Unified Quality Improvement Symposium
February 2, 2022

The Use of High Flow Nasal Cannula Outside of the Pediatric Intensive Care Unit

Judith Ugale-Wilson, MD; Frederick Stine, DO; Dmitry Tumin, PhD, Camille Bauer, MS, Michael Dunkerley, BSN

No Disclosures

Introduction

- Bronchiolitis is a common respiratory condition that affects children of all ages and can be extremely severe in children ≤ 24 months.
- No proven treatment other than supportive therapy with hydration, airway clearance, and supplemental oxygen.
  - The Relationship between High Flow Nasal Cannula Flow Rate and Effort of Breathing in Children, *The Journal of Pediatrics*, published by Khemani, R et al in 2017, showed high flow nasal cannula (HFNC) decreased rates of intubation and mechanical ventilation.
  - A Randomized Trial of High-Flow Oxygen Therapy in Infants with Bronchiolitis, *The New England Journal of Medicine*, published by Franklin, D; Babl F et al in 2018, showed that escalation of care was found to be 23% in the standard therapy group, but only 12% in the HFNC group.
- These studies showed efficacy and safety in the use of HFNC both inside and outside of the PICU.
- The policy prior to beginning the study allowed the use of HFNC (<1 L/kg) in the general inpatient floor.

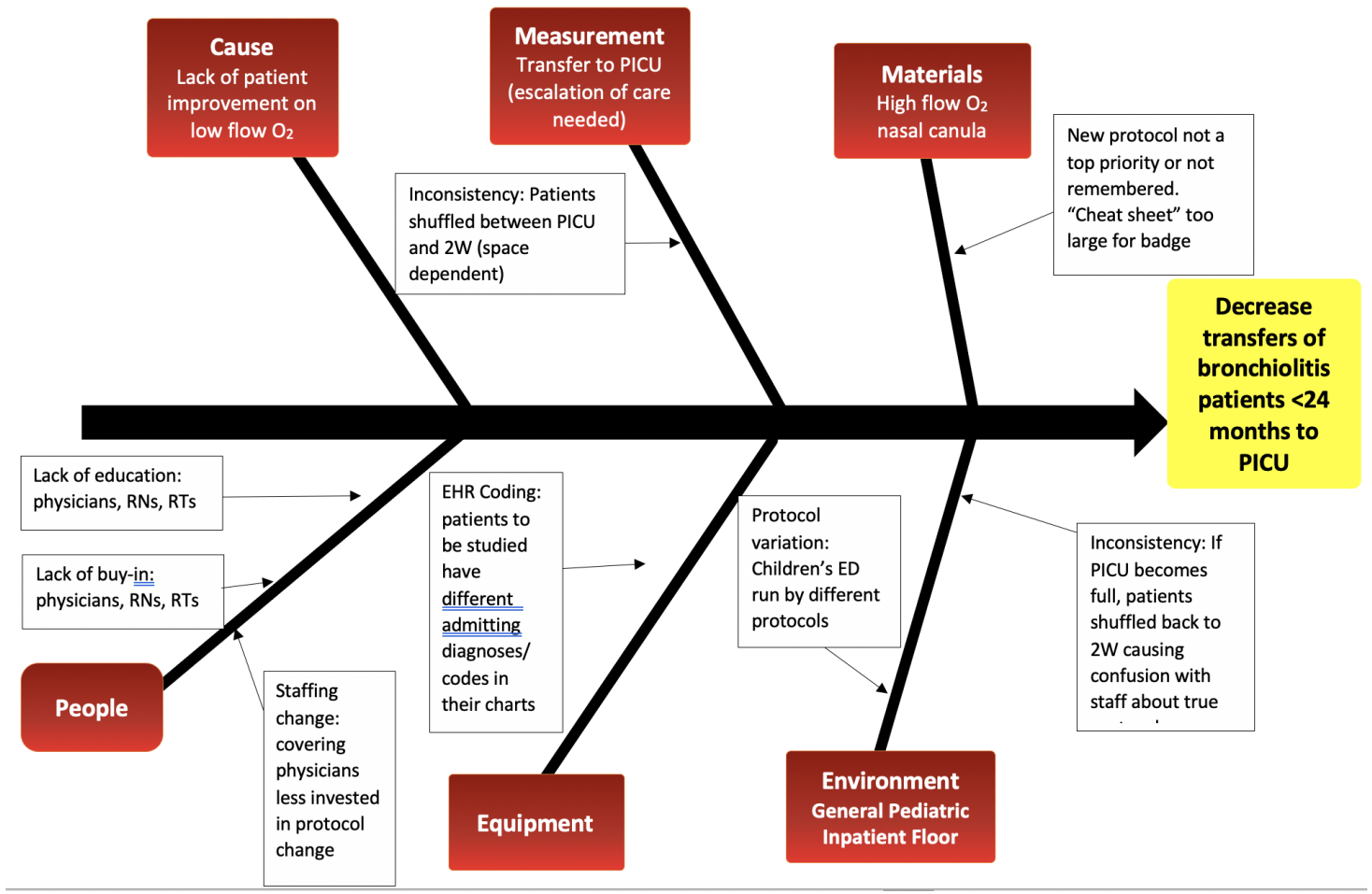
- AIM Statement: To show that the use of a new HFNC policy allowing higher flows (1-1.5 L/kg) outside the Pediatric ICU, for respiratory support of patients with bronchiolitis up to two years of age, is safe and results in at least a 25% reduction in transfers to the ICU.

Methods

- 50 patients age ≤ 24 months admitted for bronchiolitis to the general inpatient pediatrics ward were identified in the pre-intervention period (January-March 2019) and 52 patients were identified in the post-intervention period (January-March 2020).

- Pre-intervention period: 11/50 on HFNC
- Post intervention period: 19/52 on HFNC

- The new protocol for HFNC was introduced in December 2019, to begin in January 2020.



Results

Project outcomes were evaluated among patients on HFNC, with the characteristics of the patients in each period summarized in Table 1.

Post-intervention, patients with HFNC did not differ on age, sex, race/ethnicity, weight, or presence of respiratory syncytial virus (RSV) infection (Table 1).

Table 1. Patient characteristics by period among patients on high-flow nasal cannula.

Characteristic	Baseline (N=11)	Post-intervention (N=19)	P
	Median (IQR) or N (%)	Median (IQR) or N (%)	
Age (months)	2 (1, 5)	6 (2, 14)	0.078
Sex			0.643
Female	5 (45%)	7 (37%)	
Male	6 (55%)	12 (63%)	
Race/ethnicity			>0.999
Non-Hispanic Black	3 (27%)	6 (32%)	
Non-Hispanic White	6 (55%)	9 (47%)	
Other or unknown	2 (18%)	4 (21%)	
Weight (kg)	5 (4, 9)	7 (5, 9)	0.282
RSV infection	7 (63%)	16 (84%)	0.372

IQR, interquartile range; RSV, respiratory syncytial virus

Results

Fewer patients in the post-intervention cohort required admission to the PICU but this difference did not reach statistical significance (26% vs. 55%, p=0.122; Table 2).

Median hospital length of stay was shorter post-intervention (3 vs. 5 days), but this difference also did not reach statistical significance (p=0.066).

No patients on HFNC required intubation in either period and there were no deaths.

Table 2. Patient outcomes by period among patients on high-flow nasal cannula.

Characteristic	Baseline (N=11)	Post-intervention (N=19)	P
	Median (IQR) or N (%)	Median (IQR) or N (%)	
Admitted to PICU	6 (55%)	5 (26%)	0.122
Intubated	0	0	>0.999
Length of stay (days)	5 (3, 7)	3 (2, 4)	0.066
Maximum O_2 flow rate (LPM)	8 (4, 12)	8 (4, 14)	0.983
Maximum PEWS score[a]	7 (4, 9)	6 (4, 7)	0.081

[a] Data missing for 2 cases in the post-intervention period.

IQR, interquartile range; LPM, liters per minute; PEWS, pediatric early warning signs; PICU, pediatric intensive care unit

Conclusion

- The use of a new HFNC policy in the general pediatric floor is safe and resulted in a 26% reduction in transfers to the ICU.
- Our initial plan was to do a third cycle in 2021, but COVID-19 Pandemic dramatically decreased the number of admissions of bronchiolitis, and therefore there were not enough cases to further study.
- In the meantime, a systematic review was published in 2020, (High flow nasal cannula as a respiratory support in treating infant bronchiolitis: a systematic review, *European Journal of Pediatrics*, Moreel, L; Proesmans, M).
  - Its conclusions: HFNC is a safe mode of respiratory support that can be positioned between standard of therapy (SOT) and nCPAP as rescue therapy for children not adequately supported by SOT. It does not seem to shorten the duration of oxygen need nor the duration of hospital admission. HFNC is being used increasingly in the context of infant bronchiolitis. However, evidence on efficacy and safety are limited.