Quality Initiative: Standardization of Oxygen Saturation Goals & Nursing Interventions in NICU

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Background

- The use of supplemental oxygen (O_2) plays a critical role in NICU.
- The ideal oxygen saturation (SpO_2) range is unknown; it is a compromise between negative outcomes associated with hyperoxemia (e.g. ROP, BPD) or hypoxemia (e.g. NEC, death).
- Our quality initiative addresses the risk of hyperoxemia at lower gestational ages (GA) & the risk of chronic intermittent hypoxemia at higher gestational & postnatal ages (PNA).

Aim

1. Determine specific SpO_2 ranges according to GA and PNA for infants on supplemental O_2.
2. Implement changes in practice related to alarm settings & response.
3. Standardize response to alarms to minimize risk of hyperoxemia/hypoxemia.

PDSA CYCLE

PLAN

- Review literature for SpO_2 goals for infants on supplemental O_2
- Educational sessions for Neonatologists, Nurses & Respiratory Therapists to provide rationale for SpO_2 goals
- Collaborate with other Canadian NICUs, to learn about their practices around SpO_2 goals and alarms

DO/ STUDY

May 2024:

- Literature review and Neonatology Section consensus for SpO_2 ranges according to GA & PNA

OXYGEN ALARM LIMITS FOR INFANTS RECEIVING SUPPLEMENTAL OXYGEN	
Infants < 29 weeks GA	
▪ **Week 1 of life (first 7 days of life)**	**89-94%**
▪ **AFTER week 1, < 32 weeks CGA**	**87-94%**
Infants 29 $^{0/7}$ – 31 $^{6/7}$ weeks	**87-94%**
Infants ≥ 32 weeks	**90-96%**

- Collaboration with other NICUs regarding how nurses respond to SpO_2 alarms
- Plan initiated with clinical engineering for monitor configuration changes

June 2024:

- Physician - led unit huddles about "Importance of appropriate oxygen saturation ranges according to GA & PNA"
- Creation of "new" monitor profiles according to GA & PNA

July 2024:

- Initial upgrade of all unit monitors & Philips IntelliVue X2/X3 multi-measurement modules by clinical engineering
- Cue card placed on each bedside monitor
- Education on importance of alarms settings always being set according to the "new" ranges (above table)

August 2024:

- Safety checks by bedside nurses at start of shift to ensure monitor alarms set to the "new" ranges (above table)

Sept 2024:

- Unit huddles focused on standardized approach to how nurses should respond to:
  - ✦ High alarms ✦ Low alarms ✦ Multiple high and low alarms
- Monitors updated to have SMART (medium) alarms:

Alarm limit exceeded by	Time until alarm is triggered
Up to 1.5%,	50s
From 1.5% to 2.5%	25s
From 2.5% to 3.5%	15s
From 3.5% to 4.5%	12s
Over 4.5%	10s

Averaging time: 16 seconds (2 seconds for resuscitation room)

Oct - Dec 2024:

- Nursing Education Days (Theory Session & Skills Station) : SpO_2 ranges and how nurses should respond to alarms

ACT

Implemented:

- Assess & revise education around SpO_2 ranges
- Update bedside charts with "quick guide" related to nurses response to high, low & multiple high & low alarms

Ongoing:

- Quarterly audits to ensure correct SpO_2 ranges according to GA & PNA for infants on O_2 are being followed
- Event summary report tracked monthly to see if new ranges & revision of monitoring delays ↓ non-actionable alarms
- Review histograms to determine what % time infant remains within appropriate SpO_2 ranges

Conclusion

- Education around this major practice change has been completed for more than 200 nurses.
- Short data capture post progressive alarms implementation, noted a decrease in non-actionable alarms related to SpO_2.

Next Steps

- Quarterly audits to check that bedside nurses are setting SpO_2 ranges according to GA & PNA.
- Histogram reviews to determine % of time the infants remain within appropriate SpO_2 ranges.
- **Balancing measures:** Review short and long term morbidities associated with hyper/hypoxemia.

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