DEM Journal Club

# Article Appraisal

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

**Date of Journal Club:** June 19, 2018

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## Background and Study Objective(s):

Current emergency department (ED) management of bronchiolitis consists of hydration and supportive treatment, which has traditionally been limited to oxygen delivered through a standard nasal cannula. Data from bronchiolitis patients in pediatric intensive care unit (PICU) settings suggest high-flow oxygen therapy may help decrease work of breathing, improve oxygenation, and reduce rates of intubation in children with bronchiolitis. However, there have been no studies examining the efficacy of high-flow oxygen therapy in bronchiolitis patients outside of a PICU setting. The objective of this study was to assess whether the early treatment of infants with bronchiolitis and hypoxemia with high-flow therapy in EDs and general pediatric wards would result in fewer infants having treatment failure, leading to escalation of care.

## Study Design:

This was a multicenter, un-blinded, randomized controlled trial performed in 17 EDs and general pediatric wards in Australia and New Zealand. The trial population consisted of infants aged less than 12 months who presented to the ED or pediatric inpatient ward, who had bronchiolitis and had a need for supplemental oxygen. Infants who clearly needed intensive care, or those with other complicating medical conditions (ex. already on home oxygen, traumatic complications) were excluded from eligibility. Eligible infants were randomized either to the intervention, defined as 2L/kg/min high-flow oxygen delivered via Optiflow (a high-flow, humidified oxygen delivery system through nasal prongs; the authors did not report receiving any funding from Optiflow manufacturers) with a $FiO_2$ adjusted to maintain oxygen levels; or standard therapy, defined as 2L/ min of supplemental oxygen delivered via nasal prongs. The primary outcome was treatment failure leading to escalation of care, as defined by: advancing to high-flow therapy or ICU (for the standard therapy group), or advancing to ICU (for the high-flow group). Several factors played into whether care was advanced, including the patients' heart rate, respiratory rate, increasing $FiO_2$ requirements to maintain saturation, clinical gestalt, and activation of an early warning tool. The exact early warning tools used varied by hospital, but most used patient vital signs, in addition to level of consciousness and capillary refill, to generate a score used by nursing to activate more immediate attention or therapies.

## Results:

Treatment failure with escalation of care occurred in 167 of 733 infants (23%) in the standard-therapy group, versus 87 of 739 infants (12%) in the high-flow group (risk difference, −11 percentage points; 95% CI, −15 to −7; P<0.001). There was no significant difference between groups in terms of length of time between intervention and escalation of care. There were no significant differences between groups in terms of duration of ICU stay or duration of oxygen therapy. The number of infants requiring intubation did not differ between groups, and the rate of adverse events was similar and low in both groups.

## Validity of Results:

During the journal club discussion of this article, it was felt that the investigators performed the trial appropriately in terms of randomization, recruitment, and follow-up. There was a clear definition of the trial intervention and outcome; however, the definition of how patients were escalated to a "higher level of care", as this entity is difficult to clearly define.

## Generalizability of Results:

It is uncertain whether the standard of bronchiolitis care in Australia and New Zealand, where high-flow oxygen is routine, is comparable to Canada; specifically, if physicians are already comfortable using this treatment, then physicians might be more likely to escalate to high-flow in the "usual treatment" group.
This study was conducted in both EDs and inpatient pediatric wards, rather than only in EDs, and it is unclear whether there were systematic patient, physician, and treatment differences between ED and inpatient settings. Finally, "escalation of care" may be subjective and based upon unrecorded factors.

## The Bottom Line:

High-flow oxygen therapy delivered by Optiflow appears to be an appropriate and efficacious next step of therapy for bronchiolitic infants after supplemental oxygen delivered via nasal prongs. If high-flow oxygen can become a common therapy for infants in Canadian EDs, this provides another therapy in our toolbox for treatment of bronchiolitis, which can be a difficult disease to treat with limited therapy options before advancing to the need for intensive care. Importantly, high-flow therapy does not appear to have increased risks of harm compared to regular supplemental oxygen therapy.