



## Trends in Heated High Flow Nasal Cannula Use in Hospitalized Children with Bronchiolitis and Its Impact on Intubation Rate, Ward Length of Stay, and Air Leak Syndrome: A Six Year University Pediatric Practice Analyses

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## Disclosure

- None

## Background

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- | Pathophysiology of bronchiolitis involves
  - u airway inflammation
  - u increase mucus production
  - u mucus plugging and airway obstruction
- | Management of acute bronchiolitis involves
  - u suction, hydration, and oxygen therapy
- | Traditionally, oxygen provided by
  - u nasal cannula (NC)
  - u CPAP
  - u conventional ventilation

## HFNC and Proposed Mechanisms

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- | Since 2009, devices that effectively heat and humidify inspired gas at high flow rates developed and high flow nasal cannula (HFNC) increasing utilized
- | HFNC thought to improve ventilation
  - u improving mucociliary airway clearance
  - u nasopharyngeal dead space wash out
  - u reducing upper airway resistance
  - u providing some degree of CPAP

## Background: HFNC Use

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- u Widely used in PICUs and NICUs
- u Increasingly used on pediatric floors
- u Not enough known about impact of HFNC in pediatric ward setting

## Objectives

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- To study trends in HFNC use on pediatric wards and PICU from 2010-2016 in management of acute bronchiolitis
- To evaluate impact of HFNC use on
  - intubation rate
  - ward length of stay (wLOS)
  - air leak

## Methods

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- | Retrospective chart review electronic medical records
- | **Setting**
  - university affiliated tertiary care academic practice
- | **Inclusion**
  - <2 year old
  - previously healthy children, admitted for management of acute bronchiolitis on pediatric wards and PICU
- | **Exclusion**
  - complex medical cases (Freudtner criteria)

## Methods: HFNC Guidelines

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- HFNC guidelines developed for moderate to severe respiratory distress (RD) through literature review and consensus
  - HFNC initiation in ED, ward, or PICU
- Maximum HFNC limit (pilot and consensus)
  - **Wards:** 6 L/min flow, 50% oxygen
  - **PICU:** >6 L/min of flow, 50% oxygen
- Ward to PICU escalation process developed
- **Implementation:** educating stakeholders about HFNC guideline, care process, and escalation of care

## Methods: Data Elements

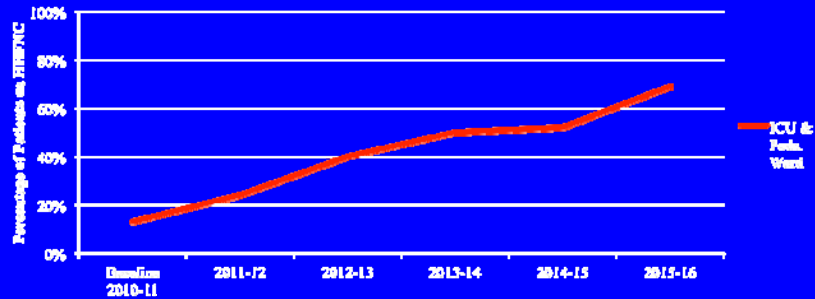
- ▣ Number children hospitalized for acute bronchiolitis
- ▣ Number children placed on HFNC on wards and PICU
  - intubation rate (%)
  - wLOS (days)
  - air leak (n)
- ▣ Six bronchiolitis seasonal data collected for trend analyses
  - ▣ September-April (season definition)
  - ▣ Sep. 2010-April 2011 (baseline data)
- ▣ Run charts
- ▣ *P*-value calculated,  $P < 0.05$  significant

## Results: Ward and PICU Hospitalization Rate

Categories	Number of Patients
Number hospitalized 6 years	6804
Percent admitted wards	80% (5457)
Percent admitted to PICU	20% (1347)
Air leak	2 patients (minor)

# Results: Trends in HFNC Use in Hospitalized Children

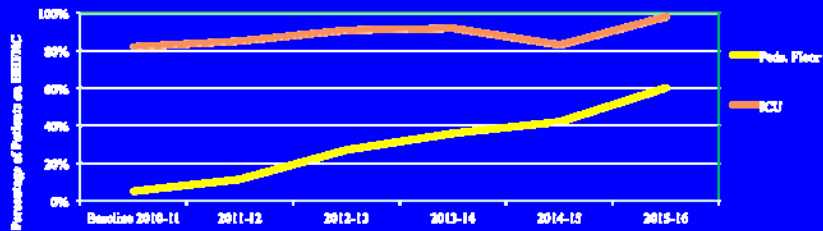
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Baseline	2011-12	2012-13	2013-14	2014-15	2015-16	<i>P</i>
13%	24%	40%	50%	52%	69%	0.004

# Results: Trends in HFNC Use Pediatric Wards and PICU

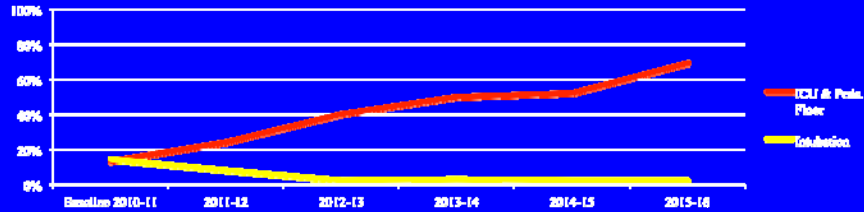
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	Base	2011-12	2012-13	2013-14	2014-15	2015-16	<i>P</i>
Wards	5%	12%	27%	36%	42%	60%	<0.01
PICU	82%	85%	91%	92%	83%	98%	<0.001

# Results: HFNC Use and Intubation Rate

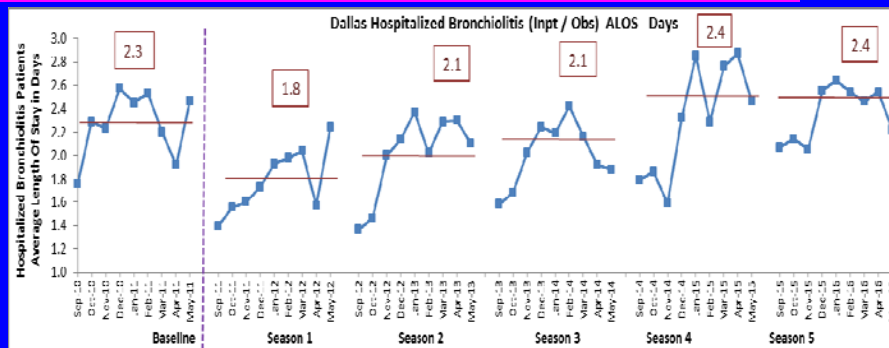
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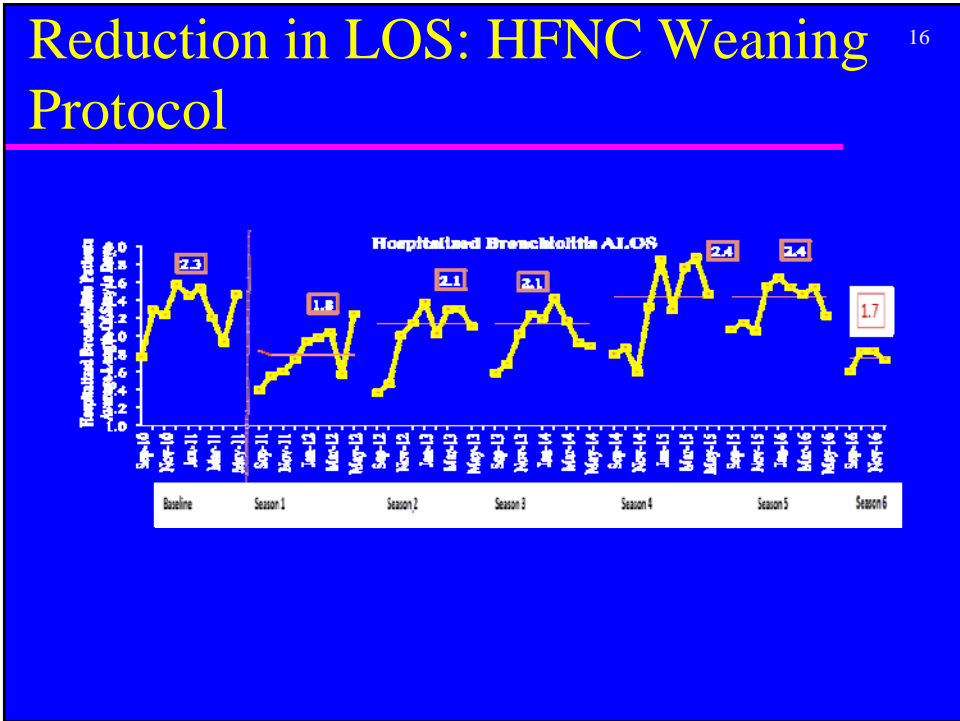
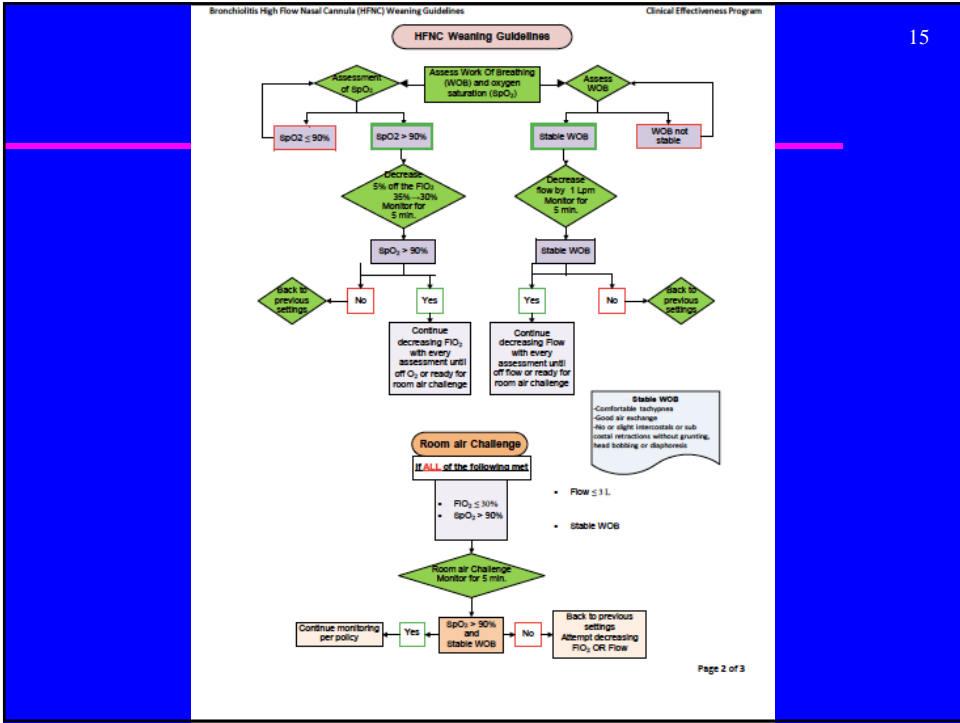
	Base	2011-12	2012-13	2013-14	2014-15	2015-16	P
PICU & ward	13%	24%	40%	50%	52%	69%	0.004
Intubation rate	14%	8%	2%	3%	2%	2%	<0.0003

# Results: HFNC Use and Ward LOS

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	Base	2011-12	2012-13	2013-14	2014-15	2015-16
PICU & Floor	13%	24%	40%	50%	52%	69%
LOS days	2.3	1.8	2.1	2.1	2.4	2.4





## Limitations

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- Single center study
- Retrospective chart review

## Conclusions

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- Use of HFNC in management of children hospitalized with acute bronchiolitis has significantly increased both pediatric wards and PICU
- Increase HFNC use has significantly reduced intubation rate from 14% to 2%
- Use of HFNC does not increase risk of air leak
- HFNC use on pediatric wards was associated with increase in wLOS

## Implications

- | HFNC might be effective form non-invasive respiratory support in children hospitalized with moderate to severe RD due to acute bronchiolitis
- | HFNC is quite safe for use on pediatric wards, reduces intubation rate but might increase ward LOS

