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An Evidence-Based Approach to Breastfeeding Neonates at Risk for Hypoglycemia

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ABSTRACT

The revised standard of care for breastfeeding infants at risk of developing hypoglycemia during transitioning to extrauterine life was developed using the American Academy of Pediatrics (AAP) 2011 hypoglycemia guidelines, the Academy of Breastfeeding Medicine protocol, and staff input. A pre/postimplementation chart audit indicated support of infant safety by glucose stabilization, breastfeeding within the first hour of life, and breastfeeding frequency without an increase in blood sampling, formula use, or admissions to the special care nursery.

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Hypoglycemia is one of the life threatening issues neonates face during transition to extrauterine life (Barnes-Powell, 2007). In utero, maternal glucose crosses the placenta, but insulin does not. Thus the fetus must produce insulin to maintain glucose homeostasis. Elevated or erratic maternal glucose levels $\geq$ 100 mg/dl during pregnancy can result in a hyperinsulinemic infant at birth (Hyperglycemia and Adverse Pregnancy Outcomes [HAPO] Study Cooperative Research Group, 2008). When the umbilical cord is cut, mobilization of infant glucose stores and/or nutritional support by feeding are required to mediate endogenous insulin. If glucose is not available, the infant becomes hypoglycemic, and the brain and other vital organs are depleted of glucose necessary to maintain homeostasis (Milicic, 2008). The American Academy of Pediatrics (AAP; 2011) recommended putting an infant to breast within the first hour of life to stabilize infant glucose.

In 2011, the AAP Committee on Fetus and Newborns published the first revision of the neonatal hypoglycemic guidelines since 1993 (AAP, 1993, 2011). This evidence-based practice guideline is a step toward standardization of treatment for neonatal hypoglycemia through the following steps: (a) identification of infants at risk, (b) assessment of blood glucose levels that require intervention, (c) treatment criteria with intravenous (IV) and/or oral nutrition, (d) frequency of blood glucose monitoring, and (e) delineation of neonatal symptoms of hypoglycemia. What constitutes neonatal hypoglycemia, the treatment modality, and subsequent sequelae have been controversial topics (Burns, Rutherford, Boardman, & Cowan, 2008; Hays, Raju, Higgins, Kalhan, & Devaskar, 2009; Straussman & Levitsky, 2010; Williams, 2005). Blood glucose levels used to define neonatal hypoglycemia ranged from a threshold of $\leq$ 25 to 50 mg/dl (Harris, Weston, Battin, & Harding, 2009; Hays et al., 2009; Williams, 2005). Treatment for an asymptomatic infant was debated, but all sources agreed that an infant that exhibited symptoms should be treated (Harris et al., 2009; Hays et al., 2009; Williams, 2005). Sequelae of neonatal hypoglycemia that have been assessed include neurological changes that could result in childhood seizure disorders and metabolic issues such as childhood metabolic syndrome (Boney, Verma, Tucker, & Vohr, 2005, Burns et al., 2008; Straussman & Levitsky, 2010).

Breast milk is the gold standard for infant nutrition. At birth, the gut is sterile and breast milk

In 2011, revision of the neonatal hypoglycemic guidelines by the American Academy of Pediatrics standardized definitions and treatment approaches to neonatal hypoglycemia.

assists in proliferation and colonization with Bifidobacteria and Lactobacilli through fermentation of nondigestible oligosaccharides to promote gut health (Walker, 2010). The AAP (2011) recommended proactive measures to stabilize infant glucose levels to minimize maternal/infant separation and to support breastfeeding success. Straussman and Levitsky (2010) reported that infants born to diabetic mothers who were breastfed within 30 minutes of life had less hypoglycemia than infants who were fed later. Colostrum or lactogenesis I, the first breast milk produced at delivery, is known to be low in glucose and calories but stimulates ketone metabolism in the neonate, thus providing nutrition and promoting glucose stabilization (Wright, Marinelli, & The Academy of Breastfeeding Medicine Protocol Committee, 2006).

Breastfeeding is supported by state and international governmental agencies (New York State Department of Health [NYS DOH], 2011; World Health Organization [WHO], 2011), professional organizations (AAP, 2011), and lay organizations such as La Leche League. All of these organizations recommend that stable infants be managed by (a) initiation of breastfeeding within the first hour of life, (b) demand feedings with the mother and infant in close proximity, (c) avoidance of bottles or pacifiers, and (d) exclusive breastfeeding for at least 6 months. Maternal/infant contact is considered one of the best predictors for breastfeeding success (Hill & Aldag, 2007; NYS DOH, 2011; Nommsen-Rivers, Chantry, Peerson, Cohen, & Dewey, 2010; Rouwei, Fein, Chen, & Grummer-Strawn, 2008; WHO, 2011) and is accomplished through rooming-in, where the mother and infant stay in the same room. Admission to the special care nursery (SCN), newborn nursery, or a transitional care nursery creates a physical separation that interrupts the continuity of maternal/infant contact. The introduction of formula prior to establishment of an ample milk supply can have a detrimental effect on infants and mothers (Hill & Aldag, 2007; NYS DOH, 2011; Rouwei et al., 2008; WHO, 2011; Wright et al., 2006). For example, formula feeding early in the postpartum experience may inadvertently suggest to a mother that her milk is not sufficient to support her infant's nutrition (Hill & Aldag, 2007; Rouwei et al., 2008).

The Joint Commission (2010) and the NYS DOH (2011) require NYS hospitals to support exclusive breastfeeding to maintain credentialing and reimbursement status. The pathophysiology of neonatal hypoglycemia may preclude exclusive breastfeeding and require medical interventions, such as the use of formula and/or IV therapy. These interventions are classified as medically indicated and are described in the Academy of Breastfeeding Medicine (ABM) Clinical Protocol #1: Guidelines for Glucose Monitoring and Treatment of Hypoglycemia in Breastfed Neonates (Wright et al., 2006). This protocol is also used by the National Guidelines Clearinghouse for the treatment of neonatal hypoglycemia (Department of Health and Human Services, 2007). Additionally, maternal and neonatal healthcare providers are faced with substandard breastfeeding rates (Healthy People 2012), process changes required by regulatory agencies (The Joint Commission, 2010; NY DOH, 2011), and the need to implement evidence-based practice (AAP, 2011).

An assessment of practice at our institution indicated that the neonatal hypoglycemia standard of care (SOC) needed revision to comply with the AAP 2011 guidelines and the ABM protocol. The AAP guideline indicates that late-preterm or term infants who are large for gestation age (LGA), small for gestational age (SGA), or born to diabetic mothers are at risk for hypoglycemia. Glucose thresholds were set that vary depending upon infant age: (a) at birth to four hours of age the blood glucose should be $\geq$ 25 mg/dl and (b) at 4 to 24 hours of age the blood glucose should be $\geq$ 45 mg/dl. The AAP indicates that if the infant glucose levels drop below these thresholds intravenous (IV) therapy should be initiated. The existing SOC defined hypoglycemia as a blood glucose of $\leq$ 40 mg/dl for all infants at any age, but treatment varied according to hypoglycemia severity with a blood glucose of 20 to 39 mg/dl requiring a formula feeding and those $\leq$ 19 mg/dl requiring IV therapy. Infants identified as at risk included all of the AAP's categories plus infants of obese mothers, polycythemia, and multiple gestations. In addition, the Hypoglycemic Risk Tool was used to screen infants born to medication dependent diabetic mothers to determine if they should be admitted to SCN (Scheurer-Monaghan, Haidar-Ahmad, Lowmaster-Csont, & Guillet, 2009). The caloric content, amount, and mode of oral nutrition administration were not addressed by the AAP or the SOC guidelines. Furthermore, neither the AAP nor the SOC addressed when formula should be administered to breastfed infants or the time