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IN REVIEW

The Paradox of Breastfeeding-Associated Morbidity Among Late Preterm Infants

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ABSTRACT

Objective: To synthesize the published research pertaining to breastfeeding establishment and outcomes among late preterm infants and to describe the state of the science on breastfeeding within this population.

Data Sources: Online databases Ovid MEDLINE, CINAHL, PubMed, and reference lists of reviewed articles.

Study Selection: Nine data-based research articles examining breastfeeding patterns and outcomes among infants born between 34 0/7 and 36 6/7 weeks gestation or overlapping with this time period by at least 2 weeks.

Data Extraction: Effect sizes and descriptive statistics pertaining to breastfeeding initiation, duration, exclusivity, and health outcomes among late preterm breastfed infants.

Data Synthesis: Among late preterm mother/infant dyads, breastfeeding initiation appears to be approximately 59% to 70% (U.S.), whereas the odds of breastfeeding beyond 4 weeks or to the recommended 6 months (exclusive breastfeeding) appears to be significantly less than for term infants, and possibly less than infants $\leq$ 34 to 35 weeks gestation. Breastfeeding exclusivity is not routinely reported. Rehospitalization, often related to "jaundice" and "poor feeding," is nearly twice as common among late preterm breastfed infants as breastfed term or nonbreastfed late preterm infants. Barriers to optimal breastfeeding in this population are often inferred from research on younger preterm infants, and evidence-based breastfeeding guidelines are lacking.

Conclusions: Late preterm infants are at greater risk for breastfeeding-associated rehospitalization and poor breastfeeding establishment compared to their term (and possibly early preterm) counterparts. Contributing factors have yet to be investigated systematically.

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Late preterm infants—those born between 34 0/7 and 36 6/7 weeks gestation—account for nearly three fourths of preterm births in the United States and are the fastest growing cohort of premature infants (Davidoff et al., 2006; Hamilton, Martin, & Ventura, 2007; Martin et al., 2007). In 2005, there were nearly 375,000 late preterm births. This figure corresponds to a dramatic increase in the incidence of late prematurity within the past two decades in the United States—by 25% from 1990 to 2005, and by 9.6% between only 2000 and 2005 (Martin et al.). In contrast, the percentage of infants $\geq$ 40 weeks of gestation has decreased by 15% since 1990, and infants born before 34 weeks of gestation have increased only moderately—by 8.5% from 1990 to 2005 (Davidoff et al.; Martin et al.). A number of interrelated factors, including increases in the number of multiple births, the national obesity epidemic and related fetal macrosomia, the trend toward later-life childbearing, consumer demand and preferences for elective inductions and Cesarean births, proliferation of obstetric malpractice litigation, practice guidelines opposing postterm deliveries, and advancements in fetal monitoring have been implicated in regard to the recent pervasiveness of late prematurity (Engle & Kominiarek, 2008; Fuchs & Gyamfi, 2008; Raju, 2006).

In concordance with the growing late preterm population, a study utilizing Nationwide Inpatient Sample (NIS) data from the federal Healthcare Cost and Utilization Project revealed that nonextreme preterm infants (28 0/7–36 6/7 weeks of gestation) consume two thirds of all hospital expenditures related to prematurity (Russell et al., 2007). The authors postulate that these expenses are attributable mainly to late

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preterm infants, in direct proportion to their prevalence, rather than acuity of illness. A cost analysis performed through a review of 185 near-term and full-term infants' electronic medical records showed that near-term infants (35 0/7–36 6/7 weeks gestation) consume a mean of $2,630 more in medical costs than infants $\geq$ 37 weeks gestation (Wang, Dorer, Fleming, & Catlin, 2004).

Despite appearances and weights often comparable to their term counterparts, late preterm infants tend to lag behind in terms of their cardiorespiratory, metabolic, immunologic, neurologic, and motor development (Engle, Tomashek, & Wallman, 2007). In recognition of this contradiction, a multidisciplinary expert panel assembled by the National Institute of Child Health and Human Development in 2005 made the recommendation to classify infants born between 34 0/7 and 36 6/7 weeks gestation as "late preterm," rather than "near term," to convey the medical vulnerability extant within this cohort (Raju, Higgins, Stark, & Leveno, 2006). Consistent with this assertion (but not with terminology), a medical record review reported that near-term infants were 4 times more likely than term infants to be diagnosed with jaundice, respiratory distress, poor feeding, temperature instability, or hypoglycemia during the birth hospitalization (Wang et al., 2004). The most common of these complications were jaundice (54%), suspected sepsis (37%), and feeding difficulties (32%).

Another medical record analysis, which included more than 33,000 infants born at seven different Kaiser Permanente Medical Care Program facilities, found that late preterm infants not admitted to the Neonatal Intensive Care Unit (NICU) were more likely than infants of all other gestational ages to be readmitted to the hospital within 2 weeks (adjusted odds ratio [aOR] = 3.10, 95% confidence interval [CI] [2.38, 4.02]) (Escobar et al., 2005). The most frequent reasons for rehospitalization were jaundice (34%) and feeding difficulties (26%). Another study by the same authors found that a gestational age of 36 weeks was one of only three predictors of rehospitalization at 15 to 182 days following discharge (Cox hazard ratio = 1.67, 95% CI [1.23, 2.25]) (Escobar, Clark, & Greene, 2006). Most recently, a chart review of more than 200,000 deliveries between 2002 and 2008 in the United States revealed that late preterm infants were significantly more likely than term infants to develop respiratory morbidity, including respiratory distress syndrome (RDS) (aOR of RDS at 34 weeks compared to 39 to 40 weeks gestation = 40.1, 95% CI [32.0, 53.3]) (The Consortium on Safe Labor, 2010).

Kramer et al. (2000) and Khashu, Narayanan, Bhargava, and Osiovich (2009) report significant mortality risks for infants considered mild or moderately preterm (32 0/7–36 6/7 weeks gestation) and "late preterm" (unconventionally defined as 33 0/7–36 6/7 weeks gestation), respectively. In the Kramer et al. study, the corresponding etiological fraction of mortality for moderately preterm infants exceeded those of very preterm infants (28–31 6/7 weeks gestation), whereas the Khashu et al. study noted significantly higher perinatal (risk ratio [RR] = 8.0, 95% CI [6.2, 10.4]), neonatal (RR = 5.5, 95% CI [3.4, 8.9]), and infant mortality (RR = 3.5, 95% CI [2.5, 5.1]) in late preterm as compared to term infants. Analogously, a 2008 committee publication by the American College of Obstetricians and Gynecologists reported that late preterm infants have a mortality rate 4.6 times that of term infants, a figure that has increased gradually since 1995 (Committee on Obstetric Practice, 2008).

Of particular concern, late preterm infants who are breastfed tend to be readmitted to the hospital with diagnoses of failure to thrive, jaundice, and dehydration more frequently than those who are not breastfed, a finding largely attributed to insufficient breast milk intake (Escobar et al., 2002; Gartner, 2001; Shapiro-Mendoza et al., 2006; Tomashek et al., 2006). This trend is disconcerting, considering the many, significant, and empirically validated advantages that breastfeeding provides, particularly for infants born prematurely (Callen & Pinelli, 2005). The purpose of this article is to address this paradox through synthesis of the available evidence on breastfeeding-associated infant rehospitalization, morbidity, and mortality and rates of breastfeeding initiation, duration, and exclusivity/supplementation within the late preterm population. A secondary objective is to describe the state of the science on breastfeeding among late preterm mother/infant dyads, including benefits and barriers to breastfeeding and current breastfeeding recommendations. The latter objective will be achieved through review of expert opinion and clinical review papers, as data-based research is currently lacking in this area.