Clinical update no. 512
18 April 2018

High flow humidified nasal oxygen is increasingly used to manage bronchiolitis. There is little evidence as to any benefit. Some background, and current Guidelines:

Infants and Children - Acute Management of Bronchiolitis

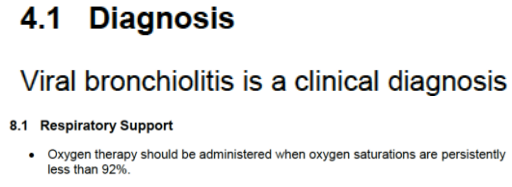
NSW GOVERNMENT Health GUIDELINE

Issue date: January 2018

1.2 Changes from previous clinical practice guideline

The following list identifies the key changes to the document:

- Thresholds/targets for adequate oxygenation
- Parameters for use of continuous oximetry
- Inclusion of High Flow Nasal Cannulae (HFNC) in management
- Viral identification is **not** recommended
- Bronchodilators are **not** recommended



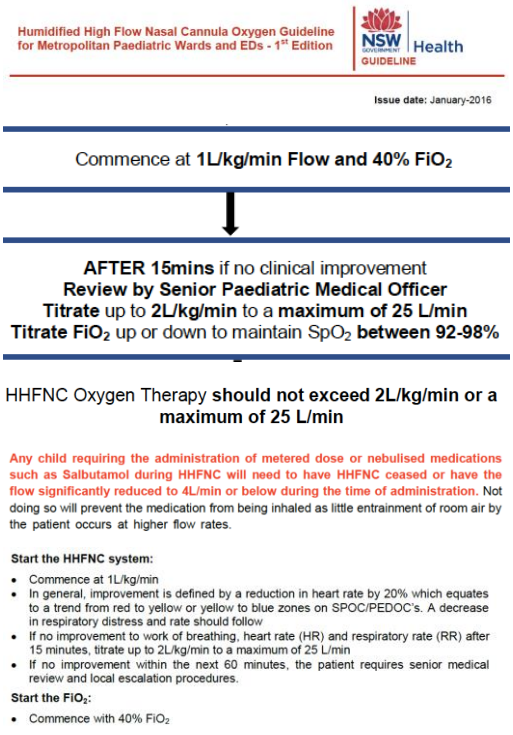
4.1 Diagnosis

Viral bronchiolitis is a clinical diagnosis

8.1 Respiratory Support

- Oxygen therapy should be administered when oxygen saturations are persistently less than 92%.

Brief desaturation that corrects is common and is not an indication for supplemental O2.



Humidified High Flow Nasal Cannula Oxygen Guideline for Metropolitan Paediatric Wards and EDs - 1st Edition

NSW GOVERNMENT Health GUIDELINE

Issue date: January-2016

Commence at **1L/kg/min Flow and 40% FiO_2**

AFTER 15mins if no clinical improvement
Review by Senior Paediatric Medical Officer
Titrate up to **2L/kg/min** to a **maximum of 25 L/min**
Titrate FiO_2 up or down to maintain SpO_2 **between 92-98%**

HHFNC Oxygen Therapy **should not exceed 2L/kg/min or a maximum of 25 L/min**

Any child requiring the administration of metered dose or nebulised medications such as Salbutamol during HHFNC will need to have HHFNC ceased or have the flow significantly reduced to 4L/min or below during the time of administration. Not doing so will prevent the medication from being inhaled as little entrainment of room air by the patient occurs at higher flow rates.

Start the HHFNC system:

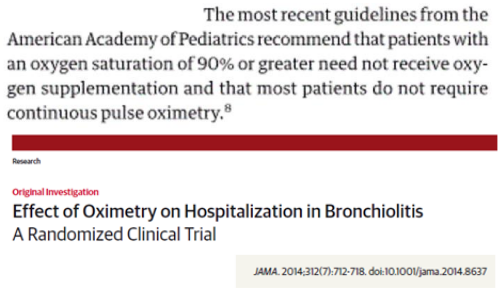
- Commence at 1L/kg/min
- In general, improvement is defined by a reduction in heart rate by 20% which equates to a trend from red to yellow or yellow to blue zones on SPOC/PEDOC's. A decrease in respiratory distress and rate should follow
- If no improvement to work of breathing, heart rate (HR) and respiratory rate (RR) after 15 minutes, titrate up to 2L/kg/min to a maximum of 25 L/min
- If no improvement within the next 60 minutes, the patient requires senior medical review and local escalation procedures.

Start the FiO_2:

- Commence with 40% FiO_2

Key decision points relate to oxygen saturation. Is desaturation harmful, and is supplemental O2 of any benefit?

The American Academy of Pediatrics recommend no supplemental O2 if saturating 90% or higher on room air.



The most recent guidelines from the American Academy of Pediatrics recommend that patients with an oxygen saturation of 90% or greater need not receive oxygen supplementation and that most patients do not require continuous pulse oximetry.[8]

Research

Original Investigation

Effect of Oximetry on Hospitalization in Bronchiolitis
A Randomized Clinical Trial

JAMA. 2014;312(7):712-718. doi:10.1001/jama.2014.8637

The pulse oximeter was altered so that it read 3% higher than the true value. Admission rates were higher in the true oximetry group, with 41% admitted versus 25% when oximetry read 3% higher. Oximetry prompted admission despite comparable clinical severity otherwise. There was no difference in clinical outcomes or representations.

mild hypoxemia are driving hospitalizations that may not be necessary.

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

A Randomized Trial of High-Flow Oxygen Therapy in Infants with Bronchiolitis

N ENGL J MED 378;12 NEJM.ORG MARCH 22, 2018

High-flow (HF) oxygen therapy through a nasal cannula has been increasingly used in infants with bronchiolitis, despite limited high-quality evidence of its efficacy. The efficacy in non-ICU settings is unclear.

Infants < 12 months with bronchiolitis and a need for supplemental oxygen therapy were randomised to high flow O2 or standard O2.

- Warmed, humidified O2 delivered at 2 L/kg/min titrated to O2 saturation >92% or >94% depending on hospital protocol; stopped when weaned to FiO2 0.21.
- Standard therapy was up to 2L/min O2 by nasal cannula.
- Supplemental O2 weaned if maintaining O2 saturation >92% or 94%, depending on local hospital protocol.
- Oral feeding was recommended.

Available at http://www.heti.nsw.gov.au/programs/emergency-medicine-training/emergency-medicine-training-test/educational-resources/em-clinical-updates/

The primary outcome was escalation of care due to treatment failure (defined as meeting ≥ 3 of 4 clinical criteria: persistent tachycardia, tachypnoea, hypoxaemia; and medical review triggered by a hospital early-warning tool). For HR and RR, treatment failure was defined as no change or increase; success was a fall of 5 for both HR and RR. For saturation, failure was requiring FiO2 > 0.4 for high flow and >2 L/min for standard NP O2 to maintain saturation.

Secondary outcomes included duration of hospital stay, duration of O2 therapy, and rates of transfer to a tertiary hospital, ICU admission, intubation, and adverse events.

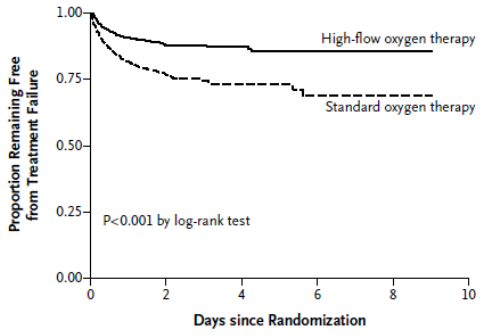
RESULTS 1472 patients were included. There was escalation of care in 12% with high flow nasal O2 v 23% with standard therapy.

There was no difference in duration of either hospital stay or O2 therapy.

One pneumothorax occurred in each group.

Of the treatment failure with standard therapy, 61% responded to high flow O2, i.e. 39% didn't.

CONCLUSIONS There was a lower rate of escalation of care among infants receiving high flow nasal O2.



The primary outcome was defined by vital signs rather than patient oriented outcomes, i.e. maintaining O2 saturation >92 or 94%, or by HR or RR not falling, despite no patient centred adverse outcome. Abnormal vital signs and tachypnoea are the reason for admission (RR 55-60), so clinical review based on abnormal vital signs does not mean there was any adverse outcome. Outcomes of greater clinical relevance such as duration of O2 therapy (1.8 days) or hospital stay (3 days) and ICU admission (10%) were no different between groups.

Table 3. Secondary Outcomes, Reasons for Escalation of Care, and Adverse Events.*

	Standard-Therapy Group (N=733)	High-Flow Group (N=739)
	No/%	
Severity of disease at time of escalation of care		
Patients with data	165	87
RR (breaths/min)	54.6±12.4	62.6±15.2
	P < 0.01	
Clinical criteria met at escalation of care		
Increasing use of O2	50/167 (30)	37/87 (43)
	P = 0.06	

Unblinded studies have inherent confounders. Although incomplete, available data shows the standard care group had escalation at a lower RR than the high flow group, which would bias results given escalation is the primary outcome. Increasing O2 use was more often a criteria with HF.

Severity Pre-enrolment		
RR, breaths/min	53.0 ±12.4	60.9 ± 14.8
SpO2 %	89.2 ± 7.90	88.7 ± 8.44

RR pre-enrolment was higher in the HF group. Mean O2 saturation was <90% in both.

Non Study treatment and medication received		
Bronchodilator	214 (29.2)	182 (24.6)

Bronchodilators were used in over a quarter of children despite Guideline recommendations not to.

Without doubt HHFNC will be increasingly used for children with bronchiolitis. It is hard to see a patient centred benefit in this study.

The issue is the threshold to use it – clearly worth trialling for severe disease with respiratory difficulty; not so clear for children with less severe disease based on this non blinded study with important confounders and bias with little patient centred outcome benefit.

Available at http://www.heti.nsw.gov.au/programs/emergency-medicine-training/emergency-medicine-training-test/educational-resources/em-clinical-updates/