

## Clinical Guideline:

**Authors:** Adapted from the all Wales Neonatal Network Early Onset Sepsis Risk assessment for Infants > 34 weeks gestation Guideline

**For use in:** EoE Neonatal Units  
Guidance specific to the care of neonatal patients.

**Used by:**

**Key Words:** Sepsis, Kaiser sepsis calculator

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**Approved by:**

Neonatal Clinical Oversight Group	
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**Ratified by ODN Board:**

Date of meeting	
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The use of the Kaiser Permanente Sepsis Risk Calculator for babies born after 34+0 weeks should only be used if there is an ongoing prospective audit as detailed below

### Audit Standards:

- Total number of babies assessed using the calculator
- Number of babies correctly identified by the calculator who develop a culture-confirmed neonatal infection
- Number of babies incorrectly identified by the calculator who do not develop a culture-confirmed neonatal infection
- Number of babies missed by the calculator who develop a culture-confirmed neonatal infection

# East of England (EOE) Guideline\*\* Early Onset Sepsis Risk Assessment for Infants $\geq 34$ Weeks Gestation

*Adapted from all Wales Early Onset Sepsis Guideline*

(\*\* Midwifery led units may choose to risk assess and continue to follow existing guidelines. Families should be informed of this so that they can make an informed choice of the place for delivery)

## Purpose:

To provide guidance on risk assessment and management of early onset sepsis (EOS) in neonates of greater than or equal to 34 weeks gestation, including the use of the Kaiser Permanente Sepsis Risk Calculator (SRC).

## Background:

Culture proven EOS in the UK in term and near-term infants is infrequent (about 0.5/1000 live births) but is associated with high morbidity & mortality. Group B streptococcus (GBS) is the commonest organism identified in EOS followed by Gram-negative infections. Nearly 15-20% infants on the postnatal wards are screened by traditional univariate risk-based algorithms (e.g. NICE and RCOG guidelines) and offered prophylactic antibiotics, until investigations clear the infant of infection. These risk-based strategies can identify only 50-60% of all EOS cases. In addition, a significant proportion of EOS cases are symptomatic at birth and do not require any algorithm for identification. Thus, the number of infants needing treatment to identify a case of culture proven sepsis in the early asymptomatic phase is estimated as 1 in 600-800 near term live births.

Developed in the USA, The Kaiser Permanente Sepsis Risk Calculator (SRC) is a multivariate model of assessing the risk of EOS using maternal risk factors and the infant's clinical state after birth (<https://neonatalesepsiscalculator.kaiserpermanente.org>). The use of SRC in the USA has been shown to reduce antibiotic initiation in newborn infants by 50% without missing additional cases of true sepsis and this finding has been replicated in other parts of the developed world with consistent results. For more information, please review references at the end of this document.

The updated 2024 KP EOS calculator was developed using a modern birth cohort (2010-2020) with universal GBS screening and reflects ACOG's current recommendations concerning which antibiotics provide adequate intrapartum antibiotic prophylaxis for GBS.

As we are not using universal GBS screening in the East of England, it is recommended to continue using the original 2017 model. Otherwise, risk estimates for infants born with maternal GBS unknown status will potentially be higher than justified.

No sepsis algorithm can function without excellent clinical care and professional judgment. The following generic principles apply in all situations and supersede any sepsis algorithm.

Kaiser Permanente sepsis calculator should be applied up to 1 hour of age.


Infants who present after this period or where further information regarding risk of sepsis is identified should receive a **FULL** clinical examination, review and plan of care.


1. All infants symptomatic of sepsis must be investigated and treated promptly with antibiotics within 1 hour of the decision to treat. This is irrespective of their sepsis risk score. See appendix 1 for common signs of clinical sepsis. If you are unsure, seek senior help.
2. Investigations for sepsis should include a blood culture (a minimum of 1ml of blood must be inoculated into the blood culture bottle) before giving the first antibiotic dose, FBC and a CRP. The CRP should be repeated 18-24 hours later.
3. Where there is a history of confirmed Group B Streptococcal sepsis or death of a neonate in previous pregnancy, **and** the mother has not received adequate intrapartum prophylaxis in this pregnancy, the newborn infant should be screened and presumptively treated irrespective of the sepsis risk score.

The following parameters should be collected as routine during labour or at elective caesarean section by attending midwives in all infants:

- Gestational age – Weeks + days
- Highest maternal intrapartum temperature in °C (i.e., from onset of established labour to first hour after delivery)
- Duration of rupture of membranes in hours – membrane rupture to time of birth
- GBS status – positive / negative / unknown
- Type of intrapartum antibiotics and time of first dose

The midwife should contact the neonatal team if according to NICE infants  $\geq 34$  weeks gestation have 1 red flag or 2 non-red flags

Risk Factors	
<b>Suspected or confirmed infection in another baby in the case of multiple pregnancy</b>	
Invasive group B streptococcal infection in a previous baby  or maternal GBS colonisation, bacteriuria or infection in the current pregnancy	
Confirmed prelabour rupture of membranes at term for more than 24 hours before onset of labour	
Preterm birth following spontaneous labour before 37 weeks' gestation Confirmed rupture of membranes more than 18 hours before a preterm birth	
Intrapartum fever higher than 38°C if there is suspected or confirmed bacterial infection	
Clinical diagnosis of chorioamnionitis	

 Where there is history of a previous GBS sepsis or death of an infant AND the mother has not received adequate intrapartum prophylaxis (penicillin), the infant should be screened and treated

Clinical Signs	
<b>Apnoea</b>	
<b>Seizures</b>	
<b>Need for CPR</b>	
<b>Need for mechanical ventilation</b>	
<b>Signs of shock</b>	
Altered behaviour or responsiveness	
Altered muscle tone (e.g. floppiness)	
Feeding difficulties (e.g. feed refusal)	
Feeding intolerance (e.g. vomiting, abdominal distension)	
Abnormal heart rate (bradycardia or tachycardia)	
Signs of respiratory distress (including grunting, recession, tachypnoea)	
Hypoxia (for example central cyanosis or reduced oxygen saturation levels)	
Persistent pulmonary hypertension of newborn	
Jaundice within 24 hours of birth	
Signs of neonatal encephalopathy	
Temperature abnormality (lower than 36C or higher than 38C)	
Unexplained or excessive bleeding, thrombocytopenia or abnormal coagulation	
Altered glucose homeostasis (hypoglycaemia/ hyperglycaemia)	
Metabolic acidosis (base deficit of 10mmol/litre or greater)	

The neonatal team should thoroughly examine the baby and follow the steps as follows:

**Step 1:** Apply the NICE criteria (see above)

a) If one red flag or two non-red flags present – proceed to Steps 2 and 3

b) No red flags and only one non-red flag – routine care with observation for 12 hours and keep a low threshold for review and screening.

**Step 2:** Assign the infant to one of the following three 'CLINICAL STATUS' categories using the guide in this table. If infant falls into the category of clinical illness move straight to sepsis screen and commencing antibiotics:

Clinical Exam	Description
<b>Well appearing</b>	No persistent physiologic abnormalities
<b>Equivocal</b>	<p><b>Any one persistent physiologic abnormality lasting ≥ 4 hrs after birth</b></p> <ul style="list-style-type: none"> <li>Tachycardia (HR ≥ 160)</li> <li>Tachypnoea (RR ≥ 60)</li> <li>Temperature instability (&lt;36.4°C OR ≥ 38° C)</li> <li>Respiratory distress (grunting, nasal flaring or chest recessions) not requiring supplemental oxygen</li> </ul>
<b>Equivocal</b>	<p><b>Two or more physiologic abnormalities lasting ≥2 hours after birth</b></p> <ul style="list-style-type: none"> <li>Tachycardia (HR ≥ 160)</li> <li>Tachypnoea (RR ≥ 60)</li> <li>Temperature instability (&lt;36.4°C OR ≥ 38°C)</li> <li>Respiratory distress (grunting, nasal flaring or chest recessions) not requiring supplemental oxygen</li> </ul>
<b>Clinical Illness</b>	<p><b>Abnormalities can be intermittent</b></p> <ul style="list-style-type: none"> <li><b>Equivocal state persisting beyond 6 hours after birth should be classed as 'clinical illness'.</b></li> <li><b>Late onset symptoms beyond the first few hours and in particular after an asymptomatic period should also be classed as 'clinical illness'</b></li> </ul>
<b>Clinical Illness</b>	<ul style="list-style-type: none"> <li>Need for mechanical ventilation (outside delivery room)</li> <li>Haemodynamic instability requiring fluid bolus or inotropes</li> <li>Persistent need for CPAP/HFNC</li> <li>Need for supplemental oxygen ≥ 1 hours to maintain oxygen saturation &gt;90%</li> <li>Neonatal encephalopathy / Perinatal depression <ul style="list-style-type: none"> <li>* Neonatal seizure</li> <li>* Apgar score &lt; 5 @ 5 minutes</li> </ul> </li> <li>Any other symptoms of serious illness – clinician determined</li> </ul>

**Step 3:** Calculate Sepsis Risk Score to determine individual infant's risk for EOS.

The Sepsis Risk Score can be accessed at the following website

- <https://neonatalesepsiscalculator.kaiserpermanente.org/InfectionProbabilityCalculatorOrig.aspx>
- Guidance on how to enter the risk factors used to determine the Sepsis Risk Score can be found in Appendix 2 and training slides.
- In the unlikely scenario that the SRC tool is not available, follow NICE guidance

Incidence of Early-Onset Sepsis	<b>1.0/1000 live births</b> Use 1.0 to calculate Sepsis Risk Score
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**Step 4:** Using the sepsis risk score **after clinical examination** THEN follow the management plan based on the EOE modified plan

Clinical examination	Clinical recommendation as per SRC	Modified Recommendation as per EOE
Well appearing	No culture, no antibiotics, routine vitals	Observe for a minimum of 24 hours on postnatal ward; Follow observation guidance using NEWTT2 chart
	No culture, no Antibiotics, vitals every 4 hours	Observe for minimum of 36 hours on postnatal ward; Follow observation guidance using NEWTT2 chart
	Blood culture	Sepsis screen and treat empirically
	Empiric antibiotics	Sepsis screen and treat empirically
Equivocal	No culture, no antibiotics, vitals every 4 hours	Once symptoms have resolved, observe for minimum of 36 hours on postnatal ward; Follow observation guidance using NEWTT2 chart
	Blood culture	Sepsis screen and treat empirically
	Empiric antibiotics	Sepsis screen and treat empirically
Clinical illness	Empiric antibiotics	Sepsis screen and treat empirically

**If at any point during observations, there is clinical worsening then perform sepsis screen and treat with antibiotics and further management as per your current practice**

The tool maybe reapplied if new information regarding maternal risk factors become available i.e. GBS status or maternal fever within 1 hour post delivery.

**Change in clinical condition of the baby should be acted on based on clinical assessment.**

Risk per 1000/births			
EOS Risk @ Birth	0.48		
EOS Risk after Clinical Exam	Risk per 1000/births	Clinical Recommendation	Vitals
Well Appearing	0.20	No culture, no antibiotics	Routine Vitals
Equivocal	2.38	Blood culture	Vitals every 4 hours for 24 hours
Clinical Illness	10.02	Empiric antibiotics	Vitals per NICU

Classification of Infant's Clinical Presentation: Clinical Illness    Equivocal    Well Appearing

### Observations:

Clinical Status	Well Appearing	Equivocal	Unwell
<b>Observation Schedule</b>	Routine observations at 1 hour, 2 hours and then 2 hourly until 12 hours of age. Thereafter continue observations every 4 hours until the end of the observation period (24-36 hours)	Hourly until all observations within normal range x 2.  Thereafter follow guidance for well appearing child.	Admit to NICU and observation as directed by clinician.

Use guidance for NEWTT2.

**Discharge:** All infants on observation pathway should be re-examined by the neonatal team before discharge to confirm well-being. Parents should be given both verbal and written information for safety netting. 'Screening for infection in newborn babies information for parents' leaflet.

## Appendix 1:

Calculator Input	Value to be entered	Notes
Incidence of Early-Onset Sepsis	<b>1.0/1000 live births</b> Use 1.0 to calculate Sepsis risk score	Based on consensus decision and variable range differences from 0.5 -1.2/1000
Gestational Age (GA)	GA at birth, in weeks and days	"Weeks" value range 34-43 "Days" value range 0-6
Highest Maternal Intrapartum Temperature (°C)	Enter the value and remember to choose "Celsius" for the temperature unit. Note: Highest intrapartum maternal temperature including up to 1 hour following delivery	Value may be whole number or number with single decimal place Examples: 37, 37.1, 37.0 are all acceptable entry values <b>Note: Midwives to document and flag up to the neonatal team, if postpartum temperature taken within 1 hour of birth is at least 0.5°C higher than intrapartum temperature so that the correct figure is used in calculation.</b>
ROM (hours)	Duration of time between rupture of membrane and birth, in hours <b>*Please enter for SRC the actual duration of rupture of membranes till birth and not just pre-labour duration</b>	Value may be whole number rounded up to the nearest 0.1 hours (single decimal place) <b>Example:</b> ROM time 4 hours and 30 minutes should be entered as 4.5 hours. <b>Example:</b> ROM time 4 hours and 55 minutes can be entered as 5.0 hours
GBS	Enter maternal GBS screening result if available. If not known enter 'unknown'	
Type of Intrapartum Antibiotics and interval from first dose to birth	<p><b>GBS-specific antibiotics are defined ONLY as Benzylpenicillin</b> This should apply only to mothers who are GBS positive or GBS unknown. <b>If erythromycin, clindamycin or vancomycin ALONE are given for GBS prophylaxis, choose the option "No antibiotics or any antibiotics given &lt; 2 hours prior to delivery."</b></p> <p><b>Broad-spectrum antibiotics (BSAB)</b> are defined as <u>two or more antibiotics given in combination</u> when there is concern for the mother developing chorioamnionitis.</p> <p><b>Timing</b> of administration of GBS-specific antibiotics or BSAB administration = interval between the first dose of Benzyl penicillin or the second antibiotic in the combination to the time of birth. <b>Example:</b> Cefuroxime is given at 2:00 PM; Metronidazole is given at 3:30 PM. Birth is at 4:30 PM. Because the second antibiotic of the combination was given 1 hour prior to delivery, choose option <b>"No antibiotics or any antibiotics given &lt; 2 hours prior to delivery."</b></p> <p><b>If a mother has been given BOTH GBS-specific antibiotics and BSAB – of the 4 possible options, select the category with the longest duration of treatment.</b></p> <p>Example: Mother is given Benzyl Penicillin at 8:00 AM and 12:00 PM for GBS +ve. She develops a fever to 38.3° C at 2:00 PM, and Cefuroxime is given at 3:00 PM. Penicillin G is given at 4:00 PM. Birth is at 4:30 PM. In this case, GBS-specific antibiotics were given &gt; 4 hours prior to delivery, but BSAB were given only 1 ½ hours prior to delivery. For calculating the SRS, in this case choose <b>"GBS specific antibiotics given &gt; 2 hours prior to birth."</b></p>	



### Appendix 3:

Possible systemic signs and symptoms of sepsis:

System	Signs and Symptoms
Respiratory	Grunting, flaring, retracting, cyanosis, oxygen requirement, apnoea, tachypnoea
Neurological	Hypotonia, hypertonia, lethargy, irritability, bulging/full/tense fontanel, seizures (associated with meningitis)
Cardiovascular	Bradycardia, tachycardia, hypotension, hypertension, decreased perfusion
Gastrointestinal	Feeding intolerance, abdominal distention, visible loops of bowel, gastric aspirates, emesis, diarrhoea, bloody stools
Other	Temperature instability, unexplained blood glucose instability, metabolic acidosis, rash, petechiae, purpura, unexplained jaundice

### References:

1. NICE guidance NG195 Neonatal infection: antibiotics for prevention and treatment <https://www.nice.org.uk/guidance/ng195>. Published April 2021, last updated March 2024
2. BPAM Framework: NEWTT 2 - Deterioration of the Newborn. A Framework for Practice. <https://www.bapm.org/resources/deterioration-of-the-newborn-newtt-2-a-framework-for-practice>
3. BPAM Safety Alert: Using the KP Risk calculator / NICE Categorical Framework with the NEWTT2 tool. <https://www.bapm.org/articles/safety-alert-using-the-kp-risk-calculator-nice-categorical-framework-with-the-newtt2-tool> Issued January 2024
4. Escobar GJ, Puopolo KM, Wi S, Turk BJ, Kuzniewicz MW, Walsh EM, Newman TB, Zupancic J, Lieberman E, Draper D. Stratification of risk of early-onset sepsis in newborns  $\geq 34$  weeks' gestation. Pediatrics. 2014 Jan;133(1):30-6.

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## Exceptional Circumstances Form

Form to be completed in the **exceptional** circumstances that the Trust is not able to follow ODN approved guidelines.

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Title:	Organisation:
First name:	Email contact address:
Surname:	Telephone contact number:
Title of document to be excepted from:	
Rationale why Trust is unable to adhere to the document:	
Signature of speciality Clinical Lead:	Signature of Trust Nursing / Medical Director:
Date:	Date:
Hard Copy Received by ODN (date and sign):	Date acknowledgement receipt sent out:

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