

Multiple Chronic Conditions in VLBW Infants: Epidemiology, NICU Care, and Outcome

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Description

Premature and very low birth weight infants are 100 times more likely than normal infants to die in the first year of life. These infants are also at high risk for developmental delays, functional disabilities, and other complex health problems with long-lasting effects, including bronchopulmonary dysplasia, necrotizing enterocolitis, and intraventricular hemorrhages. Additionally, the incidence of both prematurity and very low birth weight is rising in the U.S., and African Americans have a 2.5 times increased risk compared to the U.S. population as a whole. Research is limited on the patterns of disease, treatment, and survival for these very vulnerable infants. This study identified effective (and ineffective) treatment methods for premature and very low birth weight infants.

Specific Aims

1. Describe the incidence of bronchopulmonary dysplasia, necrotizing enterocolitis, and intraventricular hemorrhages among premature and very low birth weight infants during initial neonatal intensive care unit (NICU) stay, singly and in combination.
2. Describe the associations between these conditions and the following outcomes: death during NICU stay, cumulative burden of therapies received during NICU stay, and rehospitalization within 30 days of discharge from NICU.
3. Document the effect of inhaled nitric oxide, a common treatment to prevent and treat bronchopulmonary dysplasia, on outcomes.
4. Identify hospital- or region-specific variation in the incidence, outcomes, or treatment of the chronic conditions, and any evidence of disparate incidence, outcomes, treatment, or efficacy of treatment based on race or payer status.

Main Objective

Systematically describe the incidence, treatment, and outcomes of multiple co-occurring chronic conditions in premature and very low birth weight infants.

Chronic Conditions Considered

Prematurity
Very Low Birth Weight

Study Design & Methods

Epidemiologic description
Matching estimator techniques and propensity-score weighted regression.

Data Sources & Sample Size

Electronic health records from the Pediatric Health Information System (PHIS) database of 15,470 premature children admitted to neonatal intensive care units from 2006-2010 at 33 children's hospitals.

Strategies Addressed from the HHS Strategic Framework on Multiple Chronic Conditions

- 3.A. Identify best practices and tools
- 4.B. Understand the epidemiology of MCCs
- 4.C. Increase clinical research
- 4.D. Address health disparities

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Findings

- Overall, study hospitals exhibited large variations in their use of inhaled nitric oxide, including the age treatment was started and the length of time used for each patient. However, the rate of use increased each year, between 2007 and 2010, among the hospitals studied.
- Nearly 11% of NICU infants are diagnosed with gastro-esophageal reflux disease, which is associated with substantially increased length of stays and associated costs (approximately 30 additional days and almost \$80,000 in additional costs per patient).
- The NICU to which an infant is admitted has a large effect on survival, even after controlling for many infant and hospital variables.
- Infants with severe bronchopulmonary dysplasia can have a tracheostomy safely placed even while on ventilators with high levels of positive pressure support.

Implications

- Adherence to National Institutes of Health guidelines on use of inhaled nitric oxide could decrease variation in the use of this expensive treatment across hospitals, and reduce its unnecessary use.
- Effective treatments for NICU patients with gastro-esophageal reflux disease would result in large cost savings.
- Variation in survival rates across NICUs suggests the need for standardization of NICU practices based on evidence-based research.

Publications (as of September 2013)

Slaughter J, Stenger M, Reagan P, and Gardner W. Variation in the Use of Diuretic Therapy for Infants with Bronchopulmonary Dysplasia. *Pediatrics*; 2013 Apr; 131(4): 716-23.

Mandy G, Malkar M, Welty S, Brown R, Shepherd E, Gardner W, Moise A, Gest A. Tracheostomy placement in infants with bronchopulmonary dysplasia: Safety and outcomes. *Pediatric Pulmonology*. 2012 May 8. [Epub ahead of print]

Stenger MR, Slaughter JL, Kelleher K, Shepherd EG, Klebanoff MA, Reagan P, Nelin LD, Gardner W. Hospital variation in nitric oxide use for premature infants. *Pediatrics*. 2012 Apr; 129(4): e945-51.

(Additional publications currently in preparation).

Posters and Presentations

Jadcherla S, and Gardner W. Economic burden of gastroesophageal reflux disease (GERD) in convalescing ICU Neonates. Poster presented at Annual American Neurogastroenterology and Motility Society Meeting, 2011 Sept 16–18; St. Louis, MO.

Stenger M, Slaughter J, Shepherd E, Nelin L, Gardner, W. Hospital Variation in Nitric Oxide Use for Premature Infants. Poster presented at Pediatric Academic Society Meeting; 2011 May 3; Denver, CO.

Gardner W, Nelin L, Slaughter J, Klebanoff M, and Stenger M. Hospital Effects on the Survival of Premature Infants in NICUs. Poster presented at Pediatric Academic Society Meeting; 2011 May 3; Denver, CO.