Health Risks Associated with Late-Preterm Infants: Implications For Newborn Primary Care

Erica Saleski Forsythe, Patricia Jackson Allen

Seventy-one percent of all preterm infants in 2009 were considered late-preterm (i.e., infants born between 34 and 36 and 6/7-week gestation (Martin et al., 2011). Late-preterm infants may approximate weight of term infants and may initially transition well from birth; however, they may fail to maintain this stability (Kelly, 2010). Until recently, parents, caregivers, and health professionals have treated late-preterm infants the same as term infants, yet they are physiologically and metabolically immature and have a high risk of newborn morbidity (Engle, Tomashek, Wallman, & the Committee on Fetus and Newborn, 2007; Raju, Higgins, Stark, & Leveno, 2006). Several studies have found that the late-preterm population is at risk for respiratory complications, hyperbilirubinemia, poor feeding and hypoglycemia, temperature instability, and infection. These are all issues that can lead to admission to the NICU and a prolonged stay in the hospital, and the earlier the gestation, the higher the risk (Bastek, Sammel, Rebele, Srinivas, & Elovitz, 2010; Consortium on Safe Labor et al., 2010; Dani et al., 2009; Lubow, How, Habli, Maxwell, & Sibai, 2009; Mally, Bailey, & Hendrick-Munoz, 2010; McIntire & Leveno, 2008; Melamed et al., 2009; Pulver, Denney, Silver, & Young 2010; Raju et al., 2006; Shapiro-Mendoza et al., 2008; Tomashek et al., 2006; Vachharajani & Dawson, 2009; Wang, Dorer, Fleming, & Catlin, 2004). Primary care providers must recognize the inherent risks associated with late-preterm births to identify risk-focused management strategies for primary care of this population.

Methods

An OVID Medline, Cumulative Index to Nursing and Allied Health Literature (CINHAL), and Scopus database search was conducted using terms “infant,” “newborn,” “child,” “premature infant,” “gestational age,” “late-preterm infants,” “near-term infants,” “complications,” and “morbidity.” The results were limited to articles in English. This review included research articles that addressed the topic of short-term newborn outcomes of the late-preterm infant that would be relevant to the pediatric primary care provider. An ancestry search was performed on these articles and included in the review if criteria were met.

Literature Review

Birth History and Late-Preterm Incidence

Studies conducted to determine indications for late-preterm delivery have found that spontaneous labor and premature rupture of membranes, pregnancy-related hypertension, placental accidents, fetal disorders, intrauterine growth restriction, multiple gestation, and maternal medical disorders were all associated with late-preterm births.
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2

However, two studies have shown that maternal medical conditions and late-preterm birth were independent risk factors for newborn morbidity (Dimitriou et al., 2010; Shapiro-Mendoza et al., 2008). Compared to term infants with no exposure, late-preterm infants born to mothers with antepartum hemorrhage were 12 times more likely to experience morbidity during the birth hospitalization, and those exposed to hypertensive disorders of pregnancy were 11 times more likely (Shapiro-Mendoza et al., 2008). Both Shapiro-Mendoza et al. (2008) and Dimitriou et al. (2010) showed that earlier gestational age had a greater effect on infant morbidity than maternal medical conditions; however, when early gestational age and maternal medical conditions were combined, the researchers saw an additive effect in newborn morbidity.

The mode of delivery has been analyzed for late-preterm infants and the effect on infant morbidity. Malloy (2009) analyzed United States birth and infant death certificates from 2000-2003, and found infants 32 to 36 weeks gestation had a higher risk of neonatal mortality and morbidity when born via primary cesarean section compared to vaginal delivery, independent of risk factors such as maternal demographic characteristics, medical complications, and labor and delivery complications. Another large prospective study (DeLuca, Boulvain, Irion, Berner, & Pfister, 2009) compared modes of delivery and found that both term and late-preterm infants born by elective cesarean section, when compared with a planned vaginal delivery, had significantly higher rates of mortality, admission to the neonatal intensive care unit, and respiratory morbidity, with gestational age an independent risk factor for morbidity. Lower gestational age resulted in higher incidence of morbidity (DeLuca et al., 2009). The results of this study suggest that elective cesarean section in the preterm infant has infant morbidity risks and should not be performed unless necessary (DeLuca et al., 2009).

**Morbidities in the Late-Preterm Infant**

**Hyperbilirubinemia.** Several studies have found an increased risk of hyperbilirubinemia in late-preterm infants (Sarici et al., 2004; Vachharajani & Dawson, 2009; Wang & et al., 2004). Rehospitalization for jaundice occurs more frequently in late-preterm infants than in term infants (Escober et al., 2005; Jain & Cheng, 2006; Tomashek et al., 2006). Late-preterm infants have an immature hepatic system with limited ability to conjugate bilirubin. When combined with the risk of inadequate fluid intake and dehydration, decreased excretion of bilirubin and increased entero-hepatic circulation of bilirubin occurs (Dani et al., 2009; Mally et al., 2010). The risk of extremely high levels of bilirubin leading to kernicterus also exists (Mally et al., 2010). The American Academy of Pediatrics (AAP) and the Subcommittee on Hyperbilirubinemia (2004) released guidelines entitled, “Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation.” These guidelines state that clinicians should “recognize that infants at less than 38 weeks’ gestation, particularly those who are breastfed, are at higher risk of developing hyperbilirubinemia and require closer surveillance and monitoring” (AAP & the Subcommittee on Hyperbilirubinemia, 2004, p. 298).

**Respiratory compromise.** A large multi-site retrospective study based on electronic records of newborns admitted to the NICU with respiratory compromise between 2002-2008 found 36.5% of the late-preterm infants were admitted to the NICU for evaluation of respiratory symptoms, compared to 7.2% of the term infants (Consortium on Safe Labor et al., 2010). Multiple studies have found that late-preterm infants are at increased risk for respiratory distress syndrome (RDS), transient tachypnea of the newborn (TTN), pneumonia, and air leaks (pneumothorax and pneumomediastinum) requiring respiratory support with the rate of respiratory complications steadily decreasing with each increasing week in gestational age (Consortium on Safe Labor et al., 2010; Kamath, Marcotte, & DeFranco, 2011; Vachharajani & Dawson, 2009; Wang et al., 2004). Hypoglycemia and poor feeding. In a study conducted by Wang et al. (2004), 76% of the near-term infants (defined as 35 to 36 and 6/7 weeks gestation) with poor feeding had a prolonged hospitalization, compared to the 28.6% of term infants who had poor feeding. Hypoglycemia was found three times as often in the near-term infants compared with the term infants, and nearly two-thirds of the near-term infants required treatment with intravenous dextrose (Wang et al., 2004). Dani et al. (2009) suggested that hypoglycemia in the late-preterm infant may be due to deficient glycogenolysis and gluconeogenesis; however, poor feeding remains a plausible cause for hypoglycemia as well.

**Temperature instability.** Wang et al. (2004) found near-term infants were 10% more likely than full-term newborns to have temperature instability. Pulver et al. (2010) found that 31% of the infants studied had hypothermia requiring an isolette, causing 82% of these infants to have a prolonged hospital stay. Jay and Cheng (2006) found that late-preterm infants also had a higher risk of being readmitted to the hospital for hypothermia than term infants (2.5% vs. 0.2%). Late-preterm infants have an immature epidermal barrier and a higher ratio of surface area to birth weight than term infants, making this population more likely to have cold stress (Mally et al., 2010). Late-preterm infants also have less white adipose tissue for insulation and less accumulation of brown adipose tissue, making the infants less able to generate heat from brown adipose tissue as term infants do for thermal regulation (Engle et al., 2007).

**Infection.** Because late-preterm infants often exhibit signs of a possible infection, such as respiratory distress, temperature instability, and hypoglycemia, late-preterm infants are frequently evaluated for a suspected infection. Wang et al. (2004) found that the near-term population studied was three times more likely to be evaluated for sepsis than term infants. Pulver et al. (2010) found that 11% of the late-preterm infants studied had a prolonged hospital stay for treatment of suspected sepsis. Jain and Cheng (2006) found that 8.2% of late-preterm infants were readmitted to the hospital for suspected infection, compared to 6.6% of term infants admitted for infection.

**Early discharge from the hospital.** Because the late-preterm infant is often the same height and weight as a full-term infant and in the initial newborn period is able to maintain his or her temperature and breast or bottle feed,
the late-preterm infant may be discharged early from the hospital. Early discharge is defined as less than 48 hours after a vaginal birth or 96 hours after a cesarean section (AAP & the Committee on Fetus and Newborn, 2010). The late-preterm infant’s instability in adapting to extra uterine life may not be discovered during the birth hospitalization if the infant is discharged early (Escobar et al., 2005). The AAP recommends that early discharge should be limited to singleton births with gestational ages 38 to 42 weeks; however, discharge of the late-preterm population still occurs (AAP & the Committee on Fetus and Newborn, 2010; Goyal, Fager, & Lorch, 2011).

Early discharge is not recommended due to the multiple morbidity risks associated with late-preterm infants. In a retrospective chart review of 235 late-preterm infants, 40% of the infants experienced a prolonged hospital stay; 75% of the 34-week gestation infants and 25% of the 36-week gestation infants experienced prolonged hospital stays due to oxygen need, phototherapy for hyperbilirubinemia, hypothermia, need for nasogastric feedings, or antibiotic administration greater than three days (Pulver et al., 2010). In a large multi-site study, Shapiro-Mendoza et al. (2008) found that 22.2% of the 26,170 late-preterm births had experienced at least one complication that could lead to a prolonged hospital stay, compared to 3% of the 377,638 term infants; the 34-week gestation age group had the highest morbidity (51%), and the percentage gradually decreased with each advancing week, down to 5.9% morbidity at 37 weeks gestation.

### Table 1. Potential Postnatal Risks to Late-Preterm Infants and the Primary Care Interventions

<table>
<thead>
<tr>
<th>Postnatal Risk</th>
<th>Primary Care Interventions</th>
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<tr>
<td>General recommendations</td>
<td>Conduct frequent assessment and evaluation of infant in newborn nursery. Discourage early discharge from birth hospital. Evaluate late-preterm infants 24 to 48 hours post-discharge. Evaluate late-preterm infants at 2 weeks and 4 weeks of life.</td>
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<tr>
<td>Hyperbilirubinemia</td>
<td>Evaluate maternal and birth history for indications of increased risk for jaundice. Determine ABO compatibility. Perform bilirubin screen prior to discharge. Monitor urine and stool output. Assess for jaundice and monitor direct and indirect serum bilirubin levels if assessment warrants intervention. Initiate phototherapy when necessary.</td>
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<tr>
<td>Respiratory compromise</td>
<td>Monitor for respiratory difficulties. Educate parents on the signs of increased work of breathing and when to call the primary care provider.</td>
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<tr>
<td>Poor feeding/ Hypoglycemia</td>
<td>Monitor weight gain and feeding practices closely. Offer lactation support, if appropriate. Educate parents on feeding cues and proper feeding techniques and anticipated intake at each feeding. Monitor and review with parents the signs of dehydration and hypoglycemia.</td>
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<tr>
<td>Temperature instability</td>
<td>Educate parents on proper dressing of infant for temperature regulation. Educate parents on proper technique of taking a temperature. Review signs of cold stress with parent.</td>
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<tr>
<td>Infection</td>
<td>Educate parents to call if temperature above 100.4°F (38.6°C) or below 97°F (36.1°C). Evaluate maternal and infant risk factors for infection. Monitor for and review with parents the signs of infection and home infection control.</td>
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**Note:** Adapted from Association of Women’s Health, Obstetric, and Neonatal Nurses (AWHONN), 2010.

### Discussion

**Recommendations for Primary Care Providers**

Pediatric primary care providers and neonatal and pediatric nurses should know the risks associated with late-preterm birth (see Table 1). During the birth hospitalization, the late-preterm infant should have frequent assessments for respiratory compromise, hyperbilirubinemia, poor feeding, temperature instability, and infection. This close monitoring should not automatically require admission to the NICU unless the infant is experiencing symptoms; however, standard well-baby nursery care may not be appropriate (Pulver et al., 2010). Some hospitals have proposed late-preterm initiatives that include education of all medical team members in the well-baby nursery and parents on the morbidities of late-preterm infants, as well as having special markings or tags on the late-preterm infant’s cribs as a reminder of the need for these extended assessments (Corso & DeButy, 2011; Stoltz, Straughn, & Kupsick 2011). These initiatives could help prevent late-preterm infant morbidities through early recognition of symptoms.

Many short-term morbidities, such as respiratory distress, temperature instability, hyperbilirubinemia, and feeding difficulties, can be managed and resolved prior to discharge from the hospital. Although the AAP recommends late-preterm infants not be discharged early from the hospital, research has shown this still occurs (Goyal et al., 2011). If the infant is discharged early before these morbidities present or are corrected, these issues will be seen in the
primary care setting, most likely during the first two weeks of life.

Current AAP guidelines for healthy term infants recommend infants should be evaluated three to five days after birth or 48 to 72 hours after discharge from the hospital, and infants who are discharged from the hospital less than 48 hours after delivery should be evaluated within 48 hours (AAP & the Committee on Fetus and Newborn, 2010; Hagan, Shaw, & Duncan, 2008). The late-preterm infant should be seen within 24 to 48 hours of discharge to evaluate bilirubin levels, feeding practices, weight gain, temperature stability, respiratory effort, and signs of possible infection, allowing the health care provider to intervene early if necessary.

Feeding practices need to be evaluated because poor feeding can lead to hyperbilirubinemia, as well as hypoglycemia and dehydration. Poor feeding can be difficult to detect in late-preterm infants because feeding fatigue may be mistaken for feeding satisfaction. Late-preterm infants may not be able to handle a flexible feeding schedule because they may not “make-up” the intake volume after sleeping for three to five hours and fall behind in the required daily intake for growth (Ludwig, 2007). The late-preterm infant will need to be on a set two to three-hour feeding schedule, or may require nasogastric feedings if the infant becomes fatigued and is unable to take in adequate feedings for growth. Frequent weight checks are important if the primary care provider is concerned about inadequate intake.

After the initial visit, the next routine visit for the healthy term infant is usually at two weeks of life, and then again at two months (Hagan et al., 2008). Research has shown that morbidities in late-preterm infants are most likely to occur within the first 28 days of life, so late-preterm infants may benefit from having an additional visit at one week and four weeks of life to be evaluated for the potential morbidities (Tomashek et al., 2006).

Parent Education

Parent teaching should be conducted soon after the late-preterm infant is born to educate the parents on the need for close monitoring of their newborn and the possible complications the infant may experience adjusting to extra-uterine life. Having an infant admitted to the NICU or a prolonged hospital stay can affect parent-infant bonding and cause distress and disappointment (Pulver et al., 2010). Awareness of the possibility of admission to the NICU or an increased stay in the hospital can help prepare parents and decrease stress when it occurs.

Parents should be educated on the recognition of feeding cues and how to feed a late-preterm infant with an uncoordinated suck. Proper positioning for feeding, the need for scheduled feedings to support weight gain, what to do if the infant starts to choke, and when to notify the primary care provider of concerns or symptoms must all be discussed with the new parents prior to discharge of their late-preterm infant (Ludwig, 2007). Signs of dehydration should also be explained to parents, such as low urine output, poor skin turgor, dry eyes and skin, pale and cool skin, and lethargy (Association of Women’s Health, Obstetric and Neonatal Nurses [AWHONN], 2010).

Temperature stability in an open bassinet should be established prior to discharge. Parents will need to be educated on temperature management at home. Infants usually need to be dressed in one additional layer of clothing and swaddled in a lightweight receiving blanket to maintain their temperature. Parents should have a thermometer for home use and feel confident in using it. An in-hospital supervised trial of parents taking the temperature with their home thermometer and interpreting the readings is a recommended nursing intervention. Parents should be instructed to call the primary care provider if the temperature is above 100.4°F (38.6°C) or below 97°F (36.1°C). Signs of cold stress in the infant include lethargy, mottled appearance, tachypnea, and poor color; signs of infection include irritability, hypotonia, respiratory distress, poor perfusion, vomiting and diarrhea, and rashes (AWHONN, 2010).

Conclusion

Late-preterm infants are at increased risk for hyperbilirubinemia, respiratory compromise, poor feeding, temperature instability, and infection. Individualized risk-focused assessment of this population needs to be completed at each possible opportunity. Infant health care providers and parents need heightened awareness of the potential health risks in late-preterm infants so morbidities can be prevented or identified early and treated quickly to prevent further morbidity in the preterm infant.

References


