guidelines and only 10 out of the 55 individual respondents reported any local hospital based guidelines for their hospital (Trijbels-Smeulders 2004). Additionally, a recent survey of all delivery units in Israel was conducted which showed that despite there being no local guidelines for the prevention of the disease only 8% of units adhered to the exact CDC guidelines and 23% of units had deliberately rejected the CDC guidelines (Goldstick 2005). In 2007 RCOG performed an audit to evaluate the practice on prevention of EOGBSD in all UK obstetric units which showed most units' protocols were consistent with the RCOG 'green top' guideline of a risk factor based strategy. Only 2% of midwives and obstetricians surveyed in the audit followed a universal bacteriological screening strategy (RCOG 2007).

Whichever strategy is used it is crucial that only one method should be used and a hybrid of both strategies should be discouraged eg the administration of intrapartum antibiotics to women with risk factors despite a negative GBS culture at 35-37 weeks gestation (ACOG 2003).

2.6.2 Current status of guidelines for prevention of EOGBSD in Australia and New Zealand

Clinical practice guidelines in ANZ on the prevention of Early Onset Group B Streptococcus have differing recommendations as follows:

The Australasian Society for Infectious Diseases (ASID 2002) recommend the use of either strategy: a universal screening or risk factor based approach.

The Three Centres Consensus Guidelines on Antenatal Care (Three Centres 2006) recommends universal antenatal screening while acknowledging that the large numbers needed to treat to prevent deaths from EOGBSD may deter some hospitals from implementing universal screening in favour of a risk based approach.

The Royal Australasian College of Obstetricians and Gynaecologists (RANZCOG) statement on GBS gives no strong preference to a prevention strategy but does discuss how to implement a strategy based on universal screening (RANZCOG 2003).

The New Zealand GBS Consensus Working Party has recommended that a risk based approach be used and this strategy has been supported by the New Zealand College of Midwives (Campbell 2004).

Current policies and practices in Australian and New Zealand hospitals appear to support the use of a risk factor approach and screening approach equally (Isaacs 1999, Connellan 2000, McClaughlin 2000). In a survey of clinicians in 20 maternity hospitals in Queensland, 193 (72%) of the 270 senior midwives and obstetric medical staff indicated a preference for a risk factor based approach. In the 28% of clinicians who indicated a preference for a universal screening approach, less than half accurately identified the optimal timing (35-37wks gestation) or culture site (lower vaginal/anorectum) when screening is undertaken (Flenady 2002).

2.6.3 Cost- effectiveness

There have been numerous attempts to evaluate the cost-effectiveness of the most common strategies for the prevention of EOGBSD with differing results. Most of these analyses have been based on theoretical decision analyses and have not been examined in clinical studies. Shah and Ohlsson (Shah and Ohlsson 2001) suggest the differences in conclusions across these cost-effectiveness studies may be due to several factors such as the variability in maternal colonisation rates, the frequency of EOGBSD and the management practices of neonates born to mothers treated with antibiotics. In a Dutch study the risk-based strategy was found to be an efficient treatment strategy with a reasonable cost-effectiveness ratio compared to the screening based and combined screening/risk-based strategies (van den Akker-van Marle 2005).

In Australia, universal screening has been shown to be more expensive than intrapartum risk factor approach (Gilbert 1995). Garland and Kelly (Garland 1995) also suggested that a risk factor approach could prevent more cases of EOGBSD at a lower cost than screening but acknowledged this has not been evaluated clinically.

Universal screening further medicalises pregnancy and childbirth and may put women into the 'high risk' category of pregnancy and therefore make them ineligible for a midwifery care model (Menson 2004) An economic evaluation of this impact has not been undertaken.

2.6.4 Women's views on guideline recommendations

The guidelines were distributed through the consumer representative of the working party for informal input and feedback from consumers. No formal evaluation of either approach has been undertaken.

2.7 Declining rates of EOGBSD

There appears to have been a gradual decline in the rate of EOGBSD in Australia from 2 per 1000 births in 1991-1993 to 0.5 per 1000 in 1995-1997 to 0.29 per 1000 in 1999-2000 (Isaacs 1999, Isaacs 2002). This has been associated with increasing use of strategies for prevention – largely a risk factor based approach (Isaacs 1999). A rate of 0.5/1000 EOGBSD cases has been reported in New Zealand (Grimwood 2002) and a rate of 0.34/1000 in the USA (CDC, 2005) in the period following the adoption of either risk factor or screening based strategy.

While data on trends over time for the population of Queensland (Qld) are not available, a recent population based study provides robust data on EOGBSD incidence. Over the period 2000 – 2004 the overall rate of EOGBSD in Qld was 0.34/1000 live births which is below the USA *Healthy People 2010* target of fewer than 0.5 cases per 1,000 live births (Jenkins-Manning and Flenady 2007). In this time period the rate of EOGBSD in Queensland fluctuated from 0.42/1000 live births to 0.26/ 1000 live births. Data from one tertiary hospital in Queensland showed the rate of EOGBSD decreased from 0.74/1000 live births pre implementation of a formal EOGBSD prevention policy to 0.39/1000 live births with the largest decline of EOGBSD in the 28-34 week gestational age group (2.82/1000 live births pre implementation vs. 0.49/1000 live births post implementation) (Jenkins-Manning 2007).

However, in the 35-36week gestational age group the rate was 0.72 / 1000. Whilst small numbers render interpretation difficult, this was 2.8 times the incidence of the term population with a mortality rate of 25% compared with 3% for the term population.

2.8 Recommended approach in Queensland and rationale

On the basis of the current evidence and with consideration to the recent data for Qld (as described above), the Working Party continues to recommend a risk factor based strategy. However, due to the increased risk of EOGBSD and mortality rate for the group of infants born at 35-36 week gestational, this group will now be included in the preterm birth risk factor group.

In situations where most women attend their general practitioner or a community based midwife for share care, routine screening for GBS status at 35-37 weeks is logistically difficult. A recent study by Riley et al showed although overall intrapartum compliance with a risk based approach was similar to a culture based approach more cultures were not done and cultures done at inappropriate gestations at the community hospital practice compared to an academic hospital (Riley 2003). In addition, universal screening has been shown to be more expensive than intrapartum risk factor identification and treatment (Gilbert 1995).

The Royal College of Obstetricians and Gynaecologists UK estimated the following Number Needed to Treat (NNT) for both a screening and a risk factor based strategy. Using a screening strategy 750 women who screened positive to GBS would need to be treated to prevent one case of GBS disease and 7 034 women treated to prevent one neonatal death. Using a risk based strategy 625 women with a GBS risk factor would need to be treated to prevent one case of GBS disease and 5 882 women treated to prevent one neonatal death (RCOG 2007).

2.9 Key recommendations for the prevention of neonatal EOGBSD

Recommendation	Level of evidence	Strength of recommendation	References
<p>Antibiotic prophylaxis should be offered to women with intrapartum risk factors for EOGBSD.</p> <p>Risk factors are:</p> <ul style="list-style-type: none"> • Preterm birth <37 weeks • Membranes ruptured ≥ 18 hours prior to delivery • Maternal temperature $\geq 38^{\circ}\text{C}$ • GBS colonisation this pregnancy • GBS bacteriuria this pregnancy • Previous infant with EOGBSD 	<p>Level 1</p> <p>Level III -2</p>	<p>B</p> <p>B</p>	<p>Smaill 2003</p> <p>Boyer 1985</p> <p>Benitz 1999 Jenkins-Manning 2007 Flenady 1995</p>
<p>Penicillin is the antibiotic of choice for intrapartum chemoprophylaxis for women without penicillin allergy.</p> <p>For those women with a penicillin allergy clindamycin or lincomycin is the antibiotic of choice.</p>	Level IV	C	CDC 2002
Prevention strategies should include a management protocol for the prevention and treatment of early onset sepsis in the neonate.	Level IV	C	Benitz 1999
Women should be given appropriate written information concerning GBS prevention strategies and an opportunity to discuss these with their midwife or doctor as a part of routine antenatal care.	Level IV	C	Lumley 2000

2.10 Maternal Risk Factors for EOGBSD

2.10.1 Gestational age less than 37 weeks

Preterm birth is an important risk factor for EOGBSD. In the recent Qld study, the incidence of EOGBSD in preterm infants (<37weeks gestation) was almost five times that of term infants (1.27/ 1000 vs. 0.26/1000). The incidence of EOGBSD in preterm infants <35weeks was nearly eight times greater than term infants (2.01/1000 vs. 0.26/1000) (Jenkins-Manning and Flenady 2007). Other studies have shown a progressive increase in risk of EOGBSD with decreasing gestational age (<37 weeks OR 4.83) (Benitz 1999).

2.10.2 Anticipated duration of membrane rupture ≥ 18 hrs prior to delivery

Rupture of the membranes for 18 hours or greater is an important risk factor for EOGBSD (Flenady 1998, Locksmith 1999, CDC 1996).

2.10.3 Previous infant with EOGBSD

It is considered reasonable to administer intrapartum antibiotic prophylaxis for women who have had a previous infant with EOGBSD (Shah and Ohlssen 2001). This will not significantly increase overall numbers of women receiving intrapartum antibiotics and may assist in allaying parental and clinician anxiety.

2.10.4 GBS colonisation this pregnancy

Because GBS colonisation is the most important predictor of EOGBSD, women identified by vaginal culture as GBS carriers in the current pregnancy should be offered intrapartum antibiotic prophylaxis (Boyer 1985).

2.10.5 GBS bacteriuria this pregnancy

GBS bacteriuria in the current pregnancy indicates heavy colonisation with GBS and warrants intrapartum prophylactic antibiotics (Persson 1985).

2.10.6 Maternal temperature $\geq 38^{\circ}\text{C}$

The presence of chorioamnionitis in labour (defined by a temperature of $\geq 38^{\circ}\text{C}$) is one of the strongest predictors of EOGBSD and requires antibiotic treatment as opposed to prophylaxis for GBS alone (Benitz 1999).

2.11 Treatment for Suspected Chorioamnionitis

Women with suspected chorioamnionitis require appropriate microbiological investigations (see flow sheet) and longer term broad-spectrum combination antibiotic therapy. This regimen needs to be distinguished from prophylaxis (single agent, short term therapy).

Microbiological Investigations

- Single swab of the lower vagina/ anorectal region placed in standard transport medium for the detection of GBS
- Cervical swab collected with speculum with visualisation of the cervix
- Blood culture, urine microscopy and culture

2.12 Antibiotic regimen for EOGBSD Prophylaxis

Penicillin 1.2g IV load, then 0.6g IV 4-6 hrly during the course of labour (Australasian Society for Infectious Diseases 2002).

For those women with a history of penicillin allergy, clindamycin 900 mg IV 8 hrly, or lincomycin 600mg IV 8hrly, or erythromycin 500 mg IV 6hrly until delivery. Although there is recent evidence of increasing GBS resistance to both erythromycin and clindamycin, clindamycin is preferred to erythromycin due to the lesser isolate resistance to clindamycin (37% resistance vs. 17%) (Lin 2001, Gibbs 2004). In addition, erythromycin does not consistently cross the placenta and therefore it may provide sub therapeutic concentrations in the fetal serum and amniotic fluid (Gibbs 2004, Pearleman 2003).

To ensure adequate prophylaxis, antibiotics should, where possible, be commenced at least four hours prior to delivery to achieve optimal concentrations in the amniotic fluid and the placental circulation. However, the administration of intrapartum antibiotics is effective in interrupting vertical transmission of group B streptococcus when administered at least two hours before delivery (de Cueto 1998, Illuzzi 2006).

2.13 Other Specific Conditions

2.13.1 GBS Bacteriuria during pregnancy

GBS can cause both symptomatic and asymptomatic urinary tract infections, which should be diagnosed and treated according to the current standards of care for urinary tract infections in pregnancy. Women with GBS urinary tract infections during pregnancy should receive appropriate treatment at the time of diagnosis as well as intrapartum antibiotic prophylaxis for EOGBSD (Smaill 2003).

2.13.2 Prelabour rupture of membranes at or near term (≥ 37 weeks) (Term PROM)

Routine use of prophylactic antibiotics for Term PROM is not recommended (Flenady 2005: Level 1 Evidence, Strength Grade B). However, it is recommended that women with anticipated membrane rupture greater than 18 hours prior to delivery or any other risk factor for EOGBSD should receive intrapartum antibiotic prophylaxis (CDC 1996, Flenady 1998).

Women with Term PROM and known GBS positive status should be offered prompt induction with IV oxytocin. Women with Term PROM and negative GBS status (culture taken within 5 weeks of presentation) should be offered the option of either prompt induction with IV oxytocin or expectant management. Women with Term PROM and unknown GBS status should have a low vaginal swab taken for GBS culture.

2.13.3 Preterm prelabour rupture of the membrane (preterm PROM)

Women with preterm PROM (<37 weeks) should receive routine antibiotic prophylaxis consisting of a 10 day course of erythromycin, following vaginal cultures (Kenyon 2003: Level 1 Evidence, Strength Grading A).

Subsequently, if a woman with Preterm PROM presents in labour and has a GBS negative vaginal culture result (taken within 5 weeks of presentation) she does not require intrapartum GBS prophylaxis. Conversely, if the vaginal culture result was positive for GBS or the GBS status is unknown then intrapartum EOGBSD prophylaxis should be administered.

2.13.4 Preterm Labour (intact membranes)

Routine antibiotic therapy is not recommended for threatened preterm labour with intact membranes (King 2003: Level 1 Evidence, Strength grading A). However, when delivery is anticipated at gestations less than 37 weeks, GBS antibiotic prophylaxis should be administered, preferably at least 4 hours prior to delivery.

2.13.5 Planned caesarean section delivery

Prophylactic antibiotics for EOGBSD should not be given as routine for women undergoing planned caesarean section delivery in the absence of labour or amniotic membrane rupture, regardless of the GBS colonisation status of the mother (CDC 2002; Level IV Evidence, Strength Grading C).

2.13.6 Maternal postpartum infection

Maternal pyrexia in the first 24 hours following delivery requires systematic work up and empirical antibiotic therapy. As this may have implications for neonatal management the neonatal staff need to be informed of significant maternal post-partum pyrexia (>38°C).

2.13.7 Intrauterine fetal monitoring and intrapartum vaginal examinations.

Some studies have suggested intrauterine fetal monitoring especially for long periods of time >12 hours and > five vaginal examinations during labour may be independent risk factors for EOGBSD. However other studies have not shown this association. (Yancey 1996, Adair 2003, Schuchat 1994, Schuchat 2000).

3.0 NEONATAL PREVENTION AND MANAGEMENT OF EARLY ONSET SEPSIS

3.1 Introduction

This section of the guidelines has been developed as a supplement to the Clinical Practice Guidelines for the prevention of Neonatal Early Onset Group B Streptococcal Disease (EOGBSD). As a result of a careful review of the best available evidence, this document has been prepared to assist in clinical decision making.

As all newborn infants are at risk of infection, irrespective of gestational age, maternal risk factors or intrapartum antibiotic treatment, these recommendations apply to all newborns.

3.2 Signs of Sepsis

Clinical signs of sepsis for the neonate include:

- * respiratory distress; (oxygen requirement, grunting or chest recession);
- * temperature instability;
- * poor peripheral perfusion;
- * unexpected need for resuscitation;
- * apnoeic episodes;
- * lethargy;
- * seizures;
- * poor feeding;
- * abdominal distension;
- * hypoglycaemia;
- * hypotension;
- * metabolic acidosis.

3.3 Definitions

- Adequate intrapartum antibiotic prophylaxis: antibiotics were given to the mother more than 2 hours prior to delivery (de Cueto 1998).
- Inadequate intrapartum prophylaxis: no intrapartum antibiotic coverage administered, or antibiotics were given less than 2 hours prior to delivery.
- Early onset sepsis: sepsis within 7 days of birth.
- Definite Infection: positive blood culture and /or CSF culture.
- Probable Infection: symptomatic neonate, full blood count suggestive of infection with a likely causative organism identified on gastric aspirate or surface swab.

3.4 Management

The management of the neonate should be based on maternal history, clinical findings, gestational age and the use of intrapartum antibiotic prophylaxis. The type and duration of antibiotic treatment will be determined by the clinical indications and may be modified by results of the septic work up.

3.5 Neonates with any signs of infection

Neonates with any signs suggestive of infection should immediately undergo investigations (eg septic workup) and be given antibiotic therapy. At a minimum, the workup should involve a full blood count (FBC) with differential and blood culture. Where possible the diagnostic evaluation should include a lumbar puncture as up to 15% of neonates presenting with meningitis will have a sterile blood culture.

Gastric aspirates, surface swabs or urinary antigen studies may be taken on clinician's preference however these tests have poor sensitivity, specificity and positive predictive values for invasive group B Streptococcal infection. The use of these tests to identify an infant at risk for sepsis or to predict the most likely pathogen when clinical sepsis occurs is of limited value (Evans 1988, Fowlie 1998).

3.6 Neonates without signs of infection and maternal risk factors

Whilst it is generally agreed that symptomatic infants should receive a full diagnostic evaluation and early commencement of antibiotics the use of antibiotics in asymptomatic infants is highly variable and often depends on hospital preferences and personal experiences (Ungerer 2005). For this reason the working party has devised an algorithm, based on general consensus of expert opinion, to follow for the neonatal management of infants at risk of EOGBSD.

3.6.1 Suspected or diagnosed chorioamnionitis

Neonates of mothers with chorioamnionitis have increased risk of sepsis. Irrespective of gestational age and adequacy of intrapartum therapy and lack of signs of infection, septic work up should be performed and antibiotics administered (Escobar 2000).

3.6.2 Previous baby with EOGBSD

Women who have previously had an infant with EOGBSD require prophylaxis during labour and close observation following delivery. A full blood count, blood culture and commencement of antibiotics at birth are recommended.

3.6.3 Other Maternal Risk factors

GBS colonisation this pregnancy; GBS bacteriuria this pregnancy; ruptured membranes ≥ 18 hours prior to delivery; birth < 37 weeks (Benitz 1999).

The investigation and management of asymptomatic neonates of mothers with these risk factors is dependent on the gestational age and adequacy of the intrapartum prophylaxis. As follows:

(i) Inadequate intrapartum antibiotics and gestational age < 37 weeks

Neonates of less than 37 weeks whose mothers received inadequate intrapartum antibiotics should immediately undergo septic workup and commence antibiotic therapy.

(ii) Adequate intrapartum antibiotics and gestational age <37 weeks

For neonates born less than 37 weeks whose mothers had adequate intrapartum prophylaxis, full blood count and observation is indicated, and antibiotics should be commenced and septic work up performed if there is any suggestion of infection.

(iii) Inadequate intrapartum antibiotics and gestational age \geq 37 weeks

A full blood count should be performed on neonates equal or greater than 37 weeks whose mothers did not receive adequate intrapartum prophylaxis. Antibiotics should be commenced if the blood count is in any way suggestive of infection.

(iv) Adequate intrapartum antibiotics and gestational age \geq 37 weeks

Neonates greater or equal to 37 weeks whose mothers were adequately covered with intrapartum prophylaxis require no further investigation. However, these neonates require observation in hospital for 24-48 hours (Bromberger 2000). Should the infant become symptomatic then blood cultures and antibiotic therapy is recommended.

If at any time, any neonate, irrespective of other risk factors becomes symptomatic or if any full blood count is abnormal, septic workup should be performed and antibiotics commenced

3.7 Education of parents

It is important to remember all newborn infants are at risk of infection irrespective of the absence of risk factors in labour and therefore all babies should be observed closely for the first 24 hours for any signs or symptoms of infection. Parents, in particular those seeking early discharge from hospital, need to be made aware of the sign and symptoms of neonatal infection.

4..0 MANAGEMENT FLOWSHEETS

4.1 Flowsheet for Maternal Management (amended 09/09/2009)

Clinical Practice Guidelines for the Prevention of Neonatal Early Onset Group B Streptococcal Disease (EOGBSD)

History of previous GBS colonisation outside this current pregnancy is not an indication for universal antenatal screening or IV antibiotics in labour.

If there are neonatal health concerns refer to neonatal management flow sheet 4.2

ANTENATAL: Note following risk factors clearly in the medical record
 1. GBS colonisation this pregnancy 2. GBS bacteriuria this pregnancy
 3. Previous infant with EOGBSD

Presentation with prelabour rupture of the membranes (PROM) or labour

GESTATION?

≥37 WKS

<37 WKS

Term PROM?

Preterm PROM?

YES

NO

YES

NO

Offer choice of induction with IV Oxytocin or expectant management

Vaginal culture and 10 day course of Erythromycin

LABOUR <37wks

NO

LABOUR

RISK FACTORS PRESENT?

- Membranes ruptured ≥18hrs prior to delivery
- GBS colonisation this pregnancy
- GBS bacteriuria this pregnancy
- Previous infant with EOGBSD

YES

RISK FACTOR PRESENT?

- Maternal temperature ≥38°C

YES

NO

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INTRAPARTUM ANTIBIOTICS

PROPHYLAXIS

COMMENCE
When delivery is anticipated, aim for at least one dose 4 hours pre delivery

LOAD
Penicillin 1.2g, IV

MAINTENANCE
Penicillin 0.6g, IV q4-6h until delivery

SUSPECTED PENICILLIN ALLERGY
Clindamycin 900 mg IV q8H
or
Lincomycin 600mgs, IV q8h until delivery

TREATMENT ANTIBIOTICS (SUSPECTED CHORIOAMNIONITIS)

Follow appropriate treatment regimen

DELIVERY: Follow guideline for prevention and management of neonatal early onset sepsis.
POSTPARTUM: Notify paediatric staff of maternal pyrexia within 24 hours of birth.

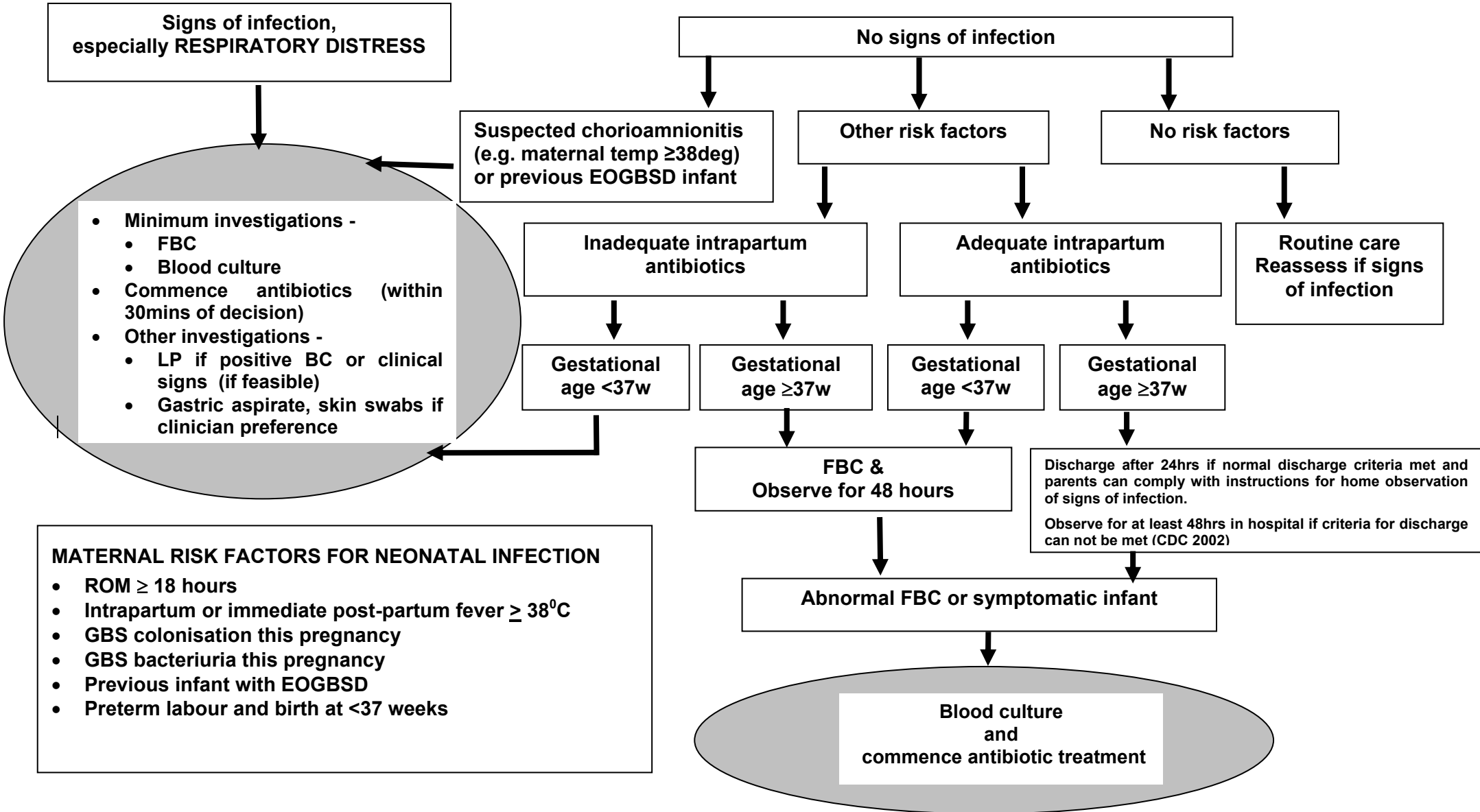
ANAPHYLAXIS MANAGEMENT

1. STOP ADMINISTRATION OF THE AGENT
2. CALL FOR ASSISTANCE
3. ADMINISTER 100% OXYGEN Intubate if necessary
4. ADRENALIN: Administer IV 1-3 mls 1: 10,000 Repeat if necessary
5. RAPID IV FLUIDS: Large bore cannula (2 if indicated) crystalloid or colloid eg N.Saline, Hartmann's or Haemacel.
6. BLOOD FOR SERUM TRYPTASE & COMPLEMENT ASSAY when stable

4.2 Flowsheet for Neonatal Management

ALL NEWBORNS ARE AT RISK OF INFECTION
irrespective of maternal risk factors and intrapartum chemoprophylaxis.
Therefore this flowchart applies to ALL neonates

SIGNS OF INFECTION INCLUDE:
Unexpected need for resuscitation, respiratory distress; (oxygen requirement, grunting or chest recession), temperature instability, poor peripheral perfusion, apnoeic episodes, lethargy, seizures, poor feeding, abdominal distension, hypoglycaemia, hypotension, metabolic acidosis.



MATERNAL RISK FACTORS FOR NEONATAL INFECTION

- ROM ≥ 18 hours
- Intrapartum or immediate post-partum fever ≥ 38°C
- GBS colonisation this pregnancy
- GBS bacteriuria this pregnancy
- Previous infant with EOGBSD
- Preterm labour and birth at <37 weeks

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6.0 APPENDICES

6.1 Screening for Group B Strep

Routine screening of women for GBS is not recommended. However, if cultures are taken to detect GBS colonisation, the following protocol should be followed:

Specimen:

Using one single dry swab stick, first take a culture from the vaginal introitus and with the same swab stick, take a culture from the rectum (swab should be inserted through the anal sphincter) and place swab in Stuarts transport medium and send to lab clearly labelled - GBS screening in pregnancy (CDC 2002).

Swabs may be self collected by the patient.

Laboratory Procedures:

The laboratory will incubate the swab in gentamicin/nalidixic acid broth at 37°C overnight and subculture to Horse Blood Agar. The Horse Blood Agar will be incubated overnight and any colonies resembling group B streptococci (beta haemolytic, catalase negative, gram positive cocci) will be streaked onto a CAMP plate and identified as GBS by the haemolytic arrow head produced in the presence of Staph aureus. Results are available in 72 hours.

Alert of carriage status

The finding of a positive vaginal culture for GBS should be clearly documented in the woman's medical record to alert staff about the need for intrapartum prophylaxis.

6.2 Methods for development of the Guidelines

The Centre for Clinical Studies at the Mater Hospital coordinated the Working Party (WP) on the EOGBSD Guidelines. The CCS conducted the literature search and collation of the findings. Information was then presented to the WP for interpretation and discussion. The CCS then compiled the draft of the updated guidelines for comment by the WP.

6.2.1 Perinatal Clinical Practice Guidelines Working Party

The working party was reconvened in October 2002 to update the current Queensland guidelines on the prevention of neonatal Early Onset Group B Strep Disease (EOGBSD) and the management of women with prelabour rupture of the membranes at term.

The working party was reconvened in 2005 and 2007 via electronic communication to update the guidelines on the prevention of neonatal Early Onset Group B Strep Disease (EOGBSD).

Purpose of the Working Party:

(i) To maintain the evidence-based clinical practice guidelines on:

- The prevention of Neonatal Early Onset Group B Strep Disease

In fulfilling this task, the Working Party followed the procedures recommended in the NHMRC documents: *Handbook series on preparing clinical practice guidelines*. Endorsed November 1999. This attention to the following steps:

- Review the scope of the guidelines where necessary in order to: ensure clinical relevance; identify further questions, target groups and relevant health outcomes to be addressed by the guidelines;
- Assess any existing guidelines;
- Undertake (or commission) a systematic review of the literature and evaluate the extent and strength of the scientific evidence relating to the effectiveness and appropriateness of the relevant interventions;
- Refine the evidence-based guidelines and other materials to explain guidelines to consumers and other defined target groups;
- Undertake wider consultation;

- Disseminate and implement guidelines; and
 - Evaluate and maintain guidelines.
- (ii) To identify gaps in current information and data for the ongoing refinement and evaluation of the above guidelines
- (iii) To collaborate with local and national bodies in the development, implementation and evaluation of the guidelines including the impact on health outcomes

Membership Coordinators

Vicki Flenady	Perinatal Researcher; Centre for Clinical Studies, Mater Health Services, Brisbane
Sue Jenkins-Manning	Neonatal Nurse; Clinical Research Coordinator, Centre for Clinical Studies, Mater Health Services, Brisbane

Members

Dr David Cartwright	Neonatologist; Director of Neonatology, Royal Brisbane and Women's Hospital, Brisbane
Dr Yogesh Chadha	Obstetrician; Royal Brisbane and Women's Hospital, Brisbane
Ms Liz Davis	Consumer representative; Stillbirth and Neonatal Death Support Group, Brisbane
Dr Joan Faoagali	Pathologist; Director of Microbiology, Princess Alexander Hospital, Brisbane
Prof Ian Jones	Obstetrician; University of Queensland O&G Department,
Mr Peter Langbridge	Neonatal Nurse Educator, Mater Mothers' Hospital, South Brisbane
Dr Helen Liley	Neonatologist; Mater Mothers' Hospital, South Brisbane
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Dr Claire Nourse	Paediatrician; Mater Children's Hospital, South Brisbane
Dr Lucinda Pallis	Obstetrician; Townsville
Dr Martyn Tilse	Pathologist; Director of Microbiology, Mater Health Services, Brisbane
Ms Jocelyn Toohill	Midwife, Nurse Unit Manager, Gold Coast Hospital.
Dr Grahame Vaughan	Obstetrician; Director of Obstetrics, Redland Hospital, Cleveland
Dr David Watson	Obstetrician; The Townsville Hospital, Townsville.

6.2.2 Questions raised by the Working Party

The following questions were raised by the Working Party and formed the basis of the search undertaken by the Centre for Clinical Studies:

What are the current rates of EOGBSD: sepsis, meningitis, longer term problems?

What are the current laboratory practices in terms of GBS screening?

Which approach is more cost-effective: Screening or risk factor based?

What is the role of PCR testing for women in labour?

Which antibiotic regimen should be used as prophylaxis?

What are the rates of allergic reactions /anaphylaxis for women treated with intrapartum antibiotics?

Is there evidence of an increase in early onset infection from E. coli or late onset sepsis GBS disease?

Is there evidence of emerging antibiotic resistance in Australia?

Should antibiotic prophylaxis be given to GBS positive women undergoing elective CS?

What are women's views on the guideline recommendations?

6.2.3 Search strategy

Concept 1	Concept 2/synonyms	Concept 3/Synonyms	Publication Limits
Neonate	Streptococcal Infection	Bacteria	
MEDLINE 1. Infant [MeSH] or Infant, Premature [MeSH] or Infant, Newborn [MeSH] or Infant, Very Low Birth Weight [MeSH] or Infant, Low Birth Weight [MeSH] or Infant, Extremely Low Birth Weight [MeSH] or infant\$ or newborn\$ or very low birth weight or premature	1. Streptococcal Infections [MeSH] or Streptococcus agalactiae [MeSH] or streptococcal infection\$ or streptococcal agalactiae or gram positive streptococ\$ or group B streptococ\$ or s adj agalactiae	1. Bacteria [MeSH] or gram-Positive Bacteria [MeSH] or bacteria or gram positive	Years 2004-2007 Randomised Controlled Trial.pt. Randomised Controlled Clinical Trial.sh. Controlled Clinical Trial.pt Other Studies
COCHRANE LIBRARY 1. Infant* and (low birth or premature or newborn or very low birth)	1. streptococ* or "streptococcus agalactiae" or "s agalactiae" or "group b strep*" or gbs		Years 2004-2007
MATERNITY AND INFANT CARE Infant – premature [DE] or Infant – low birth weight [DE] or Infant – very low birth weight [DE] or Infant very low birth weight or Infant – premature [DE] or Infant newborn	Streptococcus agalactiae – prevention and control [DE] or Streptococcus agalactiae [DE] or Streptococcal infections [DE] or streptococcal infections or group b strep\$		Years 2004-2007
Embase.com Streptococcus infection or group b strep* or streptococcus agalactiae or s agalactiae	Infant* and (low birth or premature or newborn or very low birth)		Years 2004-2007

In addition the following guideline sites were also searched:

Centre for Disease Control (CDC)	http://www.cdc.gov/
Three Centres Consensus Guidelines	www.3centres.com.au
New Zealand Guideline Group	http://www.nzgg.org.nz
National Guideline Clearinghouse	http://www.guideline.gov/index.asp
Royal College of Obstetricians and Gynaecologists (UK)	http://www.rcog.org.uk/
British Columbia Guidelines	http://www.rcp.gov.bc.ca/List%20of%20Guidelines.htm
Canadian Task Force on Preventive Health Care	http://www.ctfphc.org/
Scottish Intercollegiate Guidelines Network	http://www.show.scot.nhs.uk/sign/index.htm
National Institute for Clinical Excellence	http://www.nice.org.uk/cat.asp?c=6718

6.3 Abbreviations

The following abbreviations are used within the guideline.

CCS	Centre for Clinical Studies
CDC	Centres for Disease Control
CI	Confidence interval
CINAHL	Cumulative Index of Nursing and Allied Health Literature
CSF	Cerebro spinal fluid
EOGBSD	Early Onset Group B Streptococcal Disease
FBC	Full blood count
FDA	Food & Drug Administration
GBS	Group B Streptococcus
IV	Intravenous
MeSH	Medical Subject Headings
MR	Membrane rupture
NHMRC	National Health and Medical Research Council
NNT	Number needed to treat
PRC	Polymerase chain reaction
PROM	Prelabour rupture of membranes
RANZCOG	Royal Australian and New Zealand College of Obstetrics and Gynaecology
ROM	Rupture of membranes
RR	Relative risk
WP	Working party

6.4 Glossary of Terms

Anaphylaxis

An abnormal reaction to a particular substance causing either local or widespread symptoms.

Bacteriuria

The presence of bacteria in the urine.

Carrier

A person who harbours micro-organisms causing a particular disease without experiencing signs and symptoms of infection.

Case series

An uncontrolled observational study involving an intervention and outcome for more than one person.

Case study (synonyms: anecdote, case history, single case report)

An uncontrolled observational study involving an intervention and outcome for a single person (or other unit).

Case-control study (synonyms: case referent study, retrospective study)

A study that starts with identification of people with the disease or outcome of interest (cases) and a suitable control group without the disease or outcome. The relationship of an attribute (intervention, exposure or risk factor) to the outcome of interest is examined by comparing the frequency or level of the attribute in the cases and controls. For example, to determine whether thalidomide caused birth defects a group of children with birth defects (cases) could be compared to a group of children without birth defects (controls). The groups would then be compared with respect to the proportion exposed to thalidomide through their mothers taking the tablets. Case control studies are sometimes described as being retrospective as they are always performed looking back in time.

Chorioamnionitis

Infection of the chorionic membrane of the placenta.

CINAHL (Cumulative Index of Nursing and Allied Health Literature)

Electronic database covering the major journals in nursing and allied health. Years of coverage: 1983 - present.

Clinical guideline

A systematically developed statement for practitioners and patients about appropriate health care for specific clinical circumstances.

Clinical trial (synonyms: therapeutic trial, intervention study)

A trial that tests out a drug or other intervention to assess its effectiveness and safety. This general term encompasses randomised controlled trials and controlled clinical trials.

Cochrane Database of Systematic Reviews (CDSR)

The major product of the Cochrane Collaboration. It brings together all the currently available Cochrane Reviews and is updated quarterly. Collaborative Review Groups submit modules of edited reviews to the Parent Database for inclusion in the CDSR.

Cochrane Review

A Cochrane Review is a systematic, up-to-date summary of reliable evidence of the benefits and risks of healthcare. Cochrane Reviews are intended to help people make practical decisions.

Cohort study (synonyms: follow-up, incidence, longitudinal, prospective study)

An observational study in which a defined group of people (the cohort) is followed over time. The outcomes of people in subsets of this cohort are compared, to examine for example people who were exposed or not exposed (or exposed at different levels) to a particular intervention or other factor of interest. A cohort can be assembled in the present and followed into the future (this would be a prospective study or a "concurrent cohort study"), or the cohort could be identified from past records and followed from the time of those records to the present (this would be a retrospective study or a "historical cohort study"). Because random allocation is not used, matching or statistical adjustment at the analysis stage must be used to minimise the influence of factors other than the intervention or factor of interest.

Confidence interval (CI)

The range within which the "true" value (e.g. size of effect of an intervention) is expected to lie with a given degree of certainty (e.g. 95% or 99%). Note: Confidence intervals represent the probability of random errors, but not systematic errors (bias).

Consumer (healthcare consumer)

Someone who uses, is affected by, or who is entitled or compelled to use a health related service.

Database

A collection of organised information, usually held on a computer. In some ways a database is similar to a filing system, but with important advantages: the information can be revised and kept up to date easily, and the computer can retrieve information from it very quickly. Electronic databases such as MEDLINE, EMBASE and the CDSR can be distributed on disk, CD-ROM or via the Internet.

Early onset infection

Several definitions are used, the most common being sepsis occurring within <48 hours of birth, within the first 3 days and within the first 7 days of life.

Gold standard

The method, procedure or measurement that is widely accepted as being the best available against which new interventions should be compared. It is particularly important in studies looking at the accuracy of diagnostic tests.

Late onset infection

Several definitions are used, the most commonest being - sepsis occurring after the first 48 hours of life, sepsis occurring after the first 3 days of life and sepsis occurring after the first 7 days of life.

MeSH headings (Medical Subject Headings)

Terms used by the United States National Library of Medicine to index articles in Index Medicus and MEDLINE. Designed to reduce problems that arise from, for example, differences in British and American spelling. The MeSH system has a tree structure in which broad subject terms branch into a series of progressively narrower subject terms.

Observational study (synonym: non-experimental study)

A study in which nature is allowed to take its course. Changes or differences in one characteristic (e.g. whether or not people received the intervention of interest) are studied in relation to changes or differences in other(s) (e.g. whether or not they died), without action by the investigator. There is a greater risk of selection bias than in experimental studies (randomised controlled trials).

Placebo

An inactive substance or procedure administered to a patient, usually to compare its effects with those of a real drug or other intervention, but sometimes for the psychological benefit to the patient through a belief that s/he is receiving treatment.

Placebos are used in clinical trials to blind people to their treatment allocation.

Placebos should be indistinguishable from the active intervention to ensure adequate blinding.

Randomised controlled trial (RCT) (Synonym: randomised clinical trial)

An experiment in which investigators randomly allocate eligible people into intervention groups to receive or not to receive one or more interventions that are being compared. The results are assessed by comparing outcomes in the treatment and control groups. NOTE: when using randomised controlled trial as a search term (publication type) in MEDLINE, the US spelling (randomized) must be used.

Relative Risk (RR) (synonym: risk ratio)

The ratio of risk in the intervention group to the risk in the control group. The risk (proportion, probability or rate) is the ratio of people with an event in a group to the total in the group. A relative risk of one indicates no difference between comparison groups. For undesirable outcomes an RR that is less than one indicates that the intervention was effective in reducing the risk of that outcome.

Resistance

The degree to which a disease or disease causing organism remains unaffected by antibiotics or other drugs.

Search strategy

1. The methods used to identify trials within the Group's scope. This includes hand searching relevant journals, searching electronic databases, contacting drug companies, other forms of personal contact and checking reference lists.
2. The methods used to locate relevant studies, including the use of a CRG's trials register.
3. The combination of terms used to identify studies in an electronic database such as MEDLINE.

Term Prelabour Rupture of membranes (Term PROM)

The rupture of membranes at ≥ 37 weeks without the onset of spontaneous labour within 4 hours of membrane rupture.