Late preterm babies – their problems and care

Preterm births are an increasingly common phenomenon. This article will look at the contributing factors for preterm births, the difficulties faced by the largest group of preterm neonates, born at 34-36 completed weeks' gestation and suggest recommendations to alleviate the significant levels of mortality and morbidity faced by this group.

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Key points

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1. Babies born at 34-36 completed weeks' gestation account for up to 70% of preterm births.
2. This group of babies experience significant levels of mortality and morbidity.
3. Improvements in care for this group of babies, including expansion of transitional care schemes within maternity services, is suggested to improve the outcome for these babies.

Defined as 'birth before 37 weeks' gestation'[1], preterm births are increasing throughout the industrialised world[2,3]. This growing population accounted for 7.5% of the total birth rate in England and Wales during 2005[4], and a 9% increase in demand for specialist neonatal services through 2006-09 in England[5]. Factors cited for the sustained growth in preterm births worldwide include increasing numbers of mothers over 35 years, multiple gestations, maternal complications, including bleeding and pre-eclampsia, and fetal complications, such as intra-uterine growth retardation and premature rupture of the membranes[2,3,5].

This preterm population can be subdivided by gestational age into extreme prematurity (below 28 weeks' gestation), severe prematurity (28-31 weeks' gestation), moderate prematurity (32-33 weeks' gestation) and late preterm (34-36 weeks' gestation[3,6]).

Rapidly improving technology and skills reflect ever better outcomes for even the most fragile neonates[5,7]. The Department of Health[5] notes an 8-10% increase in the survival rate of babies below 26 weeks' gestation during 1995-2006 in England and Wales. While welcome, such success in a low volume service[8], alongside rising preterm birth rates, has increased demand in a pressurised specialty[9]. Hence, there is incentive to move babies through neonatal units quickly, and even care for some preterm babies outside of neonatal services altogether[10]. As illustrated by the guideline produced by Great Ormond Street Hospital for Children – Institute of Child Health[10], those most likely to be cared for outside neonatal services are those born at 34-36 completed weeks' gestation.

Late preterm babies

Frequently resembling term infants, rather than their preterm counterparts, this group are often cared for as term infants, particularly after an uneventful delivery[1]. However Saigal and Doyle[7] highlight that these babies are still premature and are therefore vulnerable to risk factors associated with prematurity, including temperature instability, hypoglycaemia, hyperbilirubinaemia, respiratory distress and apnoea. Such risk factors may be exacerbated when these babies are cared for as term babies. The percentage of late preterm births within the total birth rate in the United States during 1990-2006 rose from 6.8% to 8.1% – an increase of 20%[11].

There are many synonyms used in the literature to describe this group of preterm babies. It was the size, vulnerability and ambiguity of this group that prompted the United States National Institute of Child Health and Human Development (NICHD) to recommend that this group of premature infants be referred to as 'late preterm', to highlight their premature status[1,2]. Adopting the nomenclature of late preterm throughout the UK may also serve to emphasise the needs of this population, who comprised almost 70% of premature births in England and Wales during 2007[4], and 66.4% of preterm births in Northern Ireland during 2006[12].

However the true nature of this neonatal sub-population is not fully known. Currently, there are virtually no data from England describing this group; the All Wales Perinatal Survey (AWPS)[13] provides some information, but has recently changed its data sets, such that late preterm babies are not identifiable as a separate group. Furthermore, data collected by

bodies such as the Office of National Statistics[14] and the Congenital Anomaly Register and Information Service for Wales[15] shed little or no light on the impact of factors such as multiple births and congenital abnormalities on this increasing population.

Aylott[16] identifies birth and the first 6-12 hours of life as a critical time for the neonate. During this period, the newborn continues physiological and metabolic processes begun *in utero* required to survive birth. These adaptations to extra-uterine life place extreme stress on the immature physiology and metabolism of the preterm neonate[17]. It is in this time frame that all preterm babies, late preterm babies included, are particularly susceptible to iatrogenic complications. To highlight this vulnerable time frame, Aylott[16] proposes a visual depiction through which the interaction of the three most common difficulties experienced by preterm neonates – hypothermia, hypoglycaemia and hypoxia – may be considered. Entitled 'The Neonatal Energy Triangle', Aylott[18] aptly compares the interaction of these conditions with that of meshed cogs, illustrating the fact that alteration of one state will have a direct impact on the other two. While Aylott[16,18] highlights these three common difficulties, the risk of other complications, such as hyperbilirubinaemia, should not be ignored.

FIGURE 1 35+4-week girl, dressed in cardigan and wrapped in blankets to help maintain temperature.

Hypothermia

When considering hypothermia, Wang et al[19] state that late preterm babies are ten times more likely to experience temperature instability than term babies (**FIGURE 1**). Jorgensen[20] suggests that the apparent maturity and greater size of late preterm babies may mask their vulnerability to cold stress and thermal instability. Born wet into a cool environment, preterm babies are at significant risk of rapid cooling, losing as much as 1°C/minute[18,21]. Having relied on maternal thermoregulation[22], the baby now faces the vitally significant task of self thermoregulation, for hypothermia is often associated with adverse outcomes[18]. The instinctive response is to generate and conserve heat, attempting to compensate for this rapid cooling[22]. Born with an immature physiology and metabolism[1], the baby's primary response to cold stress, a body temperature of 36-36.5°C[23], is non-shivering thermogenesis – the glucose dependent metabolism of brown fat[22,24]. However, this response in the late preterm baby is limited by the interrupted storage of brown fat, which is normally deposited through the third trimester until one month after birth[16,22]. Furthermore, heat that is generated may easily be lost due to poor peripheral vasoconstriction, the large surface area to body-mass ratio, little insulating subcutaneous white fat and poor flexion[1,18].

Left alone, the preterm baby's temperature will quickly fall to less than 36°C[23]. As this occurs, glucose supplies are rapidly depleted, limiting the effectiveness of non-shivering thermogenesis and inhibiting surfactant production[24]. This in turn increases the energy requirements of breathing. Attendant peripheral vasoconstriction also induces tissue hypoxia and metabolic acidosis, further reducing the baby's thermogenic ability[18].

FIGURE 2 36-week girl, enteral feeding tube in place to support adequate nutrition.

Hypoglycaemia

Birth also removes the continuous supply of placental glucose, described as the primary cerebral energy source[16] and critical to normal cellular function[16]. At birth, Aylott[16] states that neonatal blood glucose levels are approximately 70% of maternal levels and fall to a trough level after 1-2 hours, when hepatic glycogen stores are depleted. Through mobilisation of both extrinsic and intrinsic energy sources, including vigorous ketogenesis, the blood glucose levels of healthy term babies rise after 3-4 hours[16]. In recognising this physiological process, Aylott[18] describes a stressor of the newborn preterm baby that arises from the need to achieve glycaemic homeostasis with limited internal stores and normal intermittent feeding. As fetal hepatic storage of glycogen rapidly increases only after 36 weeks, this stress can be substantial. Wang et al[19] state that late preterm babies are three times more likely to experience hypoglycaemia than term babies. The difficulty in achieving glycaemic homeostasis by this method is compounded by immature glycogenolysis and glyconeogenesis pathways and limited ketogenic ability[16,25].

The need for exogenous glucose sources also requires the late preterm baby to feed effectively (**FIGURE 2**). However, feeding

difficulties in late preterm babies are widespread[16,26]. Some of the most common include poor oral coordination and tone; they also tire easily and sleep for longer periods in comparison to term babies[27]. The combination of these and other factors can give the illusion that the late preterm baby is satiated after brief insufficient feeds[26]. Hence, late preterm babies are at greater risk of hypoglycaemia than term infants due to insufficient feeding[16].

Acknowledging such physical and physiological immaturity, Jorgensen[20] describes an increased likelihood of neurological impairment and adverse long-term developmental outcomes for late preterm babies following prolonged hypoglycaemic episodes. While Aylott[16] recognises that transient hypoglycaemia is a normal feature of the term baby, it is evident that there is an increased risk of prolonged hypoglycaemia for newborn late preterm babies whose clinical care follows that of term babies. This risk is compounded by a lack of consensus on a definition for neonatal hypoglycaemia, and the resulting tendency for care to be determined by individual judgement and clinical symptoms[16].

Hypoxia

The final factor highlighted by Aylott[16,18] is hypoxia resulting from respiratory distress disorders. With the incidence of these disorders nine times higher in late preterm than in term babies, respiratory distress disorders are considered as one of the most common difficulties in preterm babies[28]. These difficulties arise from an immature respiratory system. At this stage of fetal development, late preterm babies have established the major components of the respiratory tree and are considered to be in the saccular stage[29,30]. However, Smith et al[30] indicate that it is not until around 36 weeks' gestation that true alveolar structures and an adequate pulmonary capillary bed are apparent. Subsequently, lung maturation continues through the improvement of the capillary bed and thinning of the alveolar structures, increasing the area for gaseous exchange more than twenty fold by 40 weeks' gestation[30].

Concurrent with structural development in the saccular stage is the maturation of the surfactant system. Coating the airway lumen, particularly in the alveoli, this lipid-based surfactant has the three fold purpose of reducing surface tension, thereby preventing alveolar collapse during expiration and over inflation during inspiration, providing alveolar stability and reducing the work of breathing[30]. While surfactant production begins as early as 24 weeks' gestation, this system does not mature until about 36 weeks' gestation[29,30]. Respiratory distress syndrome arises from lack of surfactant, dramatically increasing the work of breathing[16].

Transient tachypnoea of the newborn (TTN), arising from failure to clear fetal lung fluid, is another common respiratory complication of late preterm babies. Once thought to be caused primarily by vaginal squeezing during normal delivery, studies now suggest that active movement of sodium through alveolar epithelia is the main process for fluid clearance. Excessive fluid in the lung increases the effort of breathing. Presentation of TTN in late preterm babies is unpredictable, presenting as late as twenty four hours after birth[16].

Neonatal admission

Aylott[18] describes a downward spiral facing some preterm babies, whereby increased work in breathing not only consumes more glucose, but can induce hypoxia and therefore acidaemia – which inhibits surfactant production. Ketogenesis quickly follows the onset of hypoglycaemia, which compounds the problem by increasing acidotic conditions further. Depletion of energy stores also increases the risk of hypothermia, which further inhibits surfactant production. Treated as term babies, late preterm babiess are again at significant risk of iatrogenically enhanced respiratory distress disorders. Aylott[18] also describes the similarity and non-specific nature of the initial symptoms of hypothermia, hypoglycaemia and hypoxia, which complicates treatment further. When each of these three conditions are considered, it is apparent that they are not isolated but intimately linked.

Despite these increased risks clinical experience shows that following uneventful deliveries and achieving good Apgar scores, the majority of late preterm babies are successfully cared for by their mother on postnatal wards. Caring for their child, mothers will be happy that the early birth has apparently had no ill effect on their newborn baby. However, having defaulted into term care pathways, some late preterm babies may struggle in coping with the demands placed on them. Though the late preterm baby will have been fed, this may have been insufficient. Alternatively, mothers may recognise difficulties in feeding, and exhaust the neonate in attempting to provide sufficient milk. Pleased that their baby is sleeping well so soon after birth, mothers may not think to wake their baby in good time for the next feed. Also, late preterm babies are likely to be dressed as a term baby, which may result in them experiencing cold stress, exacerbated by exhaustive feeding sessions where glucose supplies are depleted. The cold stress may be such that admission to a neonatal unit is warranted at this point. Furthermore, these stressors may drive the late preterm baby into a state of respiratory distress, with display of such symptoms as nasal flaring, recession and grunting. At this point, specialist neonatal care would be required.

Neonatal admission procedures vary, but follow a common thread that includes assessment followed by support of the baby. In clinical experience, the late preterm baby is placed naked in a warmed incubator, allowing easy access and observation while also providing warmth. Nonetheless, Ellis[24] warns that frequent access will still lead to cooling. Providing a neutral thermal environment, whereby thermal homeostasis can be maintained with minimum effort[24], removes one stressor and reduces pressure on limited glucose supplies.

Concurrently, the late preterm baby's respiratory effort is assessed. Multiple signs of respiratory distress are usually treated through continuous positive airway pressure[31]. This removes another stressor on the neonate by reducing respiratory effort, again reducing pressure on limited glucose supplies. On admission, late preterm babies may receive glucose intravenously[16]. This provides essential energy without further compromising respiratory effort. When respiratory support is not required, Ludwig[27] suggests that late preterm babies are likely to need supplemental feeding through a nasogastric tube, reducing the stressor of feeding. Enteral feeding may need to be formula milk, as mother's milk supply may not yet be sufficient for the neonate's requirements. While these approaches may seem simplistic, Aylott[18] indicates that it is simple interventions skillfully used in the first hours after birth that avoid many complications.

Care of the family

Whereas neonatal admission may be necessary for the newborn, it is nonetheless a stressful experience for the parents[32]. The unexpected, sudden neonatal admission of what was thought to be a well baby increases parental anxiety substantially. Furthermore parents, particularly the mother, are likely to be experiencing feelings of grief, inadequacy and failure[33]. Burdened with these emotions, parents now face the milieu of the neonatal unit[34], and the need to communicate with and care for the baby that in their eyes they have already failed twice over; giving birth early and now allowing them to become sick. Additionally, mothers may be asked to allow their new baby to have formula milk. While this may be necessary, Flacking et al[35] suggest that the child's mother may perceive this as another reminder of her failure and shattered dreams.

The Poppy Report[36] found that the greatest support parents can receive is understanding and patience from the nurses looking after their baby. Good, accurate and consistent communication was found to be the foundation of this support, and provides parents with a significant asset in the care of their baby. Sustained with this supportive relationship, parents who understand the needs of their baby are far more able to interact appropriately with their baby, paving the way for greater attachment and substantially improved care[37]. In forming this supportive relationship, nurses must seek to engage parents as active partners in care and teach them how to care for their own baby, giving them opportunity to do so[34]. In this role, nurses must recognise that most research has focused on the maternal-infant bond. While noting this, both Hopwood[37] and The Poppy Report[36] highlight the increasingly recognised role of the father in these relationships. From these reviews, fathers are seen to be in equal need of support, but in a different form than mothers. Often first to see the baby in the neonatal unit, alone, fathers are easily overwhelmed and greatly appreciate one-to-one support[36]. Hopwood[37] also found that fathers require details on care and status, while mothers thrive on a social relationship with nurses. Nonetheless, Hopwood's[37] review showed fathers need time to care for their baby, forming an important bond with their baby – one that will positively influence the maternal bond.

Transitional care

Recognising that many late preterm babies are successfully cared for by their mother[11], and continuing Aylott's[18] ideal that prevention is better than cure, healthcare professionals have explored options that would support the needs of late preterm babies and their parents. Simpson[38] describes work in the 1970s that explored the concept of transitional care for newborn babies. Simpson[38], Bromley[39] and Hubbard[40] describe implementation of transitional care schemes catering for babies classified as special care babies by the British Association of Perinatal Medicine (BAPM)[41]. At birth, some late preterm babies would fit this description; Northern Ireland's Neonatal Outcomes Research and Evaluation[12] reported that during 2006 42.5% of late preterm babies admitted to neonatal units only required special care, as defined by BAPM[41]. It is possible that many of these admissions may have been avoided with effective transitional care. Directed by specially trained midwives and nursery nurses, supported by neonatal staff as required, mothers would still care for their babies. Such care could easily be provided on postnatal wards, negating the stress of the neonatal admission, and thereby enhancing the parent-child bond. In some cases, it may be useful to provide transitional care in designated areas on postnatal wards. Williams[42] describes how such schemes can reduce pressure on specialist neonatal services with minimal increases in expenditure. It is therefore surprising that there is little information in the literature about neonatal transitional care beyond those authors cited.

Nonetheless, key to effective care of late preterm babies is parental understanding of their needs, and not simply perceiving them as term babies, but a little small. Literature designed to help parents understand and care for their newborn late preterm baby written in plain language would be very helpful. Information such as how to dress their baby appropriately, to recognise the different states of arousal and when would be the most effective time to feed them could be included. Coupled with a transitional care scheme, this would provide an important tool to help parents care for their child effectively, ameliorating the impact of a late preterm birth and possible avoiding admission to a neonatal unit.

Summary

Recognition of this emerging preterm population and their associated difficulties should help to reduce the significant mortality and morbidity experienced by this group. Parental and staff education and access to transitional care schemes on the postnatal ward could also help to reduce the complications of late preterm births. Requiring very little financial input, these initiatives would relieve pressure on an already stretched neonatal service and more significantly would improve outcomes for late preterm babies and the bond with their parents.

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Letter to the Editor

Re: Infant feeding: take politics and moralism out of the maternity ward

by Ellie Lee. *Infant* 2011; Volume 7 Issue 3 pages 71-72.

Dear Editor

Working in the intensive care environment, I am an unquestionable supporter of breast milk for babies – especially where it is what the mother wants. However, it is very refreshing to see somebody spelling out that political correctness around this issue has gone too far. I really enjoyed this well written piece which has so coherently brought a little balance into the breast feeding debate.

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