

# Reducing Bronchopulmonary Dysplasia in the NICU

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## Aim

Bronchopulmonary dysplasia (BPD) is a prevalent morbidity associated with prematurity. In 2005, the incidence of BPD in VLBW infants our NICU was 61%, greater than the 75<sup>th</sup> %ile for the Vermont-Oxford Network (VON). A QI project was initiated in 2006, with an aim to develop a bundle of potentially better practices to reduce the incidence of BPD by 50%. At this time, our project continues, with a current goal of further reducing the incidence of BPD in our NICU, so that we perform in the 10<sup>th</sup>-25<sup>th</sup> %ile within the VON.

## Setting

VLBW patients admitted to the Level IV Penn State Hershey NICU, a regional quaternary NICU with outborn infants accounting for 40% of annual admissions.

## Methods

We used value compass methodology to develop a web of causation for BPD, which identified drivers and process

measures. Key process changes were: respiratory care (non-invasive methods of ventilatory support), fluid restriction in the first few days of life (monitoring daily weight), limit exposure to hyperoxia (pulse oximeter alarm limits 85-95%), limiting oxidative stress from blood transfusions (strict transfusion guidelines), use of vitamin A.

## Measures

*Process metrics-* compliance with 1) obtaining daily weight; 2) setting pulse oximeter alarm limits as ordered; 3) transfusion criteria; 4) vitamin A treatment criteria. *Outcome measures:* incidence of BPD in inborn and outborn infants in the NICU.

## Results

Compliance with obtaining daily weights increased from 50% to 100% over the 5 year period. Compliance with transfusion criteria remained between 90-100% and compliance with administration of vitamin A was between 90-100% until the national shortage of vitamin A precluded its use in 2011. Compliance with pulse oximetry

Limits increased from 0% to 87% with initiation of this QI project.

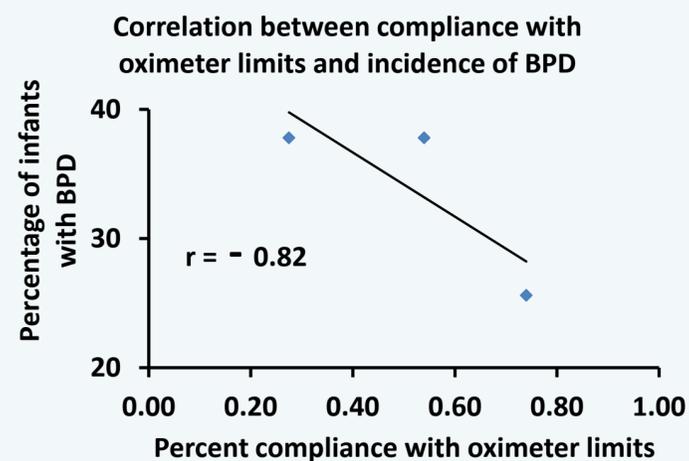


Figure 1. There was an inverse correlation between compliance with oximeter limits ordered and incidence of BPD in 2007-2009.

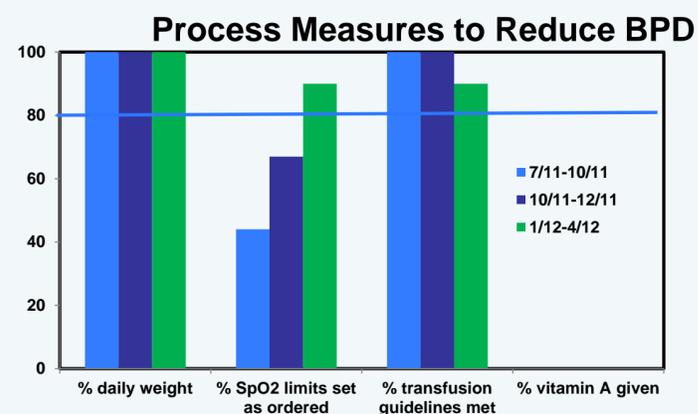


Figure 2. PDSA cycles showing percent compliance with potentially better practices: % of patients with daily weight, % of patients with pulse oximetry limits set as ordered, % of patients transfused based on guidelines, % of eligible patients who received vitamin A for the most recent 3 quarters as shown in the key. There has been a shortage of vitamin A nationally, so there are no data for this metric.

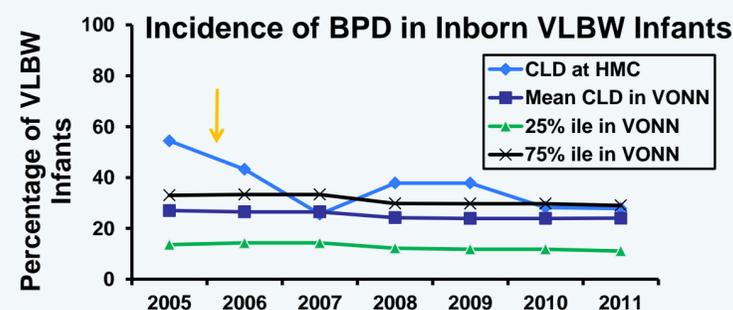


Figure 3. The incidence of BPD showed an initial decrease in 2006 and 2007 after implementation of potentially better practices (orange arrow). There was an increase in the incidence of BPD in 2008-09 after which intensive efforts to increase compliance with better practices were made. The incidence of BPD declined in 2010 and 2011. We have achieved the goal of maintaining an incidence of BPD at fewer than 30%.

There was a significant decrease in alarm limit compliance to 33% in 2007, which led to intensive staff education and change to the use of Massimo technology. During these intermediate years there was a significant inverse correlation between compliance with pulse oximetry alarm limits and subsequent incidence of BPD (figure 1). Most recent compliance with pulse oximetry limits has increased to 90% (figure 2). The incidence of BPD has decreased from 61% (all infants) and 54% (inborn infants) to 33% and 27.4%, respectively (figure 3).

## Discussion

This ongoing multi-disciplinary (RT, RN, MD) effort has made progress in improving compliance with process changes and reducing the incidence of BPD. We have reduced the incidence of BPD by 50%, but we continue to work to reduce the incidence further.

Sustainability is a key aspect of this, and all, QI projects. The most difficult aspect related to sustaining the practice changes was compliance with pulse oximetry alarm limits.