Quality Improvement Programme to improve compliance with a delivery room CPAP (DRCAP) guideline introduced into a Tertiary NNU

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Background

Continuous positive airway pressure (CPAP) can be used to provide respiratory support at birth to babies born prematurely, reducing the need for intubation and ventilation (1). The lungs of preterm infants are susceptible to injury. Although early intubation allows for early surfactant administration, it also allows the opportunity for volutrauma. The use of CPAP as the initial mode of respiratory support has been advocated to support respiratory function, without the risk of volutrauma (2,3).

Randomised controlled trials have demonstrated increased survival free from Bronchopulmonary Dysplasia (BPD) for babies treated with nasal CPAP in the delivery room. The estimated treatment effect of one additional infant surviving to 36 weeks without BPD for every 25 treated in this way (1).

A guideline was introduced into our neonatal unit in November 2015 'Initial Respiratory Management of babies on delivery suite' to include the use of CPAP as the primary mode of respiratory support in selected preterm infants.

An audit was undertaken following introduction of the guideline which showed reduction in the rate of intubation at birth in infants born between 30- 33+6 weeks gestation. However, there was no reduction in the rate of intubation in babies born between 26- 29+6 weeks gestation, who are the babies most at risk of developing BPD. (Table 1)

	2015	2016
Intubated	66	50
Not Intubated	4	18
% Intubation	94	73.5

Table 1 Audit Data showing rates of intubation at birth for babies born between 26 and 29+6 weeks

Our unit is part of the Vermont Oxford Neonatal Network (VON) and benchmarking within VON showed that we were in the upper quartile for intubation of VLBW babies at birth.

In response to the audit and the benchmarking data, a Quality Improvement Project was initiated with the primary aim of reducing very low birth weight intubation rates at birth into the interquartile range for the VON network, aspiring to reduce rates below VON median.

Methods

Data relating to delivery room practice was collected prospectively for all babies with gestation between 26+0 and 33+6 weeks or with a birthweight of <1500g born at LWH between 01/03/2017 and 28/02/2018.

Data was analysed in three patient groups:

All VLBW babies (<1500g)

All babies born between 26+0 to 29+6 weeks gestation

All babies born between 30+0 to 33+6 weeks gestation

Intubation rates were calculated for each cohort of 10 babies on a prospective basis and presented to the clinical team monthly to demonstrate performance against our standards. An example of the data displayed is shown below (Figure 1).

A series of PDSA (plan, do, see, act) cycles were performed with the aim of improving the use of delivery room CPAP and reducing intubation rates at delivery. Interventions included: publicity, recruitment of champions in medical and nursing workforce, policy modification, "Lesson of the Week", increased training of all staff, targeted feedback and training of specific individuals.

Main Outcome Measures

Primary Aim:

- To reduce intubation rates of VLBW babies born at Liverpool Women's Hospital from the current rate of 61.7% into the interquartile range for the VON network (<53%).

Secondary Aims:

- To reduce the intubation rate of VLBW babies below the VON network median (41.2%).
- To reduce the rate of intubation at birth of babies born between 26+0 to 29+6 weeks gestation from the 2016 rate of 66.7% to below the VON network median of 41.4%.
- To maintain the rate of intubation in babies born between 30 - 33+6 weeks gestation below the rate of 8.6% achieved in the 2016 audit.
- To identify BPD rates in infants with a birthweight of <1500g and to assess the impact of the programme on this rate.

Results

VLBW babies:

193 VLBW babies were born in our hospital during the period. We were successful in achieving our primary aim, but did not bring the rate below the VON median of 41.2% (Figure 2). Further analysis of each individual case was performed. Many babies were ineligible for DRCAP according to our protocol (gestation <26 weeks or apnoeic at 5 minutes of age). If these cases are excluded, the intubation rate of the 'DRCAP eligible' VLBW babies for the whole period was 34%.

	2015	2016	QIP period
Intubated	113	87	66
Not Intubated	35	54	71
% Intubation	76	61.7	48.7 ^{1,2}

¹ p<0.0001 vs 2015, ² p=0.02 vs 2016

Babies born between 26 and 29+6 weeks gestation: 76 babies of this gestation were born at LWH during the period. This was achieved during our programme with evidence of a decreasing trend for intubation at delivery (Figure 3).

	2015	2016	QIP period
Intubated	66	50	31
Not Intubated	4	18	29
% Intubation	94	73.5	51.7 ^{1,2}

¹ p<0.05 vs 2015, ² p=0.01 vs 2016

Babies born at 30 to 33+6 weeks gestation: The previous audit had shown a successful reduction in intubation rates for these babies from 40.4% in 2015 to 8.6% by late 2016. Our aim was to maintain this rate which was accomplished with only 3/50 babies intubated during this programme period (6%).

BPD

BPD free survival rates for VLBW babies in the first 50% was 56/96 (58.3%) and in the second 50% was 39/97 (40.2%). This decrease in BPD free survival may be due to an increased proportion of extreme preterm babies in the 2nd half of the study, which is likely to have a greater effect on BPD free survival than DRCAP.

To examine the impact of DRCAP on BPD free survival rates, we looked at babies born between 26-29 weeks gestation to minimise the impact of changing case mix. Due to a relatively small number of babies (73) and the likely magnitude of any impact of DRCAP on this outcome, it has not been possible for us to detect a statistically significant change in the rate. The trend, when plotting the rate of BPD in each 10 consecutive subjects, suggests that there may be an increasing rate in BPD free survival in this group through the QIP period, which matches the improved implementation of DRCAP. This should be interpreted with caution.

Conclusions

Using CPAP as the means of respiratory support at birth improves outcome for VLBW babies. Writing a clinical policy based on research evidence is not difficult, but changing clinical practice in the complex environment of a regional neonatal unit can be challenging.

Supporting the introduction of our new policy with this Quality Improvement approach has been successful in changing practice and should be of benefit to our patients.

We feel that further improvements are possible, therefore we have reduced the lower limit of gestation at which babies are eligible to receive DRCAP. We are evaluating other methods of providing CPAP at birth and will continue to monitor our performance.

References:

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