“Cure Me – BPD”: a QI intervention to reduce the incidence of BPD in a Level IV NICU
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Background: Bronchopulmonary Dysplasia (BPD) is a relatively common chronic condition in premature infants. Factors which increase the risk of BPD include decreasing gestational age, hyperoxia events, inflammation / sepsis, poor nutritional status, barotrauma / overdistension, and atelectasis / scarring (reviewed in Jobe, NeoReviews 7 (10) 2006). We noted that the incidence of any BPD and severe BPD in our all-referral unit was higher than VON network and CHND network NICUs, even when attempting to control for NICU type, patient GAB, and age at admission. Therefore, we initiated a QI project to improve adherence to best practices to reduce our iatrogenic contribution to the development of BPD. We targeted patients born under 30 weeks gestation at birth and admitted to the level IV NICU on DOL 0-28

“SMART” Aim: We will decrease the incidence of any BPD - in infants born before 30 weeks, and admitted to our main campus NICU before 29 days of life who survive to day of life 28 - from 78% to 62% by 12/31/2015 and sustain indefinitely.

Setting: NCH NICUs are a collection of 9 NICUs in the greater Columbus area, compromising 254 beds. The main Children’s Hospital houses 3 NICUs with 114 beds and serves as an all-outborn referral center for the other 6 NCH NICUs as well as NICUs in central/southern Ohio and neighboring states.

Mechanisms: While no single factor determines the likelihood of BPD, we felt that our current practices did not consistently and optimally mitigate factors which incite BPD as described above. This was likely due to 1) lack of awareness of our problem / sense of urgency, 2) lack of awareness of best practices, and 3) systems issues preventing consistent application of these practices. The team identified multiple drivers of BPD and has chosen to focus on respiratory practices for our first interventions.

Drivers of Change/Methods: Initially the team focused only on physician behavior with little improvement. In July 2014 an educational blitz / kick-off / burning platform effort targeted all employees in the NICU including NNPs, RNs, RTs, pharmacists, nutritionists, and parents with the goal of motivating adherence to a number of baseline policies. To emphasize the goal of having every baby on room air (21%) by DOL 28 the slogan “0.21 by 28” was created and is included on all communication and is displayed in the NICU. Baselines were developed regarding oxygen saturation limits, vent weaning and extubation policies, and non-invasive respiratory support. Nurses and physicians were instructed on how to assess oxygen saturation data over each shift. A “wingman” mentality was encouraged where all staff remind others about adherence to best practices.

Measures:
- Outcome measures are time to first extubation, any BPD (at DOL 28), and severe BPD (at 36 wk CGA).
- Process measures are adherence to vent weaning, non-invasive support, and saturation limit policies.

Data/Results: Since the “kick-off”, adherence to the non-invasive respiratory support policy has improved. Other process measures have shown limited improvement. Any BPD rate has shown special cause shift, while severe BPD has shown modest improvement without demonstrated shift as of yet.

Discussion: While BPD is a multifactorial disease, we felt that we had an opportunity to make significant improvement in our rates at NCH Main Campus NICU. Because of the complexity and size of our unit, as well as a myriad of QI projects ongoing, no improvement and in fact some worsening of BPD rates were seen until a consistent message was delivered that this reducing BPD needed to be a top daily priority for all NICU staff. Engagement of bedside nurses has been a major key to the first signs of success in the project. We expect that as we continue to work towards improvement in our process measures and report results back to the unit we will see further improvement in our outcome measures.

Team Acknowledgement: Sustained involvement and dedication from all members of the formal QI team as well as all physicians, nurses, and respiratory therapists in our unit has been required to start to achieve improvement.
**Key Drivers**

**Nutritional Status**
- Develop protein intervention guidelines
- Continue to improve compliance with feeding protocols
- Implement guidelines to encourage more rapid weaning/antibiotics of patients admitted before 29 days of life
- Implement consistent respiratory support challenge at 36 weeks CGA along with standardization of definition of BFD
- Nursing/RT focus on O2 use/Alarm limits

**Compliance with respiratory support weaning protocols**
- Protocols for reducing NEC, IVH, FDA
- For infants on O2 at DOL 28, establish consistent respiratory care protocol(s) (non-invasive support) from DOL 18 to CGA 36 weeks
- Track individual physician compliance with all protocols
- Division baseline protocols integrated into Anchor and EPIC

**Prevention/minimization of comorbid conditions**

**Reducing variability in practice**

**Specific Aim**

We will decrease the incidence of severe BPD in infants born before 30 weeks and admitted to main campus before 29 days of life who survive to 36 weeks corrected gestational age from 62% to 48% by 12/31/2015 and sustain indefinitely.

We will decrease the incidence of any BPD in infants born before 30 weeks and admitted to main campus before 29 days of life who survive to day of life 28 from 78% to 62% by 12/31/2015 and sustain indefinitely.

Process measure: Develop ability to track compliance with vent wean order once placed, and achieve 80% compliance by 6/30/2015

**Neoservices Acute Ventilation Weaning Protocol – Implement on admission for DOL 0-28**

Starting ranges for IPV:
- RR = 40-60/min
- Ti = 0.2-0.4 s
- PEEP = 5-8 cm H2O
- PS = as needed to provide comfort on non-vent breaths

Apply TCM and obtain a gas to correlate. If TCM not correlating, and arterial line present, RT to get ABG q1.2 hr pm

Assess P/CO2 q30-60
- Wean PIP by 2 or rate by 5-10. Notify MD/NNP of interventions
- Increase PIP by 2 if inadequate chest rise, or increase rate by 5-10 to max. of 60. Notify MD/NNP of interventions

Maintain until PIP ≤ 23 and Rate ≤ 25

Apply Pulse Oximeter

FIO2 weaned based on target saturations (under 36 wks CGA, goals = 90-95%, alarms = 80-98%)

FIO2 ≤ 30%

Any patient may be on this protocol at any time. However, consider switching to subacute weaning protocol (to be developed) for following:
- patient > DOL 28
- patient not showing signs of rapid change in physiology
- TCM not correlating and no arterial line present
- Is on minimal vent settings with 2 failed extubation attempts or unable to extubate due to neurologic/airway pathology

**Protocol to improve rate of weaning of ventilator**
Non-Invasive Respiratory Support for Premature Infants

- 28 weeks is used as the first cutoff, as below this gestational age the overwhelmed lungs cause of respiratory insufficiency, after RDS and/or lung disease, is a highly elastic chest wall and respiratory system. The primary treatment for this is reliable positive pressure.

- Between 28 and 32 weeks, a highly elastic chest wall is less likely to become, however, good oxygenation on RA would be reasonable evidence of a well-maintained FRC.

| Protocol to Prevent Atelectasis After Extubation |

- **Cure Me – BPD Nurse Action Items**
  - O2: 1 rarely, 1 often
  - Increase < 25%, back by 5-10 minutes
  - Alarms < 95%

- **Cure Me – BPD MD/NNP Action Items**
  - Wean
  - Extempore
  - CPAP over HNDC or oxygen

- **Cure Me – BPD MD/NNP Action Items**
  - Use the “NEA DRH with Raising” order
  - Extempore (NXP = 39%, max ≤ 25 & MPD ≥ 25 – validation algorithm)
  - Follow the non-invasive support protocol to prevent atelectasis: CPAP, good, HMNC, and O2 back
  - Reinforce proper behavior with oxygen in rounds every day

- **Cure Me – BPD RT Action Items**
  - Execute wear protocol
  - Remind others of their policies

- **Cure Me – BPD Family Action Items**
  - Remind your caregivers about their use of the ventilator, CPAP, and oxygen

**Handouts Used in Burning Platform / Roll-Out Presentations**
CONTROL CHARTS FOR OUTCOME MEASURES
Noninvasive Respiratory Management Compliance

Chart Type: p-Chart

Start noninvasive vent management protocol
21 by 28
1) Signs
2) Meetings
Good

Percent of Alarm Limits Set Appropriately

We can continue to improve!
Setting alarms appropriately will remind us to wean FiO2
Weaning FiO2 will prevent BPD!