

Chronic Lung Disease in Very Preterm Infants: Impact of a Multidisciplinary Improvement Effort

I. Problem

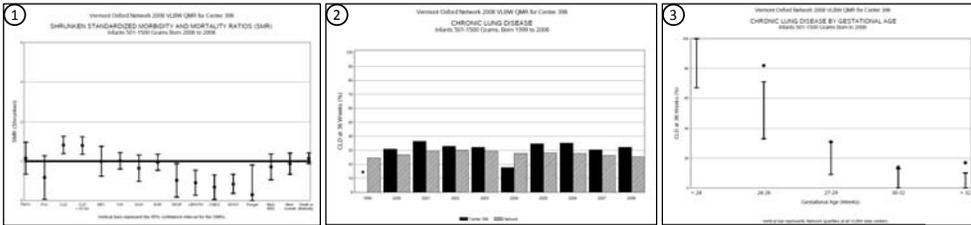
Chronic Lung Disease (CLD), also known as Bronchopulmonary Dysplasia (BPD), remains one of the most common long-term morbidities affecting preterm infants. Gestational age is the most important determinant of CLD, although evidence suggests that clinical care practices may also modify CLD risk. In part due to comparative data suggesting relatively high rates of CLD in our NICU, we undertook a broad, multidisciplinary effort to examine and improve our respiratory care practices with a goal of reducing our CLD rate.

II. The Team

Jane Smallcomb (Nurse Manager), Susan Young (CNS), Issa Al-Aweel (Systems Engineer), Susan Bryant (RN), Rosanne Buck (NNP), Candace Buckley (RT), Barbara Curran (RN), Steve Hamilton (RT), Glen Housefield (RT), Michael Jackson (RT), Jennifer Kinder (RN), Nina Koyama (RT), Brenda Laurie (RT), Lawrence Rhein (MD), Megan Letendre (RN), Dion Malala (RT), Eileen Malala (RT), Virginia May (RN), Denise McGarry (RT), Jessica Metzger (RT), Jamie Perkins (RN), Mary Quinn (NNP), Jennifer Reader (RN), June Rivers (NNP), Brett Rozhon (RN), Brenda Sheridan (RN), Anne Marie Spada (RT), Kyle Spear (RT), Mary Whitlock (NNP), Munish Gupta (MD)

III. Current State

Comparative Outcome Data from Vermont-Oxford Network (VON)



IV. Countermeasures

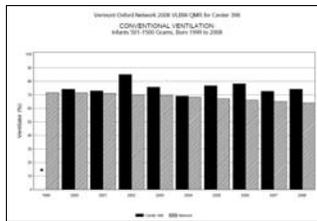
Chronic Lung Disease Working Group (CLDWG)

In 2006, we formed the Chronic Lung Disease Working Group (CLDWG), a multidisciplinary team of NICU staff tasked with examining respiratory care practices and identifying opportunities for improvement, with the long-term goal of reducing rates of CLD.

CLDWG – Planning

- Review of literature, data → group discussion on best practices
- NICU team to Columbia respiratory care conference
- Primary focus: decreasing mechanical ventilation use, increase CPAP
 - Selective intubation, early CPAP
 - Rapid weaning following surfactant, early trials of extubation to CPAP
- Focus on reducing ventilatory-associated lung injury
 - Attention to tidal volumes, avoidance of over-ventilation
 - Attention to oxygen use, avoidance of hyperoxia
- Development of CLDWG scorecard
 - Outcome measures: CLD, pneumothorax
 - Process measures: CPAP, any mechanical ventilation, reintubations, nasal septal injury, unplanned extubations, hypocarbia

Comparative Process Data from VON



From 2000 to 2008, percent of VLBW infants receiving any mechanical ventilation has been higher at BIDMC than in the overall VON network.

CLDWG – Interventions

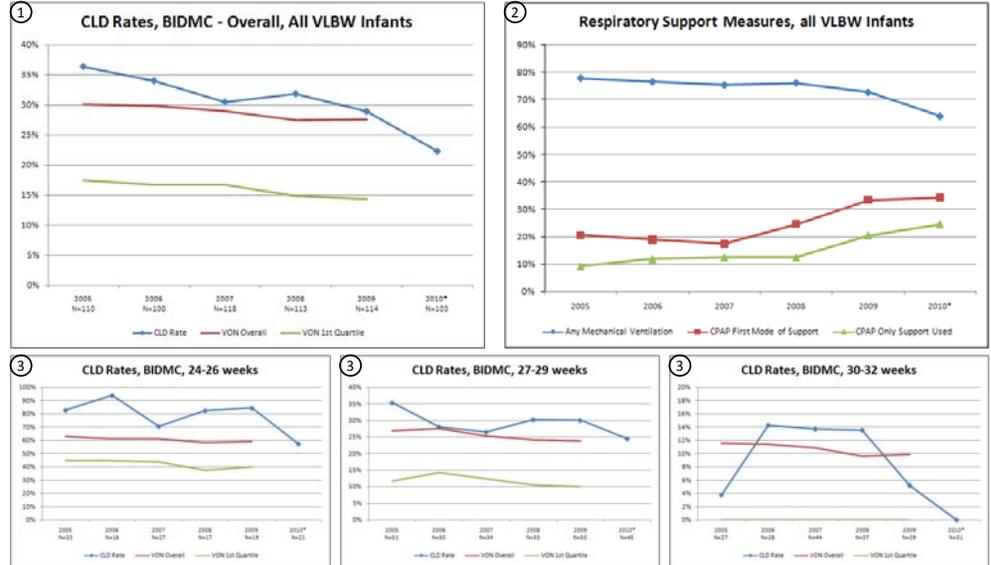
- Continuous focus among NICU team on respiratory management
- Delivery room practice changes to avoid hyperoxia and over-ventilation
 - Blended oxygen, oximeters, T-piece resuscitators
- Revised CPAP delivery system to increase success of CPAP support
 - New prongs, securing system, positioning aids, CPAP training guides

V. Implementation

Timeline				
2006	2007	2008	2009	2010
CLDWG formation	Focus on respiratory care			
Literature review	Delivery room management	Columbia conference	CPAP system revision	Refinements to CPAP system
		Scorecard development	Scorecard development	Scorecard tracking

VI. Results

Results: CLD Rates, Use of Mechanical Ventilation, and Use of CPAP



- CLD rates at BIDMC appear to be declining (39% reduction 2005 to 2010, $p=0.025$). Overall rate is now less than VON rate.
 - Over same period, use of mechanical ventilation appears to be decreasing and use of CPAP appears to be increasing.
 - CLD rates appear to be decreasing across all gestational age categories.
- *2010 results are year to date (nearly complete).

VII. Analysis

Lessons Learned

- Improving outcomes of a complex, multi-factorial disease requires a broad, multi-disciplinary team.
- Even with a multi-disciplinary improvement team, introducing practice change was difficult. We should have spent more time working with the NICU staff as a whole before implementing changes, including soliciting broader staff input, offering more education and opportunities for discussion, and developing more robust training tools.
- There can never be TOO much communication.

Next Steps

- Provide feedback and updates to staff, celebrating the results of the efforts to date while recognizing the hard work required from all.
- Continued monitoring of CLDWG scorecard with regular feedback of data to CLDWG team and to staff in order to sustain improvements.
- Development of additional measures for CLDWG scorecard (pneumothorax, hypocarbia).
- Exploration of other practices related to CLD to identify opportunities for improvement (nutrition, fluid management, infection).