SGA and VLBW Infants: Outcomes and Care

Kasey Jackson, MD,* John W. Harrington, MD*†
*Eastern Virginia Medical School, Norfolk, VA
†Children's Hospital of The King's Daughters, Norfolk, VA

AUTHOR DISCLOSURE Drs Jackson and Harrington have disclosed no financial relationships relevant to this article. This commentary does not contain a discussion of an unapproved/investigative use of a commercial product/device.

Given the recent advances in medical care, babies are surviving at smaller birthweights. Categories have grown from normal birthweight (>2,500 g) to include low (<2,500 g), very low (VLBW, <1,500 g), extremely low (<1,000 g), and micro-premie (<750 g) birthweights. In addition, the categories of small and large for gestational age remain in place. Intrauterine growth retardation (IUGR) pertains to the fetal environment that can be affected by fetal, placental, or maternal factors, which is different than small for gestational age (SGA), which only defines a baby born at a weight more than 2 SD below the 50th percentile for their gestational age (ie, <10th percentile). Herein we discuss the complications, care, and outcomes for SGA (most likely caused by IUGR) and VLBW infants.

COMPLICATIONS/MANAGEMENT

The 2 categories share many of the same complications and concerns given that both infants are small but to varying degrees. However, infants who are VLBW are usually due to prematurity, whereas infants who are SGA may result from maternal complications due to pregnancy-induced or chronic hypertension, diabetes, collagen vascular disease of which systemic lupus is most prominent, asthma, chronic renal disease, receipt of anticonvulsant drugs, or use of substances such as tobacco, marijuana, and other drugs of abuse. Obviously, the complications worsen with smaller size and earlier gestational age at birth. Respiratory problems are a major concern. Asphyxia and/or meconium aspiration at birth requires immediate resuscitation and possible intubation. Decreased surfactant production in the premature infant can lead to respiratory distress syndrome and requires administration of endotracheal surfactant. Infants can have apnea of prematurity, requiring caffeine. Infants should be on continuous pulse oximetry and be given supplemental oxygen to maintain oxygen saturations of 85% to 92%.

Temperature maintenance is difficult for small infants because they have a large surface area to body weight ratio and low brown fat stores. They have difficulty in both conserving and creating body heat. These infants should be rapidly and copiously dried at birth to prevent loss of heat from evaporation. They should then be placed in warmed blankets or plastic wrap (depending on weight) to avoid loss of heat from radiation and convection. To maintain temperature, infants should be swaddled and placed in a radiant heater or an incubator (again, depending on weight).

Along with low temperatures, these infants are also at risk for low blood sugar levels. Glucose levels should be measured immediately after birth and with frequency dependent on stability. Goal glucose levels are greater than 45 mg/dL (>2.5 mmol/L). Feedings or intravenous fluids (depending on gestational age and developmental ability) should be started as soon as possible. For symptomatic

Prognosis of Very Low-Birthweight Babies. Campbell D. *Pediatr Rev.* 1997;18(3):99–100

Delayed Introduction of Progressive Enteral Feeds to Prevent Necrotizing Enterocolitis in Very Low Birth Weight Infants. Morgan J, Young L, McGuire W. *Cochrane Database Syst Rev.* 2014;12:CD001970

Slow Advancement of Enteral Feed Volumes to Prevent Necrotizing Enterocolitis in Very Low Birth Weight Infants. Morgan J, Young L, McGuire W. *Cochrane Database Syst Rev.* 2015;10:CD001241

Babies Who Are Small for Gestational Age. Russell BK. *Pediatr Rev.* 1995;16(9):354

The Small-for-Gestational Age Infant. Thureen PJ, Anderson MS, Hay WW. *NeoReviews.* 2001;2(6):e138–e149

hypoglycemia (ie, coma, seizure) or severe hypoglycemia (glucose level <20 mg/dL [<1.1 mmol/L] lasting for >30 minutes), a 10% dextrose in water bolus should be given at 2 mL/kg then run continuously at 4 to 8 mg/min per kilogram.

Fluids and gastrointestinal issues are also of concern. The VLBW infants are specifically sensitive to fluid imbalances given their high levels of insensible water losses and underdeveloped kidneys. They can have too much or too little fluid, high or low sodium levels, high potassium levels, high magnesium levels (often from the patient's mother receiving it during labor), or low calcium levels. They struggle with managing free water, reabsorbing bicarbonate, excreting potassium, and concentrating urine. Hyperbilirubinemia can also be seen. The indirect form can be seen in both SGA and VLBW infants as a sequela of prematurity, whereas the direct form can sometimes be seen in the VLBW infants who received total parenteral nutrition (TPN).

When and how quickly to feed VLBW infants is a topic of debate. One must balance the need to provide nutrition and energy to grow with the risk of necrotizing enterocolitis (NEC) in immature guts. A literature review in 2014 showed no evidence that the risk of developing NEC was decreased by waiting more than 4 days to start enteral feeds. Another review in 2015 showed that advancing feeds more quickly (30–40 mL/kg per day vs 15–24 mL/kg per day) also did not raise the probability of developing NEC. In fact, it showed that the slower rate of increase (and the consequent delay in achieving full feeds), led to a higher risk of developing a serious infection. In addition, when possible and available, maternal or banked human milk can provide added benefit to preventing NEC. All infants who cannot feed by mouth should be started on fluids at a rate of 60 to 80 mL/kg per day without sodium or potassium. Fluid amounts taken in and excreted out and electrolyte levels should be monitored closely. If infants are very small and/or are on significant life support, TPN may need to be initiated to bridge the gap and should be without lipids for the first 3 to 5 days.

Hypotension is commonly seen in VLBW infants. Umbilical lines should be placed to give more accurate recordings of blood pressures as well as to allow for blood collection until a more permanent line can be placed. Management includes starting dopamine at 5 μg/kg per minute and adjusting as needed. Fluid boluses should not be given reflexively unless there are obvious signs of hypovolemia as infants are already at risk for fluid overload and hyponatremia.

Mothers with SGA infants are specifically at risk for polycythemia, which can lead to hyperviscosity of the blood, defined as a venous hematocrit value greater than 60%. Infants do not usually have symptoms, but when they do, it is more likely to be seen in males. Consequences include hypoglycemia, hypoxia, and an increased risk of NEC. Management should include glucose and oxygen supplementation as needed and possibly partial volume blood exchange.

OUTCOMES

Survival for these infants depends on many factors. Broken down by birthweight alone, 1-year survival is 74% for infants weighing 500 to 750 g, 82% for 751 to 1,000 g, 92% for 1,001 to 1,250 g, and 95% for 1,251 to 1,500 g based on the National Vitals Statistical Summary in 2016.

Both VLBW and SGA infants face increased rates of readmission to the hospital, especially for respiratory tract infections. Final growth is difficult to predict in these infants because the causes of their initial low weights are various and often multifactorial. Neurodevelopmental difficulties are commonly seen in these infants (5–10 times more in SGA versus appropriate-for-gestational age), and cerebral palsy is common in the VLBW infants and seen more often with lower birthweights.

Infants with VLBW are at risk for long-term ophthalmologic and hearing deficits. Retinopathy of prematurity, strabismus, and refractive errors are not uncommon. Oxygen saturations should be kept at 85% to 92% to prevent high arterial oxygen tensions and decrease the risk of retinopathy of prematurity. Ophthalmologic examinations should begin at 1 month of age if less than 32 weeks' gestational age. Hearing deficits can be attributed to prematurity, hyperbilirubinemia, meningitis, and exposure to ototoxic drugs. Approximately 2% to 3% of VLBW infants may be deaf and will require further interventions. All infants should receive a hearing test in the nursery and later with their pediatrician, but it is vitally important for pediatric health care providers and the parents of the small, premature infants to ensure follow-up on any abnormalities.

COMMENT: Although medical advances have improved mortality rates and prognosis, the limit of viability for premature infants still remains at approximately 24 weeks, which was the same threshold when I was an intern several decades ago. Critical research continues to be conducted to assist in improving treatment and outcomes, but research in infants

who are extremely premature and extremely low birthweight will require multisite neonatology research networks because patient numbers at individual institutions are too limited. This *In Brief* also reinforces the critical need for continued preventive research to prevent prematurity and preventive strategies for mothers who have some of the diagnoses that lead to SGA infants.

– Janet R. Serwint, MD
Associate Editor, *In Brief*

ANSWER KEY FOR JULY 2018 PEDIATRICS IN REVIEW

Genetic Counseling in Pediatrics: 1. A; 2. B; 3. A; 4. C; 5. B.
Disorders of the Umbilical Cord: 1. B; 2. C; 3. C; 4. D; 5. D.
Vomiting in Children: 1. E; 2. C; 3. B; 4. C; 5. C.

SGA and VLBW Infants: Outcomes and Care

Kasey Jackson and John W. Harrington

Pediatrics in Review 2018;39;375
DOI: 10.1542/pir.2017-0091

Pediatrics in Review®
AN OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

SGA and VLBW Infants: Outcomes and Care

Kasey Jackson and John W. Harrington

Pediatrics in Review 2018;39;375
DOI: 10.1542/pir.2017-0091