Treatment for early-onset neonatal sepsis

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Neonates with suspected early-onset sepsis are often treated aggressively with antibiotics before infection is confirmed. NICE has recommended a gentler approach.

In this article...
▶ Challenges in identifying early-onset neonatal sepsis
▶ Audit findings in a district general hospital
▶ Guidance on streamlining care in suspected or confirmed sepsis

Early-onset neonatal sepsis (within 72 hours of birth) is a significant cause of morbidity and mortality. Of approximately 688,000 live births in England annually, up to 10% of neonates are investigated for the condition, which is most commonly due to group B streptococcus in term babies; a large proportion of these babies receive antibiotics (Bedford-Russell, 2010).

However, the incidence of early-onset neonatal sepsis proven by blood or cerebrospinal fluid culture in the UK is 1.15 cases per 1,000 births. It is estimated that for every case of proven neonatal sepsis, more than 90 cases are investigated and/or treated with intravenous antibiotics where infection has not been confirmed.

Background
The challenge facing health professionals is to identify neonates with sepsis and initiate antibiotic therapy in a timely manner and to avoid unnecessary treatment of those who do not have infection.

It may not be possible to avoid giving antibiotic treatment to a proportion of babies who have risk factors for sepsis but are not infected (Berardi et al, 2013); NICE (2012) suggests there are sometimes unnecessary delays in recognising and treating sick neonates. This has led to the development of regional and local guidelines to identify risk factors for sepsis in the newborn (Berardi et al, 2013; Colbourn et al, 2007). These include:
» Maternal pyrexia during labour;
» Prolonged rupture of membranes;
» Detection of group B streptococcus in maternal high vaginal swabs;
» Premature delivery.

NICE (2012) has published guidance to streamline treatment of early-onset neonatal sepsis and improving cost-effectiveness without compromising patient safety. This review was largely influenced by a clinical audit at a small district general hospital to assess the management of early-onset neonatal sepsis with blood tests, IV antibiotics and monitoring performed by neonatal nurses. Our practices were compared with the NICE (2012) guideline.

Audit study
A prospective audit was conducted over two months (November and December 2012), examining antibiotic treatment of suspected early-onset neonatal sepsis. There were 234 deliveries (annual rate 1,600) with gestational ages of 32-41 weeks; 22 babies were identified with risk of sepsis and received antibiotic therapy; their average length of stay in hospital was 3.3 days. Reasons cited in the medical notes for suspecting sepsis included:
» Respiratory distress;

5 key points
1 Up to 10% of neonates are investigated for early-onset sepsis
2 Treatment is often started because sepsis is suspected before test results are available
3 NICE guidelines aim to reduce needless intervention and antibiotic resistance while ensuring babies with infection are treated promptly
4 NICE has "red flag" factors to identify babies at greatest risk, as well as other signs that should be considered
5 Implementing this guidance would free up nursing time and cots in neonatal units

Implementing NICE guidance could reduce patient to nurse ratios in neonatal units
Lethargy;
Poorn feeding;
Maternal and obstetric risk factors for early-onset neonatal sepsis.

All 22 babies had blood tests for sepsis (C-reactive protein, full blood count and blood culture) before antibiotics were started. Microbiological tests were negative in all cases; seven of the 22 (37%) results took over 48 hours to become available.

All the babies could have been safely managed with only 36 hours of antibiotic therapy as recommended by NICE (2012) but their therapy was an average of 248 hours. The NICU (14%) did not match the NICE screening criteria but were treated for presumed early-onset neonatal sepsis; these babies could have been observed for 24 hours without starting antibiotic therapy.

On the basis of the results and available statistics from previous years, we estimate that each year 300 babies will be treated in our hospital for suspected early-onset neonatal sepsis, although only 1-3 would be expected to have blood/CSF-proven sepsis.

Management
Early-onset neonatal sepsis is a significant cause of mortality and morbidity, and early antibiotic therapy saves lives (Satar and Özü, 2012). Concern that a neonate may be at risk should therefore prompt testing and early initiation of antibiotics.

However, in most cases, treatment is started on presumption of sepsis risk (NICE 2012) when the baby is clinically well with normal inflammatory markers and a negative blood culture. In such cases, antibiotics can be stopped early (after 36 hours) and the baby safely discharged home. This process is expected to become more streamlined as the NICE (2012) guideline is implemented.

The NICE guideline was introduced to reduce the burden of needless intervention, to promote early discontinuation of antibiotics (after 36 hours) in well neonates and thus reduce the development of bacterial resistance while ensuring that babies with infection are treated promptly.

The guideline identifies several “red flag” factors (Box 1) to identify babies at greatest risk. The presence of any red flag factor should trigger blood investigations and antibiotic treatment; investigations and treatment are also necessary where there are no red flag factors, but two or more other risk factors or other clinical indicators are present. However, if only one risk factor is present in an otherwise well neonate, health professionals may use their clinical judgement and consider withholding antibiotics with close monitoring for at least 12 hours after birth.

### BOX 1. RISK FACTORS

**Red flag risk factors**
- Parenteral antibiotic treatment given to the mother for confirmed or suspected invasive bacterial infection at any time during labour, or in the 24-hour periods before and after the birth
- Suspected or confirmed infection in another baby in multiple pregnancies
- Respiratory distress starting more than four hours after birth
- Neonatal seizures
- Need for mechanical ventilation in a term baby
- Signs of shock

**Other risk factors**
- Signs of respiratory distress <4 hours after birth
- Need for mechanical ventilation in a preterm baby
- Vomiting, excessive gastric aspirates and abdominal distension
- Local signs of infection (for example, affecting the skin or eye)
- Hypothermia <36°C or pyrexia >38°C that is non-environmental

### NICE guidance implementation

Around 6,800 newborn babies in England receive interventions (largely treatment for suspected sepsis) that may be of limited benefit, costing an estimated £104.6m per year (Department of Health, 2011).

Implementing the NICE (2012) guideline could reduce costs without putting neonates at risk. Treating well neonates with risk factors for sepsis increases the workload of staff involved in preparing, checking and administering the antibiotics and monitoring the infants (NICE, 2012).

The NICE (2012) guideline is also likely to be of significant benefit since neonatal units are often understaffed and may not meet the neonatal nurse ratio of 4:1 recommended by the British Association of Perinatal Medicine and Department of Health (Pillay et al., 2011). A prospective observational study in six UK neonatal units has found that one nurse can care for no more than 2.7 babies, when taking account of the need for observations to be undertaken without delays or omissions, and to allow adequate nursing breaks (Pillay et al., 2011).

No significant differences in delays or omissions of care have been observed between nurses with specialist neonatal nursing qualifications and those without, suggesting that such delays cannot be assigned purely to inexperience or inability to think critically. The workload of caring for sick neonates may increase the risk of tasks being delayed or omitted when workloads and nursing ratios are higher (Spence et al, 2006). Implementing the NICE (2012) guideline is likely to free up nursing time, which will ensure better care for neonates.

### The way forward

NICE (2012) recommends treating neonates who have risk factors for sepsis but are clinically well with only 36 hours of IV antibiotics provided that they remain well, inflammatory markers remain within normal limits and their microbiological tests are negative (Ismail and Gandhi, 2014). This is supported by a recent audit study in which 236 term babies who had low inflammatory markers and negative blood cultures were safely discharged after 36 hours of antibiotic therapy; none of whom were readmitted with sepsis (Johnston and Anthony, 2013). The authors supported the idea of repeating the C-reactive protein in the 36-hour period of antibiotic treatment as well as a negative blood culture before stopping antibiotics, as this will add certainty (Johnston and Anthony, 2013).

Following our audit, a care bundle was introduced in our unit to streamline the management of suspected early-onset neonatal sepsis in line with NICE (2012), and staff were trained. Following discussions, blood culture results are now available at 36 hours from the microbiology department. We plan to repeat the audit a year after the care bundle’s implementation.

### References