

Reduction of hypocarbia in extremely low birth weight infants

Uduak Akpan, MD

Unified quality improvement symposium

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Background / introduction

- The traditional use of a pressure controlled ventilating system in the NICU increases the risk of hypocarbia (low PaCO₂) in babies
- This is due to difficulty in regulating the pressure required to ventilate in the face of ever changing lung compliance
- Hypocarbia increases the risk for periventricular leukomalacia (PVL) in premature babies, which in turn increases the risk for cerebral palsy and poor neurodevelopmental outcomes

Background / introduction

- Extremely low birth weight (ELBW) babies are at highest risk from the effects of hypocarbia
- The use of volume targeted ventilation could decrease hypocarbia by automatically regulating vent. pressures
- Our QI initiative may improve this problem by
 - Increasing awareness of problem by education
 - Introducing the use of volume targeted ventilation in the highest risk population

Collaborative team members

- Uduak Akpan, Neonatologist
- Sunny Patel, Fellow
- Lauren Jones, Neonatal nurse practitioner
- Darian Brewington, Respiratory therapist
- Paige Driver, Medical Student

AIM statement

By March 2017, the use of volume targeted ventilation will decrease the incidence of hypocarbia ($\text{CO}_2 < 40\text{mmHg}$) in ELBW babies during the first week of life by 50%

Methods

- Based on literature review, we decided that the use of VTV would help decrease the incidence of hypocarbia due to the automatic vent. pressure wean
- We designed our QI to increase the use of VTV with the aim of decreasing the incidence of hypocarbia
- We selected 'prevalence of hypocarbia in the first week' as our outcome measure and 'use of VTV' as our process measure

How will we know this change is an improvement?

- We determined the baseline incidence of hypocarbia (<40mmHg)
- Then we determined the use of VTV vs. pressure controlled ventilation
- Our change will be an improvement if over the months, with increasing VTV use, we also see a corresponding decrease in the incidence of hypocarbia

Baseline data

| Variable | Median /% |
|-----------------------------------|------------|
| Gestational age (wks) | 25 |
| Birth weight (g) | 730 |
| Apgar at 1 min | 2 |
| Apgar at 5 mins | 7 |
| Number intubated | 97% |
| DOL at intubation | 0 |
| Number with hypocarbia | 85% |
| Number with hypocarbia <35mmHg | 68% |
| Initial ventilator type | VTV (42%) |
| | HFV (39%) |
| | SIMV (18%) |

Improvement strategies employed

PDSA cycle I

Plan

- Determination of problem
- Literature review
- Proposal for change i.e. use of VTV
- Determination of data to be collected, by who etc.

Do

- Presentation of proposal to neonatology group
- Collection of baseline data
- Education of group by vent. company rep
- Initiation of project in October 2016

Improvement strategies employed

Study

- Monthly data collection and analysis

Act

- Discuss strategies to encourage the use of VTV for initial ventilation
 - Ensure awareness of problem
 - Reserve VTV capable vent. for highest risk babies

Improvement strategies employed

PDSA cycle 2

Plan

- Meetings to discuss progress and problems
- Development of survey
- Development of vent. policy

Do

- Distribution of survey

Improvement strategies employed

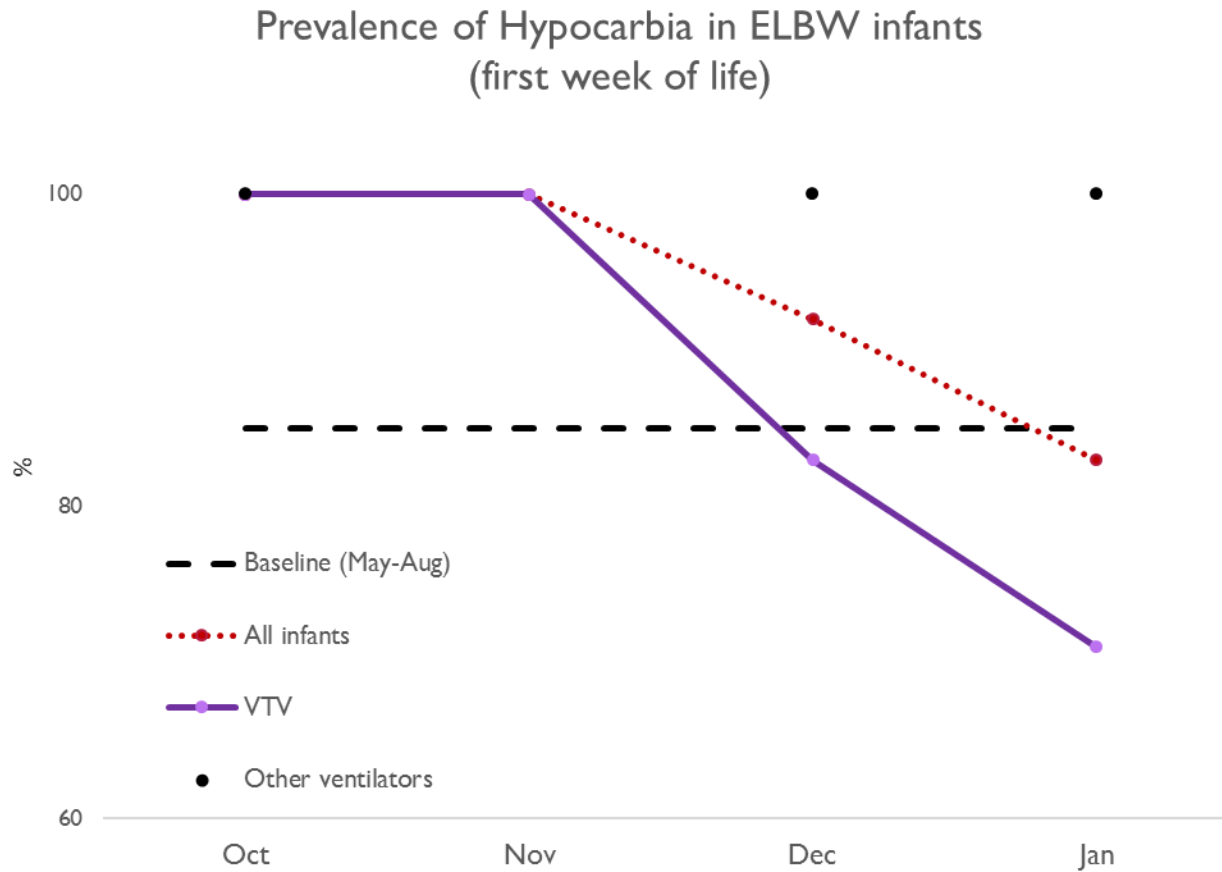
Study

- Monthly data collection and analysis
- Analysis of survey

Act

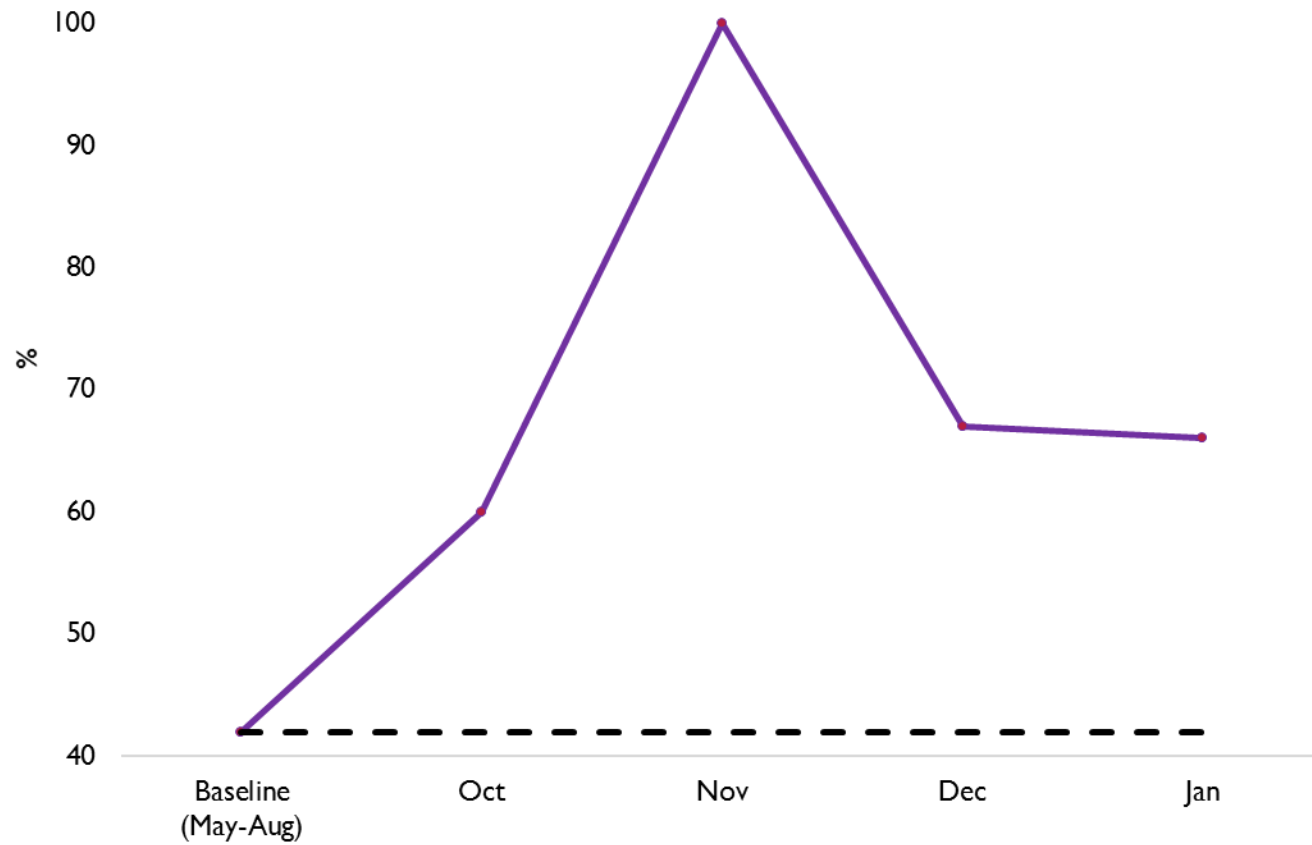
- Repeat education session by vent. company rep
- Discuss results so far with group
- Continue to work on development of vent. policy

Outcomes



Outcomes

VTV use in ELBWs



Challenges encountered in QI process

- Lack of awareness of incidence of hypocarbia
 - Presentation of QI proposal with baseline data
- Inadequate knowledge of the proper use of VTV ventilators
 - In-service training with ventilator company rep.
- Inadequate number of VTV ventilators for the anticipated number of ELBW's
 - Plan to reserve at least one VTV capable vent to be used for ELBW's if possible
- Lack of ventilator policy to regulate use
 - Develop and institute policy

Lessons learned through QI efforts

- Team spirit makes the difference
- Education is key
- Resistance to change plays a big role in suboptimal outcomes
- Institution of guidelines helpful

Next steps

- Institution of ventilator policy
- Review of survey results and implementation of new ideas
- Request the purchase of more VTV capable ventilators
- Presentation of results so far to group to elicit suggestions

THANK YOU

Questions?