

# Bronchiolitis from RCTs to guidelines



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THE UNIVERSITY OF  
**AUCKLAND**  
Te Whare Wānanga o Tāmaki Makaurau  
NEW ZEALAND



# Outline



- Australasian guidelines
- Knowledge translation in bronchiolitis
- High Flow
  - New evidence
  - How we should be using it

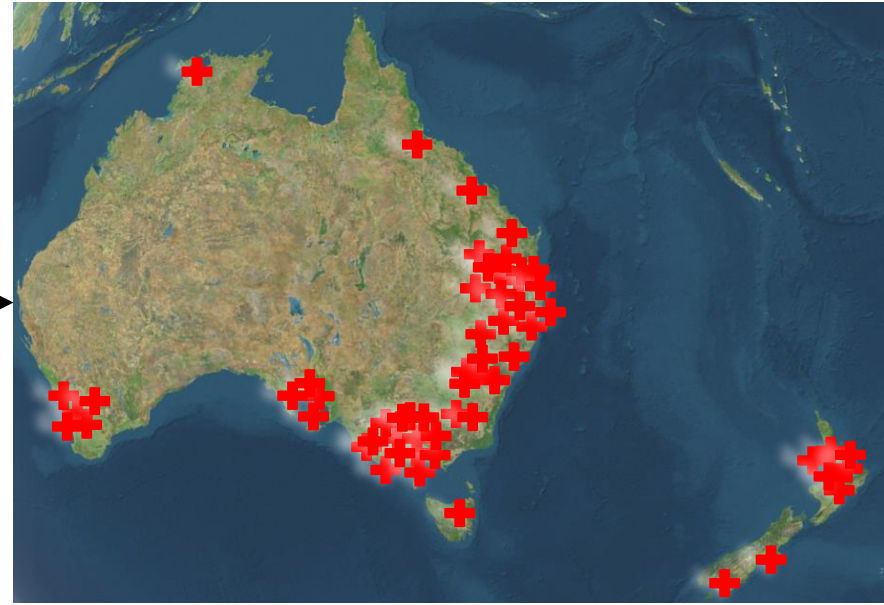
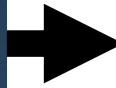
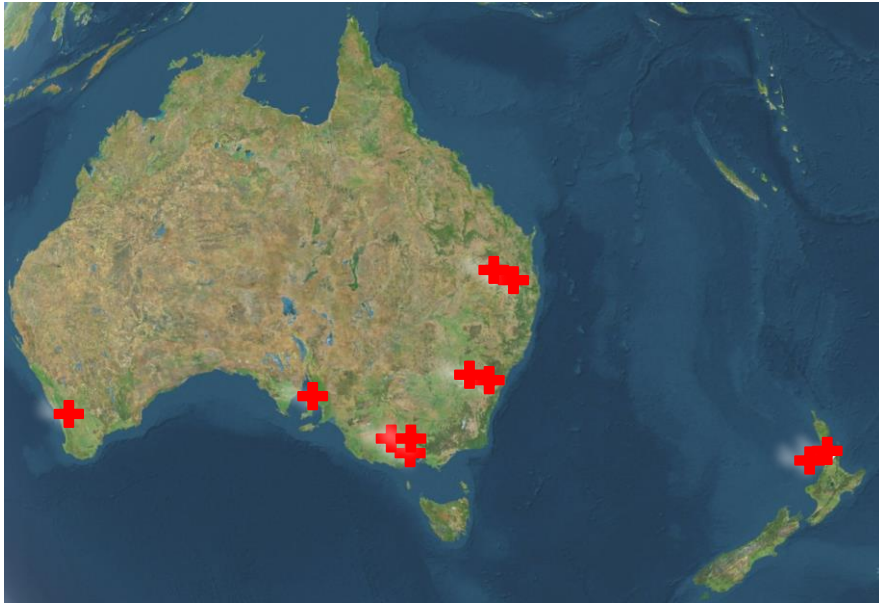




Paediatric Research in  
Emergency Departments  
International Collaborative



# 58 Sites

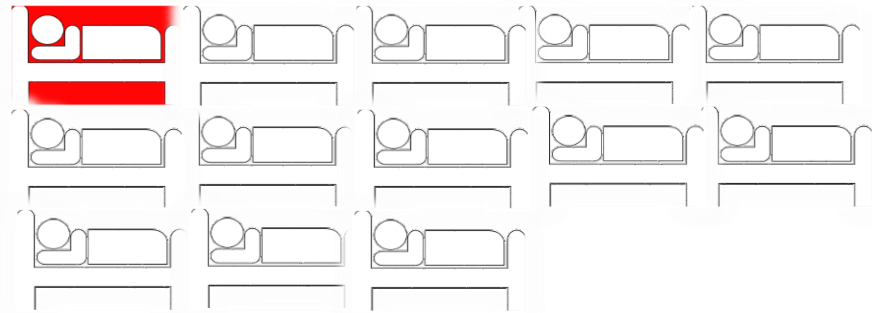




# PREDICT



# Bronchiolitis: Burden of disease



 x3 Maori

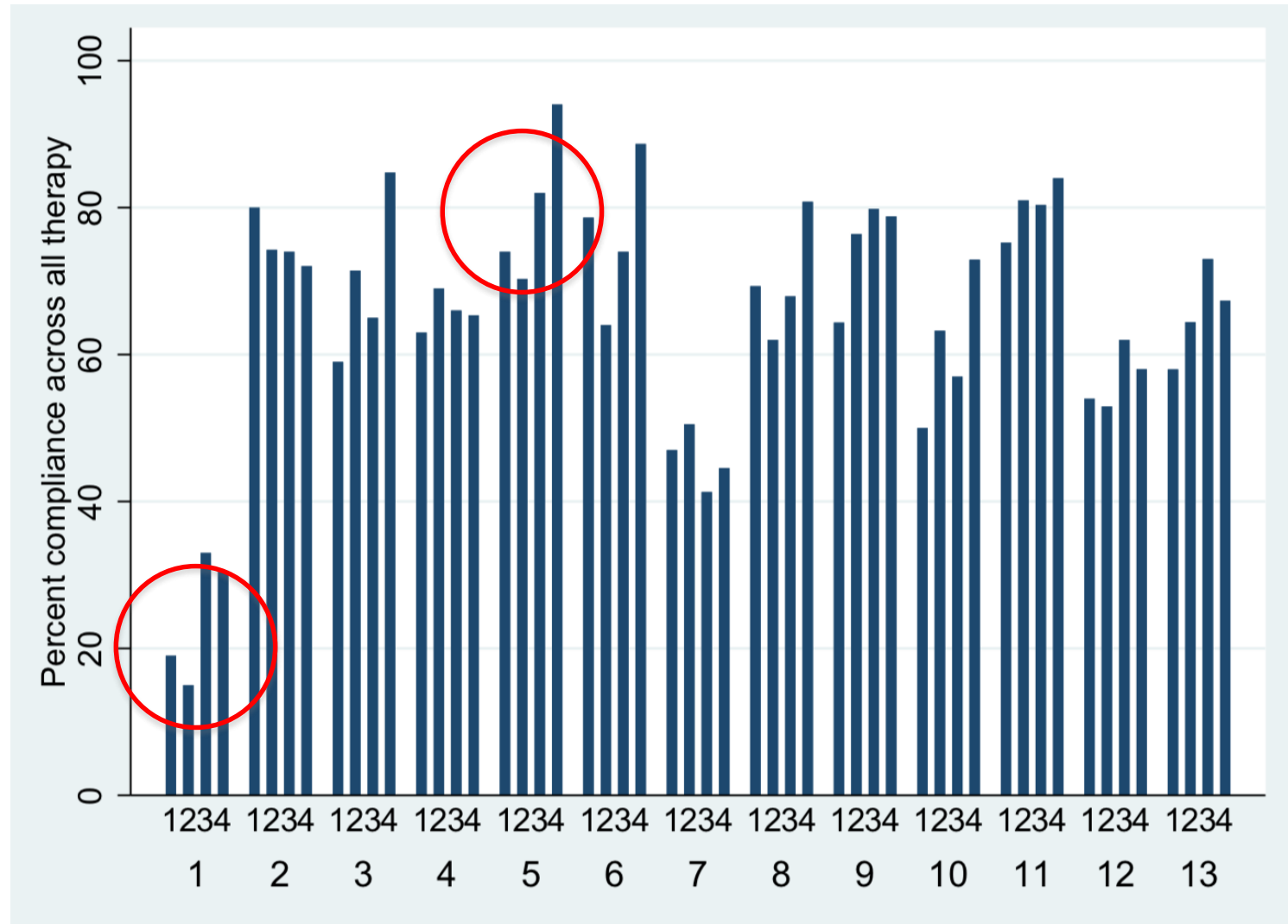
 x4.3 Pacific



 x4.7



# Bronchiolitis: Variation in practice

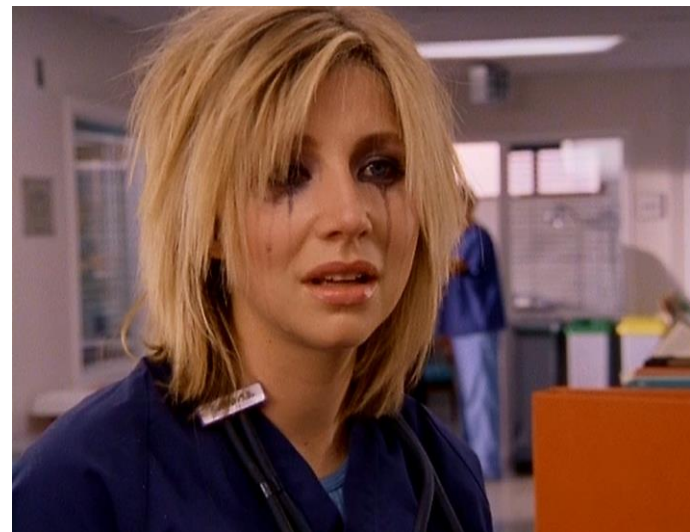


Guidelines are “*statements that include recommendations intended to optimize patient care that are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options*”

Institute of Medicine







starship.org.nz

Menu Search Donate Starship Child Health

Starship Clinical Guidelines

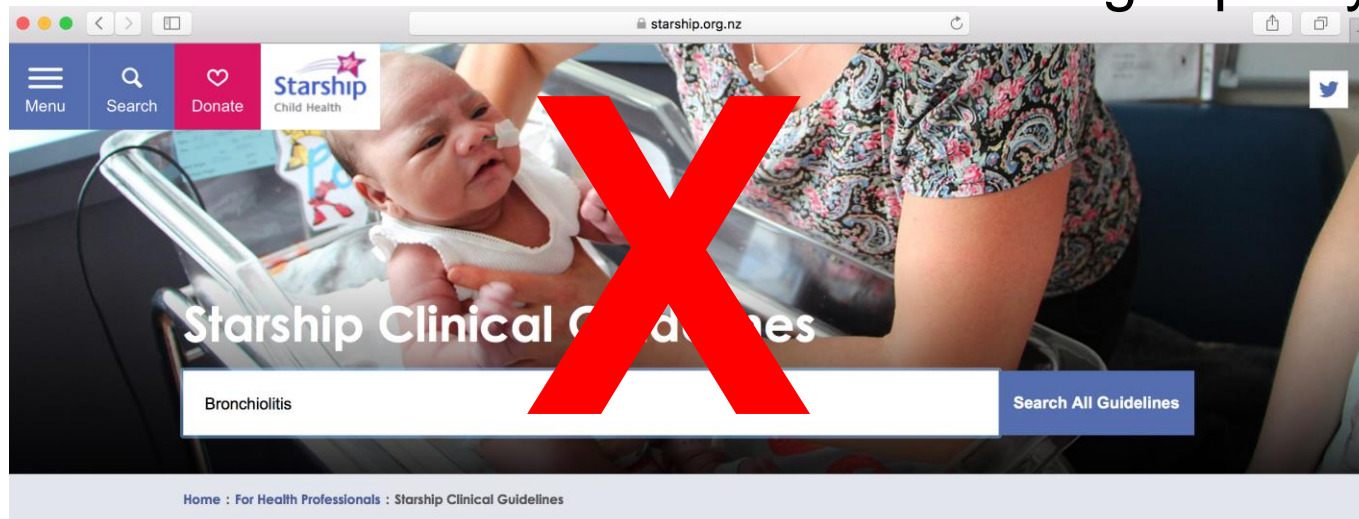
Bronchiolitis

Search All Guidelines

Home : For Health Professionals : Starship Clinical Guidelines



- Non-transparent
- No systematic search of literature
- Recommendations don't clearly indicate strength or evidence base behind them
- Often not multidisciplinary
- Often little consultation
- Questionable relevance outside institution
- But no time for high quality



# Bronchiolitis: Local guidance

Journal of Paediatrics and  
Child Health



doi:10.1111/jpc.14104

## ORIGINAL ARTICLE

### Australasian bronchiolitis guideline

Sharon O'Brien,<sup>1,2</sup> Meredith L Borland,<sup>1,3</sup> Elizabeth Cotterell,<sup>4</sup> David Armstrong,<sup>5,6</sup> Franz Babi<sup>ID</sup>,<sup>7,8,9</sup> Paul Bauert,<sup>10</sup> Christine Brabyn,<sup>11</sup> Lydia Garside,<sup>12</sup> Libby Haskell,<sup>13</sup> David Levitt,<sup>14</sup> Nicola McKay,<sup>15</sup> Jocelyn Neutze,<sup>16</sup> Andreas Schibler,<sup>14,17,18</sup> Kam Sinn,<sup>19</sup> Janine Spencer,<sup>20</sup> Helen Stevens,<sup>21</sup> David Thomas,<sup>22</sup> Michael Zhang,<sup>23</sup> Ed Oakley,<sup>8,9,24,25</sup> and Stuart R Dalziel;<sup>13,26,27</sup> on behalf of the Paediatric Research in Emergency Departments International Collaborative (PREDICT) Network, Australasia



Paediatric Research in  
Emergency Departments  
International Collaborative



Starship Clinical Guidelines  
*developed by clinicians at Starship Child Health*

### Bronchiolitis

*This document is only valid for the day on which it is accessed. Please read our disclaimer.*

#### Within this Document

- Diagnosis
- Investigations
- Initial assessment
- Admission
- Management
- Oxygen therapy
- High flow therapy (HFNC)
- Fluids and Feeding
- Discharge Planning
- Follow up
- Information for Families

#### Related Documents

[Fever Investigation and Management](#)  
[Chest xray in acute wheeze](#)  
[Intravenous Fluids](#)  
[Respiratory support on Starship wards](#)

This guideline is based on the PREDICT Australasian bronchiolitis clinical guideline with additional information specific to Starship. This is intended for infants aged 0-12 months with bronchiolitis. The guideline may be relevant for 12-24 months old but there is less diagnostic certainty in this age group.

# Bronchiolitis: Local guidance


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**Do not use** beta-2 agonists (GRADE strong)

**Do not use** adrenaline (GRADE strong)

**Do not use** glucocorticoids (GRADE strong)

**Do not use** antibiotics (GRADE conditional)

Routine CXR **not recommended** (GRADE conditional)

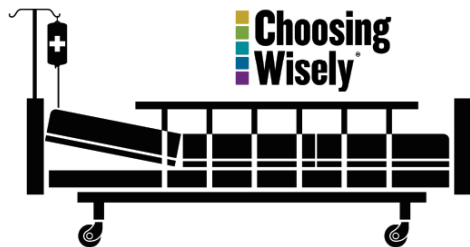




# Bronchiolitis: Local guidance



Canadian  
Paediatric  
Society



**NICE** National Institute for  
Health and Care Excellence

**Do not use** beta-2 agonists (GRADE strong)

**Do not use** adrenaline (GRADE strong)

**Do not use** glucocorticoids (GRADE strong)

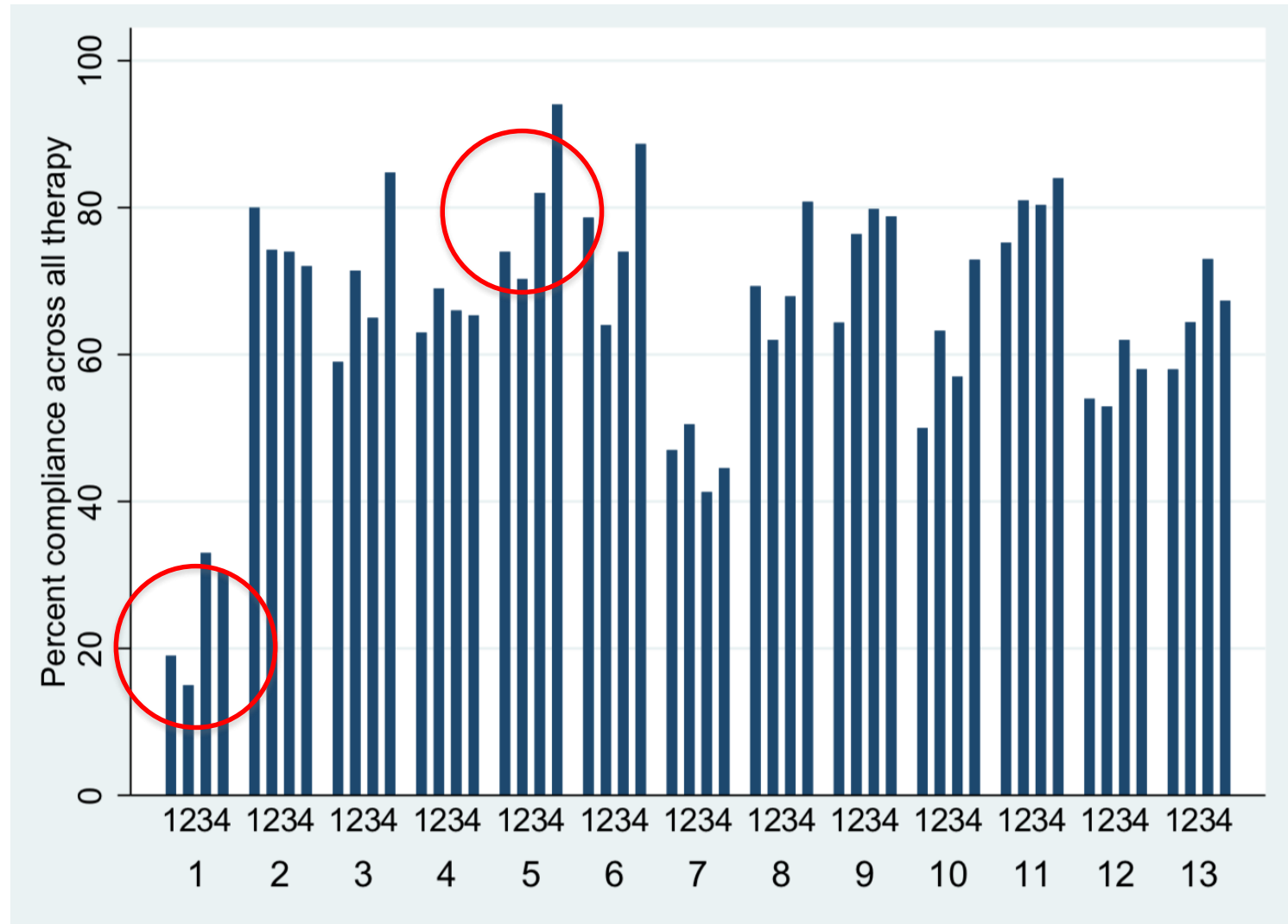
**Do not use** antibiotics (GRADE conditional)

Routine CXR **not recommended** (GRADE conditional)





# Bronchiolitis: Variation in practice



# Bronchiolitis: Knowledge translation



What is  
known

What is  
currently  
done

# Bronchiolitis: Knowledge translation

Haskell et al. *BMC Pediatrics* (2018) 18:218  
<https://doi.org/10.1186/s12887-018-1187-7>


BMC Pediatrics

## STUDY PROTOCOL

## Open Access



# Implementing evidence-based practices in the care of infants with bronchiolitis in Australasian acute care settings: study protocol for a cluster randomised controlled study

Libby Haskell<sup>1,2\*</sup> , Emma J. Tavender<sup>3,4</sup>, Catherine Wilson<sup>3</sup>, Sharon O'Brien<sup>5</sup>, Franz E. Babl<sup>3,6,7</sup>, Meredith L. Borland<sup>5,8</sup>, Liz Cotterell<sup>9,10</sup>, Tibor Schuster<sup>3,11</sup>, Francesca Orsini<sup>3,11</sup>, Nicolette Sheridan<sup>12</sup>, David Johnson<sup>13</sup>, Ed Oakley<sup>3,6,7</sup>, Stuart R. Dalziel<sup>1,2</sup> on behalf of PREDICT<sup>14</sup>

# Bronchiolitis: Knowledge translation

## Question

To determine whether tailored, theory informed KT intervention improves compliance with the Australian Bronchiolitis Guideline with regards to CXR, antibiotics, epinephrine, glucocorticoids and salbutamol

## Method

Cluster RCT of 26 hospitals in Au/NZ to intensive KT (local champions, education, audit and feedback) vs. usual practice

- Multidisciplinary key stake holder meeting to create organisational buy-in ✓
- Identification of up to four clinical leads (medical and nursing) from ED and paediatric inpatient areas ✓
- One day train-the-trainer workshop for clinical leads ✓
- Provision of KT materials for local training ✓
  - Educational power points
  - Fact sheets
  - Posters
  - Parent / caregiver information sheet
- Monthly audit and feedback site reports ✓





# HFNC in bronchiolitis



# HFNC in bronchiolitis

## Initial evidence from PICUs

Retrospective before & after studies, historical controls

**McKiernan et al. n=115** J Peds 2010

Intubation decreased from 23% to 9%,  $p < 0.05$

**Schibler et al. n=298** Intensive Care Med 2011

Intubation decreased from 37% to 7%,  $p < 0.05$

All low quality studies subject to confounding

Maturing of evidence in 2017/2018



# TRAMONTANE I

Milesi et al. Intensive Care Med 2017

RCT of 2 L/kg/min HFNC vs. 7 cmH<sub>2</sub>O nCPAP in infants <6/12 with bronchiolitis admitted to 5 PICUs in France (n = 142)

Non-inferiority design (margin 15%)

Primary outcome = Failure within 24 hrs = 1 point increase in modified Woods score; rr>10 bpm; 1 point increase in EDIN score; 2 apnoea/hr



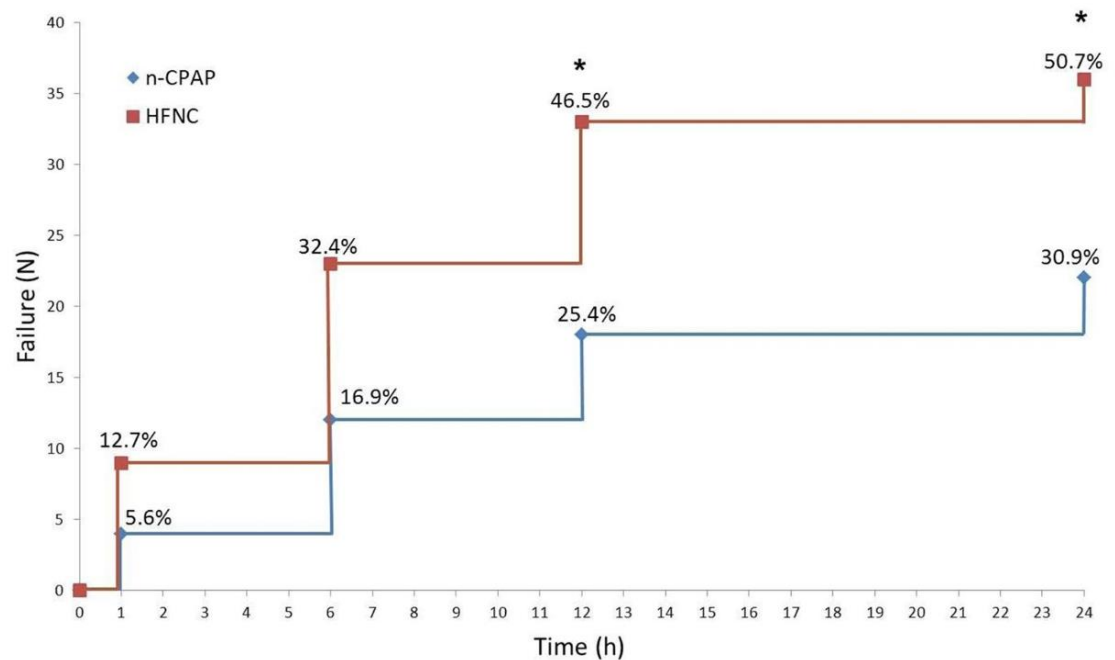
# TRAMONTANE I

Milesi et al. Intensive Care Med 2017

## Failure within 24 hours

51% HFNC vs. 31%, RD -19% (-3% to -35%),  
superiority analysis  $p=0.001$

- Cross over  
allowed; HFNC  
successful in 82%  
of nCPAP failures



# TRAMONTANE II

Milesi et al. Intensive Care Med 2018

RCT of 2 L/kg/min HFNC vs. 3 L/kg/min HFNC in infants <6/12 with bronchiolitis admitted to 16 PICUs in France (n = 286)

Primary outcome = Failure within 48 hrs = 1 point increase in modified Woods score; rr>10 bpm; 1 point increase in EDIN score; 2 apnoea/hr





# TRAMONTANE II

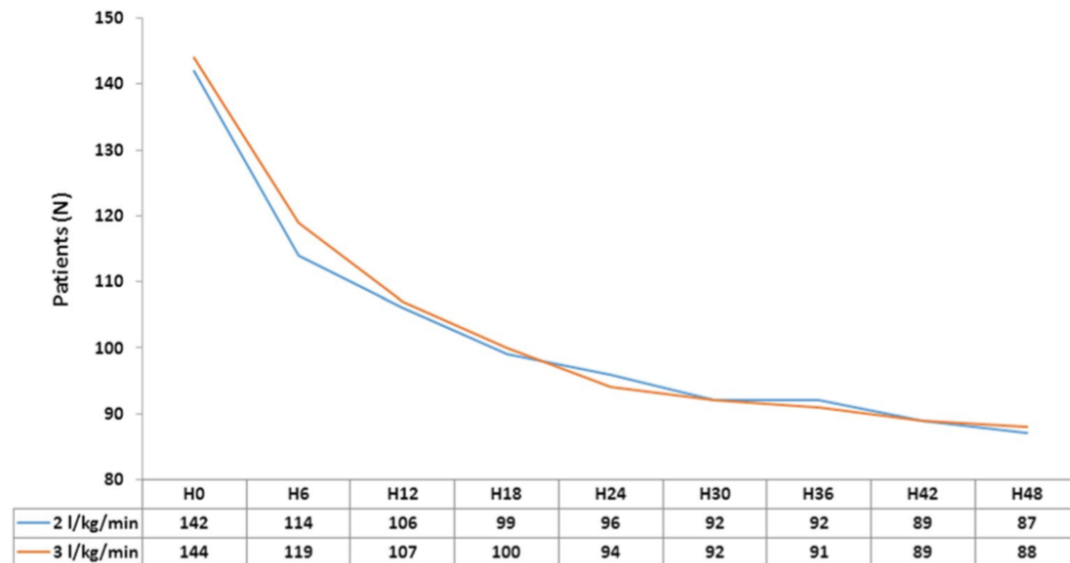
Milesi et al. Intensive Care Med 2018

## Failure within 48 hours

39% 2 L/kg/min vs. 39% 3 L/kg/min,  $p=0.98$

### 3 L/kg/min

- More discomfort  
43% vs. 16%
- More PICU 6.4 d  
vs. 5.3 d
- No death or air  
leak syndrome



# HFWHO RCT

Kepreotes et al. Lancet 2017

RCT of 1 L/kg/min vs. LFNC in infants <2 years  
admitted with bronchiolitis to John Hunter Hospital,  
Newcastle

Inclusion = moderate bronchiolitis

Exclusion =  $\text{SpO}_2 < 90\%$



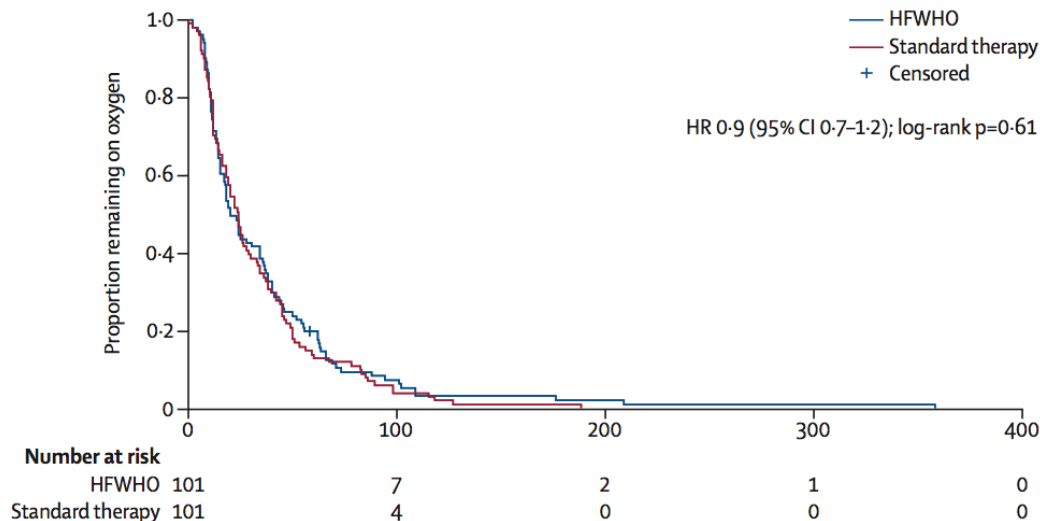
# HFWHO RCT

Kepreotes et al. Lancet 2017

## Results

Primary outcome = time from randomisation to last use of O<sub>2</sub>

No difference 20 vs. 24 hours, p=0.61



Less treatment failure on HFNC 13% vs. 33%, p=0.002

61% who experienced treatment failure on LFNC were rescued by HFNC

Safe, PICU admission no different 12% vs. 14%

# PARIS



*The* NEW ENGLAND JOURNAL *of* MEDICINE

ORIGINAL ARTICLE

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

Donna Franklin, B.N., M.B.A., Franz E. Babl, M.D., M.P.H.,  
Luregn J. Schlapbach, M.D., Ed Oakley, M.B., B.S.,  
Simon Craig, M.B., B.S., M.H.P.E., M.P.H., Jocelyn Neutze, M.B., Ch.B.,  
Jeremy Furyk, M.B., B.S., M.P.H.&T.M., John F. Fraser, M.B., Ch.B., Ph.D.,  
Mark Jones, Ph.D., Jennifer A. Whitty, B.Pharm., Grad.Dip.Clin.Pharm., Ph.D.,  
Stuart R. Dalziel, M.B., Ch.B., Ph.D., and Andreas Schibler, M.D.

# PARIS



## Primary outcome

3 out of 4 of

HR unchanged or increased

RR unchanged or increased

$\text{FiO}_2 \geq 40\%$  to maintain  $\text{SpO}_2 \geq 92\%$ , or LF  $\text{O}_2 > 2\text{L/min}$  to maintain  $\text{SpO}_2 \geq 92\%$

Hospital internal Early Warning Tool calls for medical review and escalation of care

AND escalation of treatment care or level of care



# PARIS

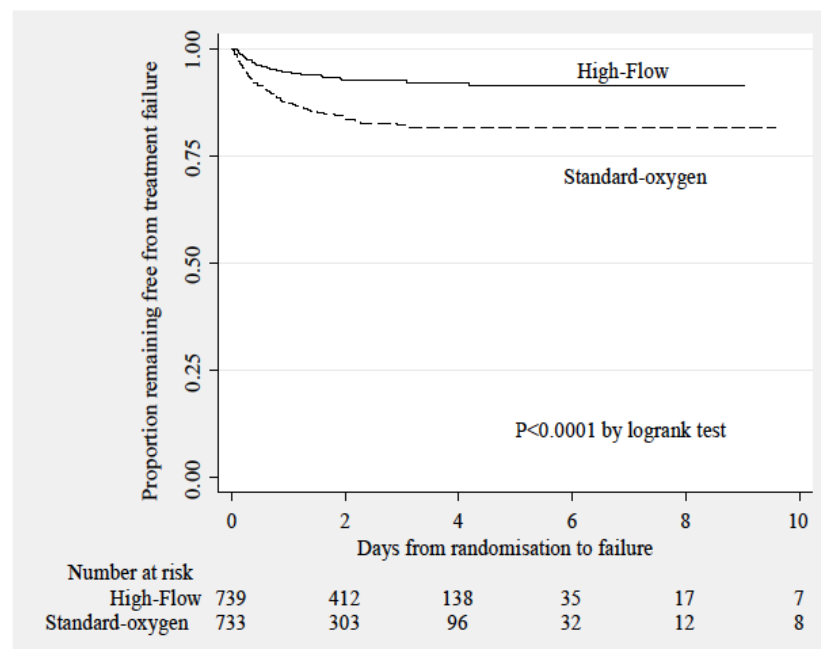


## Primary outcome

Escalated care O<sub>2</sub> 22.8% vs. HFNC 11.8%,  $p < 0.0001$

Escalated care +  $\frac{3}{4}$  criteria O<sub>2</sub> 15.7% vs. HFNC 7.2%,  $p < 0.0001$

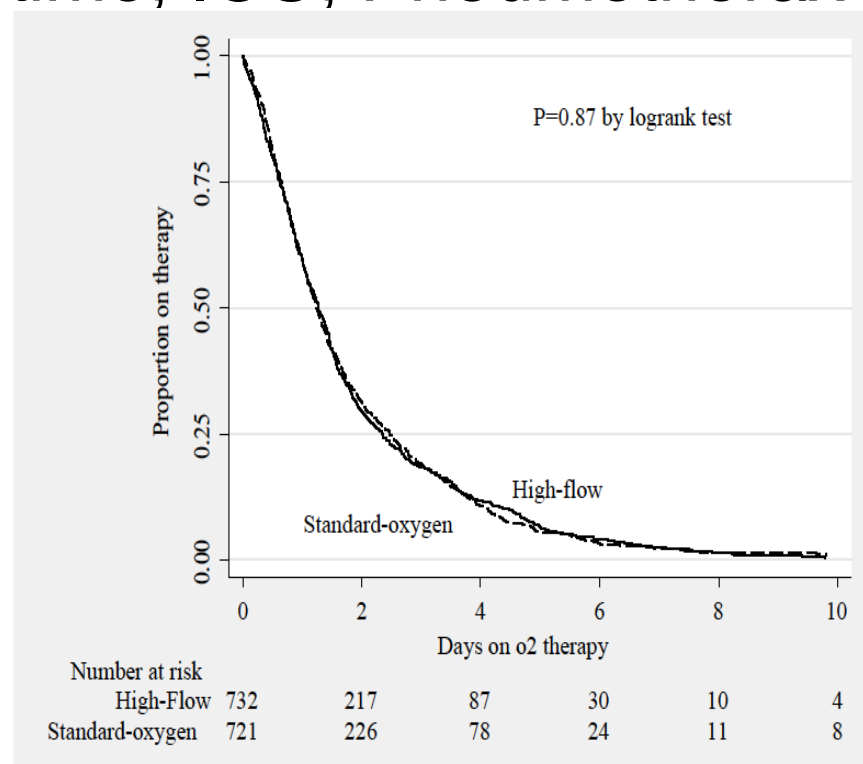
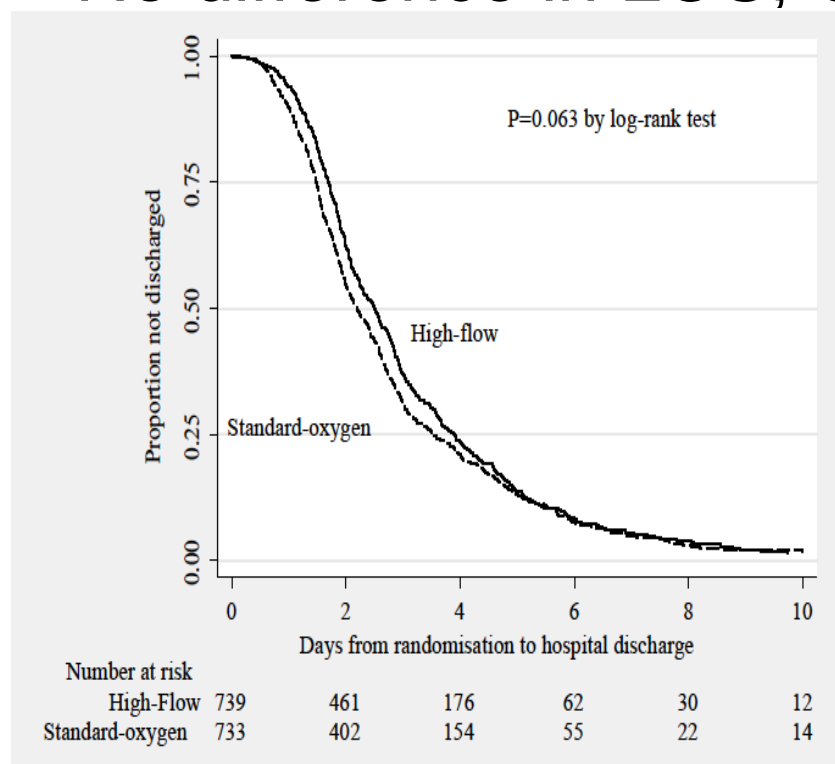
102/167 (61%) who failed standard care rescued by HFNC



# PARIS

## Secondary outcomes

No difference in LOS, O<sub>2</sub> time, ICU, Pneumothorax



# HFNC in bronchiolitis

Like all new toys it is never as good as promised

An example of why we do RCTs

Observational data of reduced intubation in PICU

Yet 1<sup>st</sup> RCT not positive c.f. nCPAP

HFWHO RCT & PARIS

Safe on ward



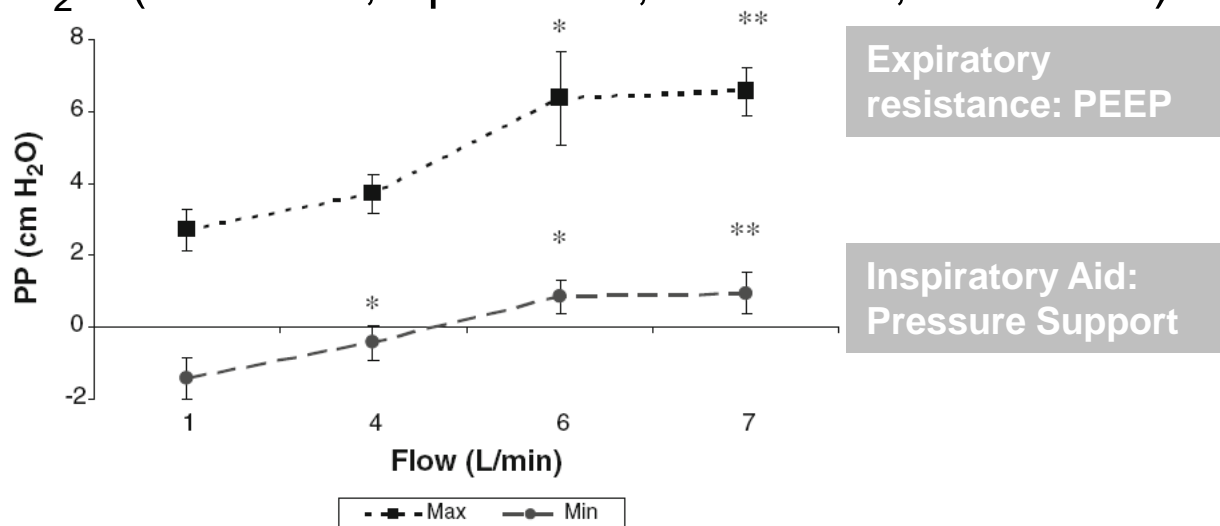
# HFNC in bronchiolitis

## Current evidence base

- **Safe** outside ICU
- **Rescue treatment** at 2 L/kg/min

≥2 L/kg/min needed to give both PIP and PEEP

≥4 cmH<sub>2</sub>O (Sen 67%, Spec 96%, PPV 75%, NPV 95%) Milesi 2013

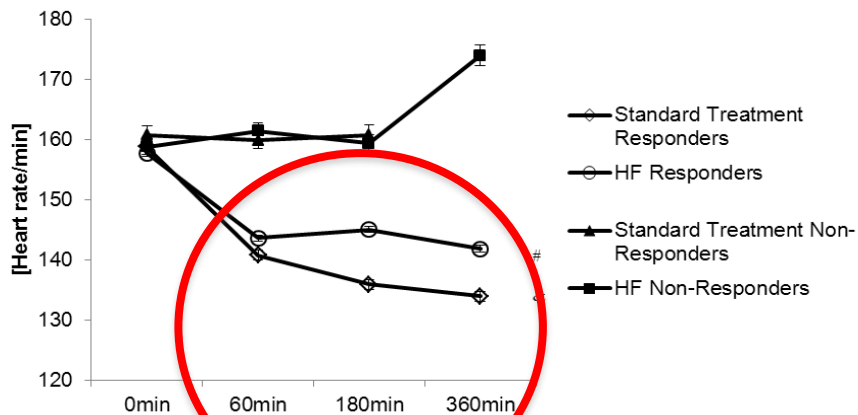


# HFNC in bronchiolitis

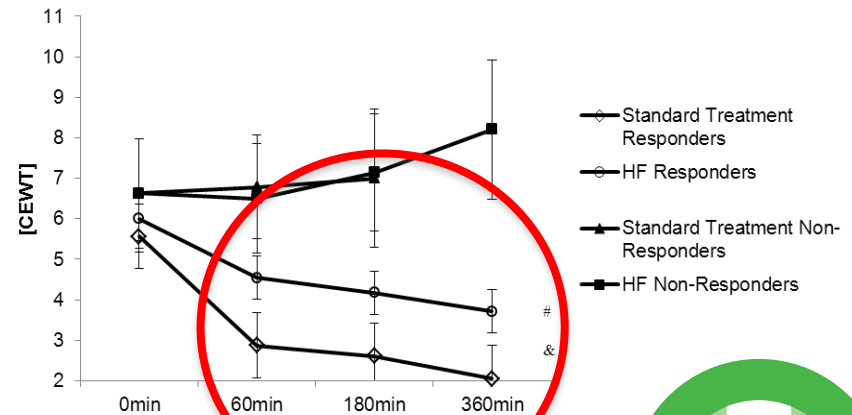
## Current evidence base

- **Safe** outside ICU
- **Rescue treatment** at 2 L/kg/min
- Evidence of effect within a **few hours** Mayfield 2014

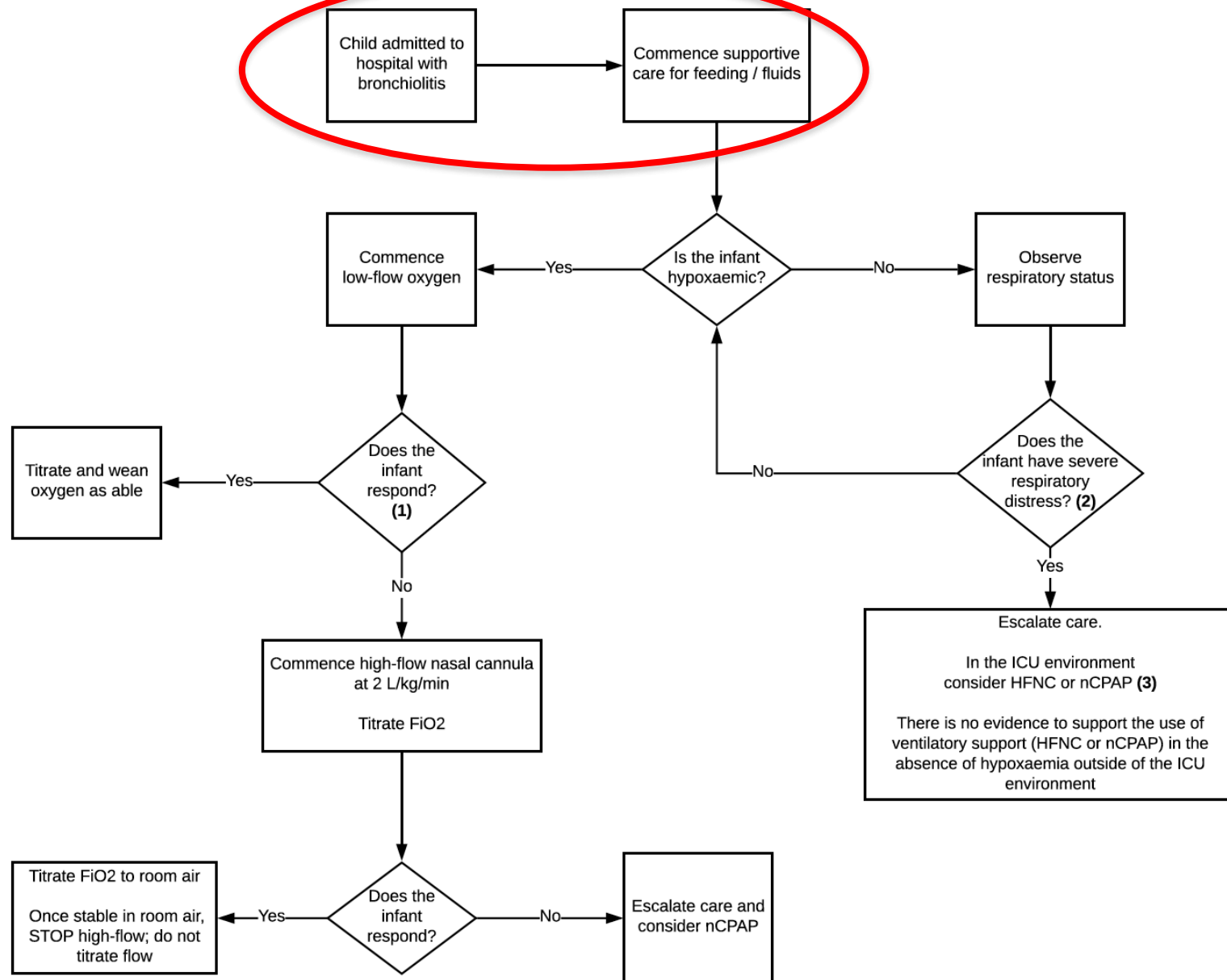
Heart Rate



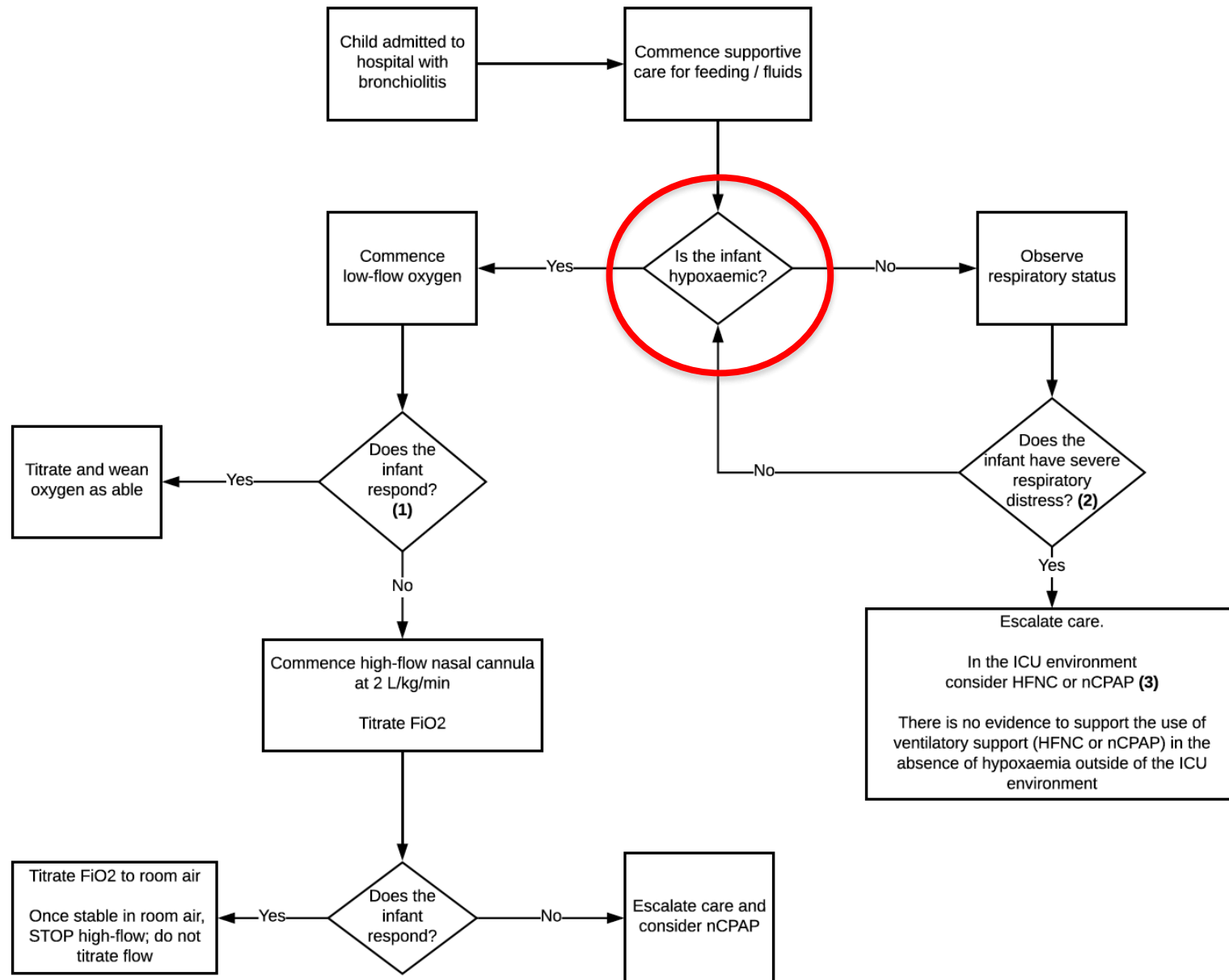
CEWT



# How to use HFNC in bronchiolitis

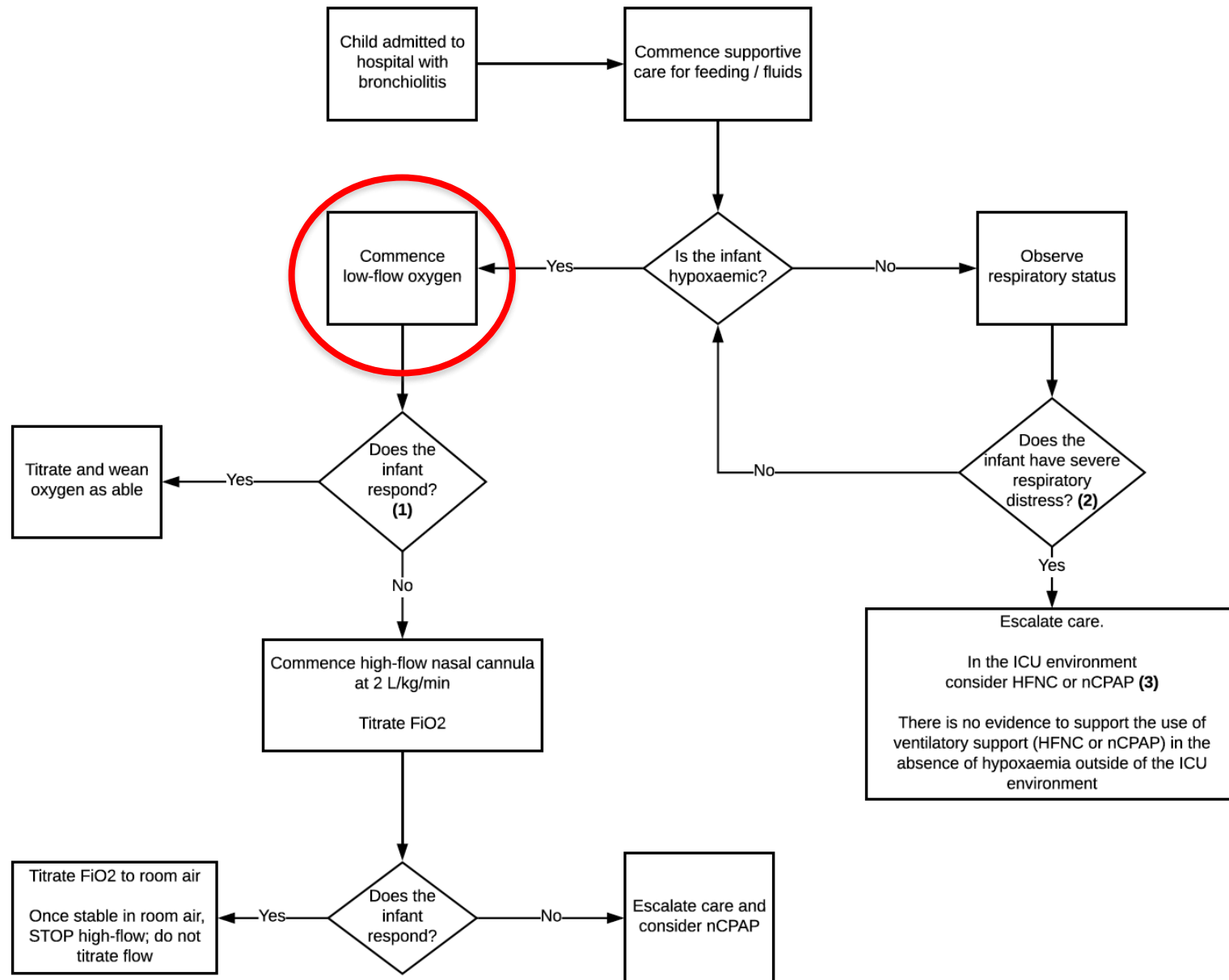


# How to use HFNC in bronchiolitis

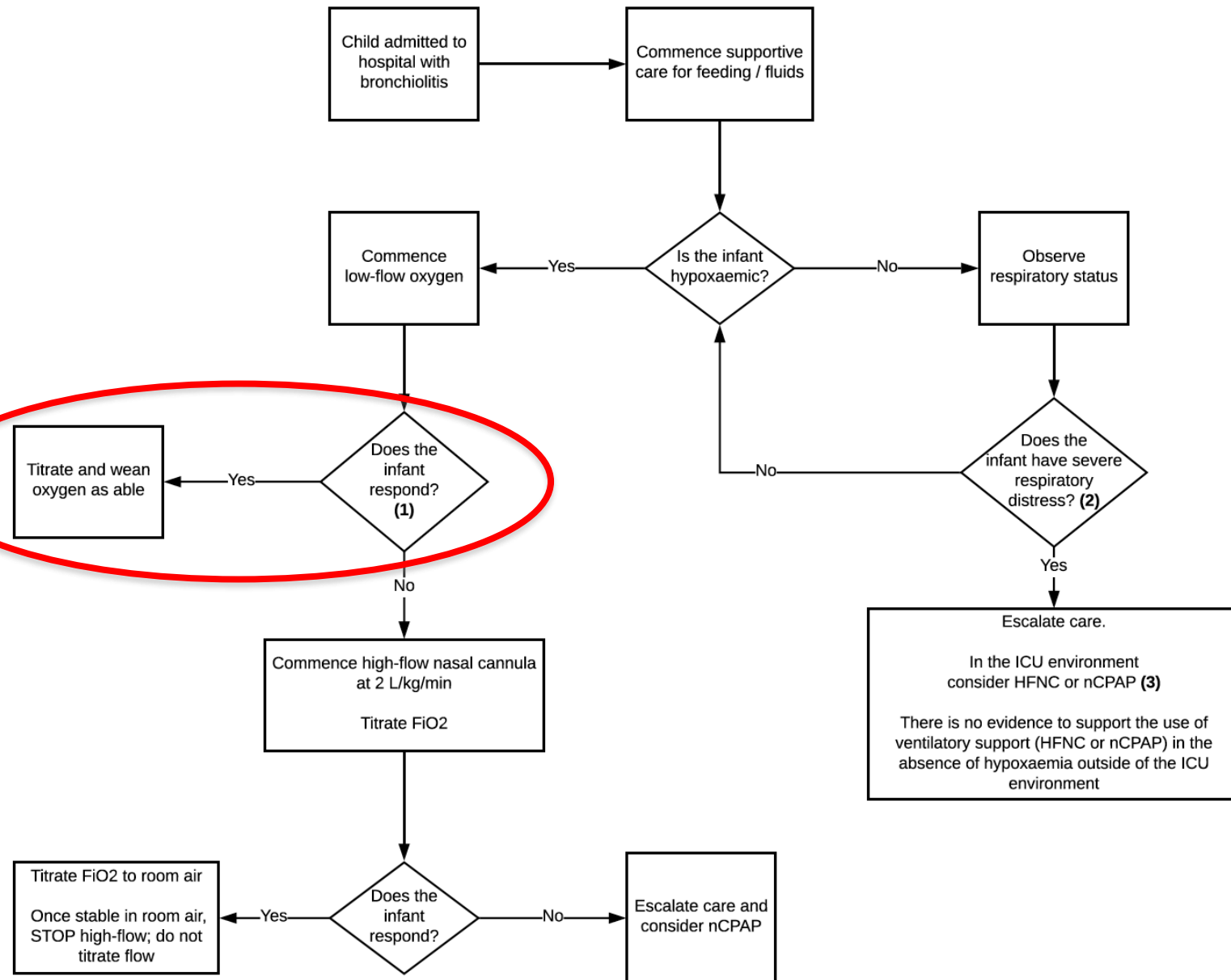




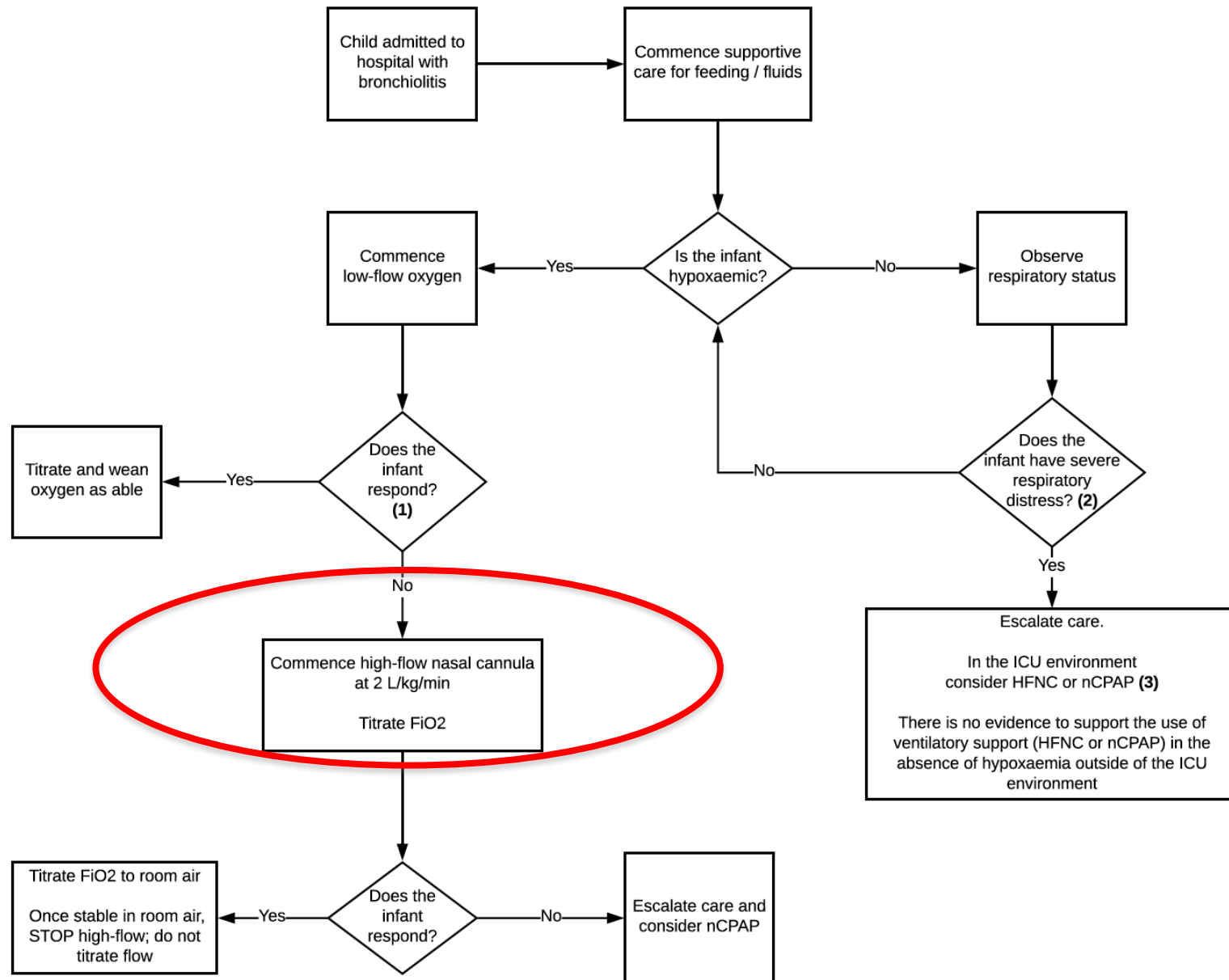
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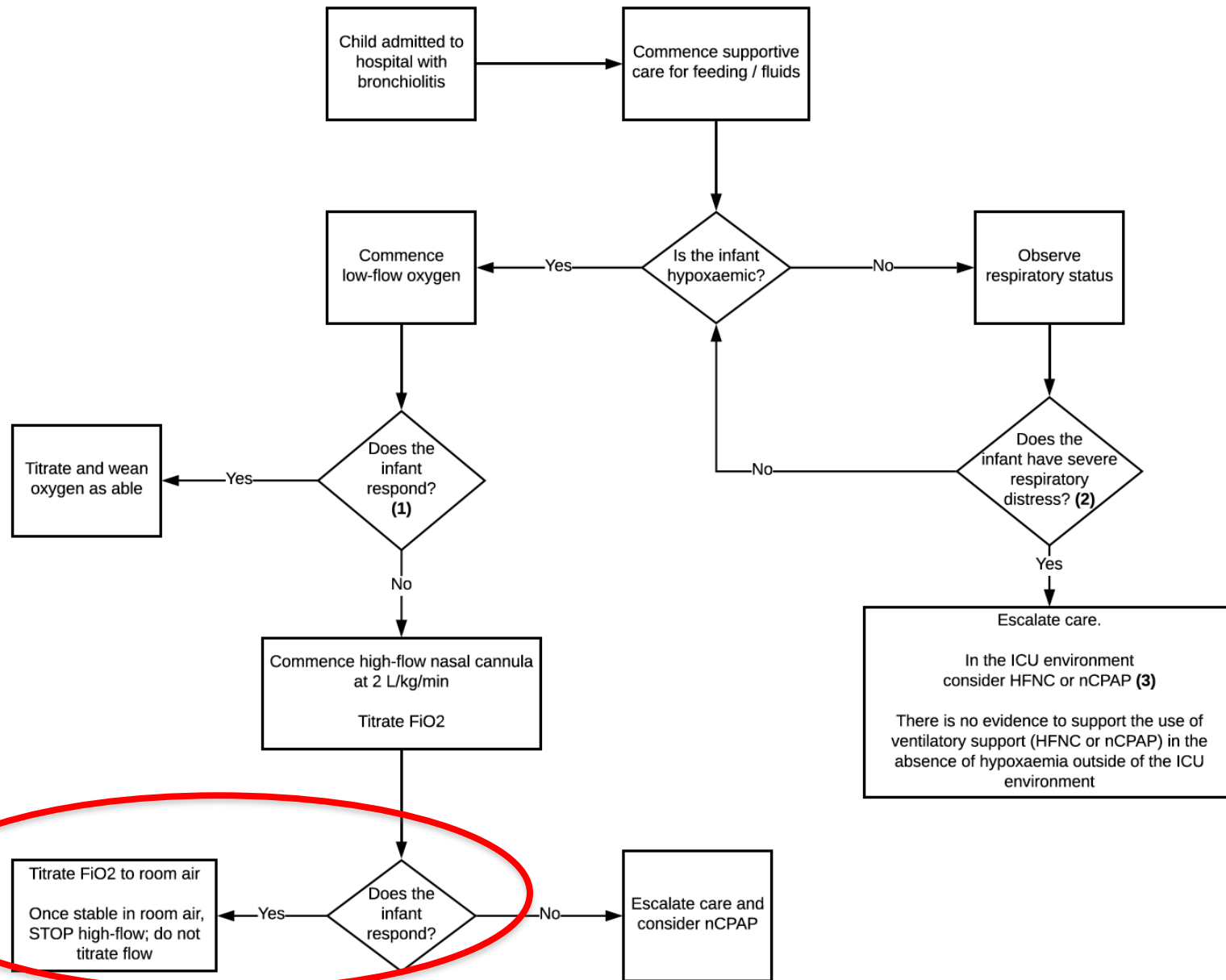
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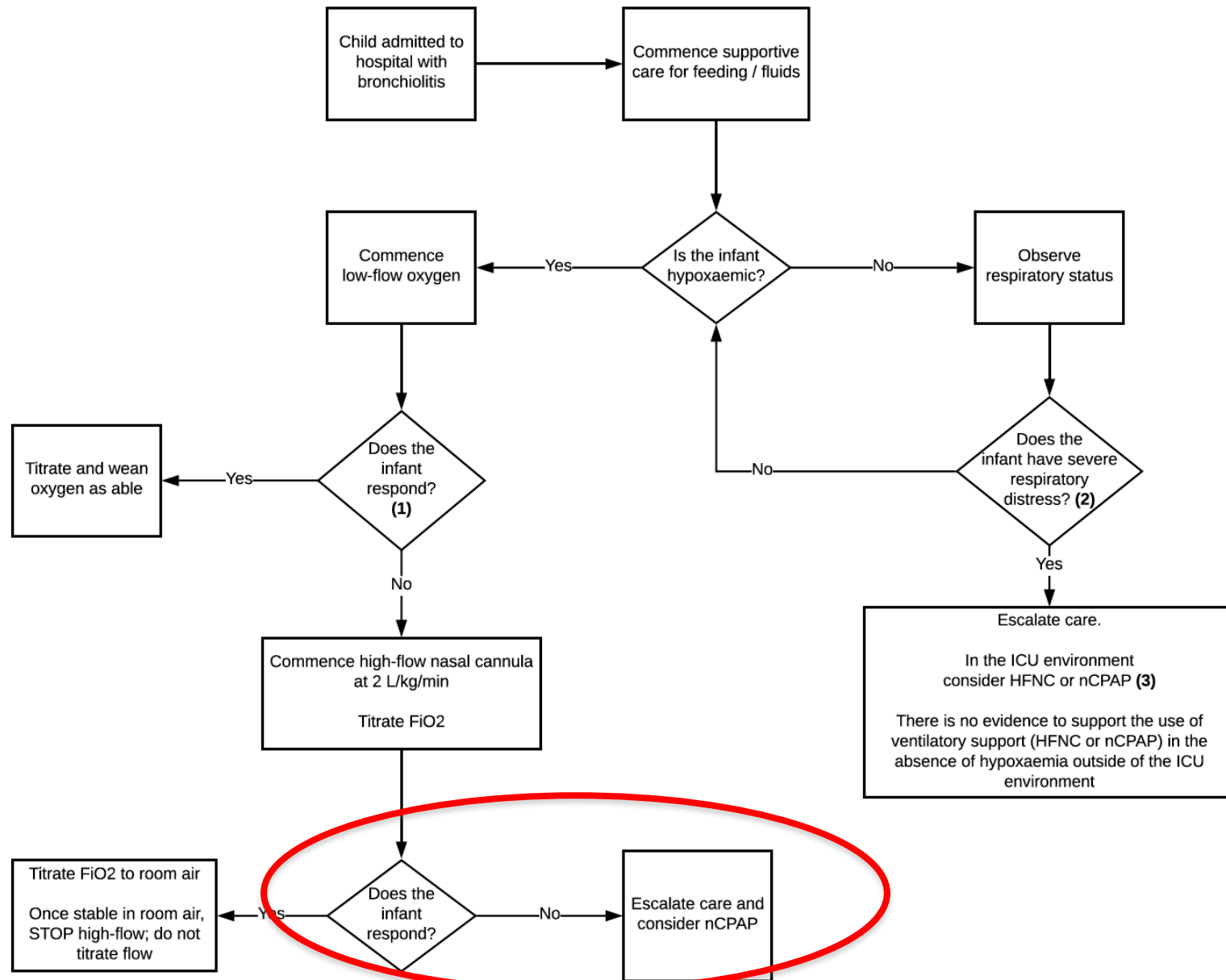
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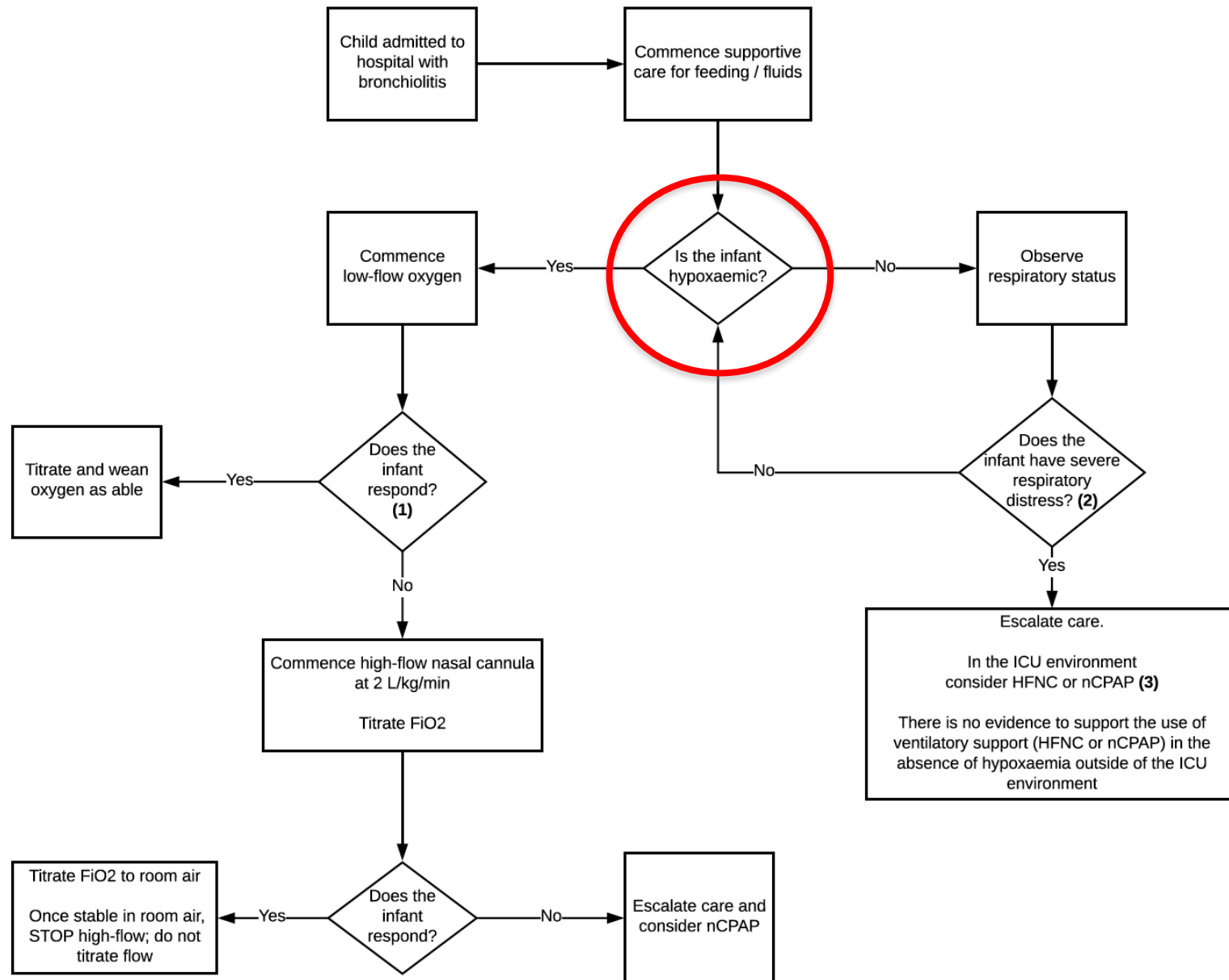
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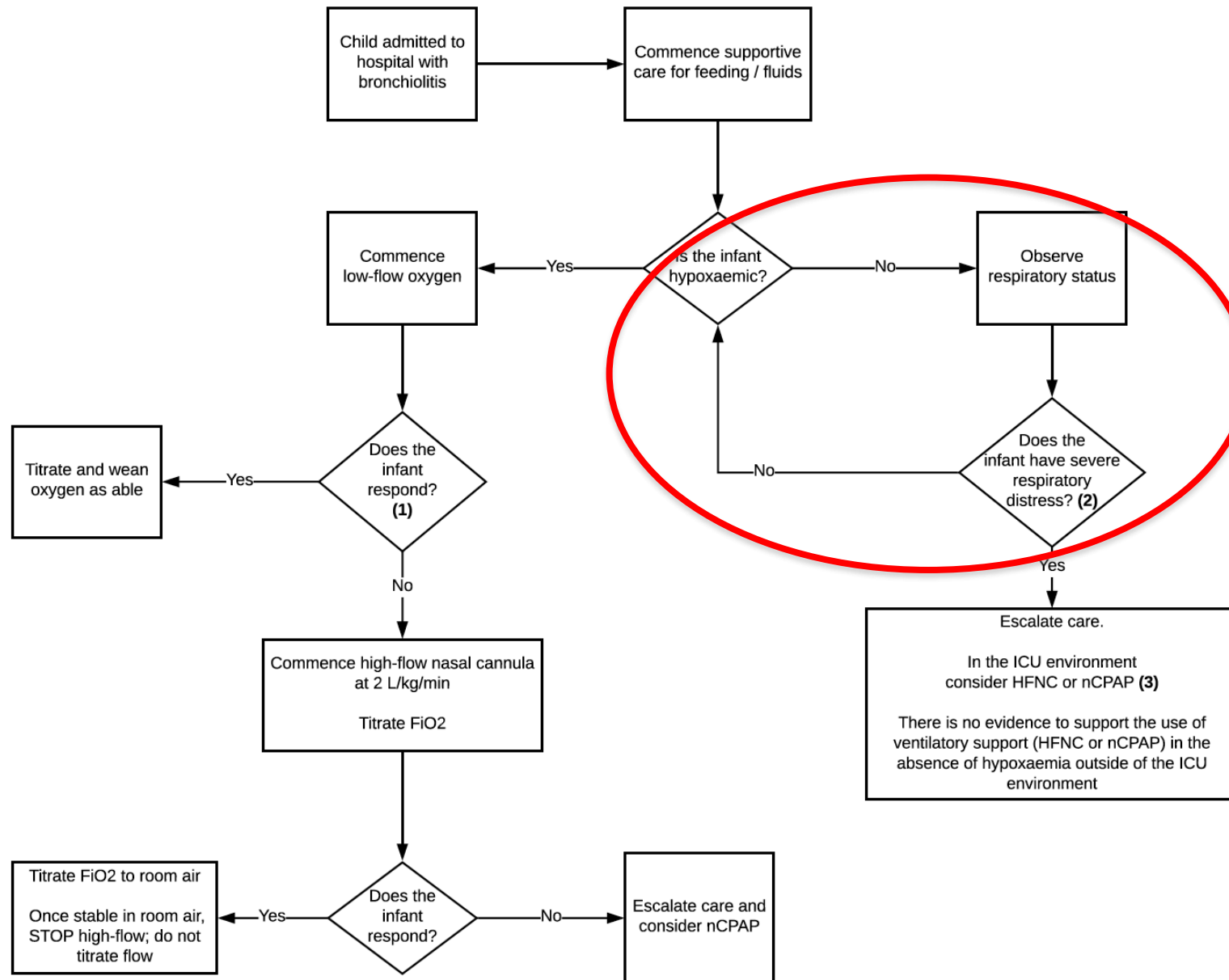
# How to use HFNC in bronchiolitis



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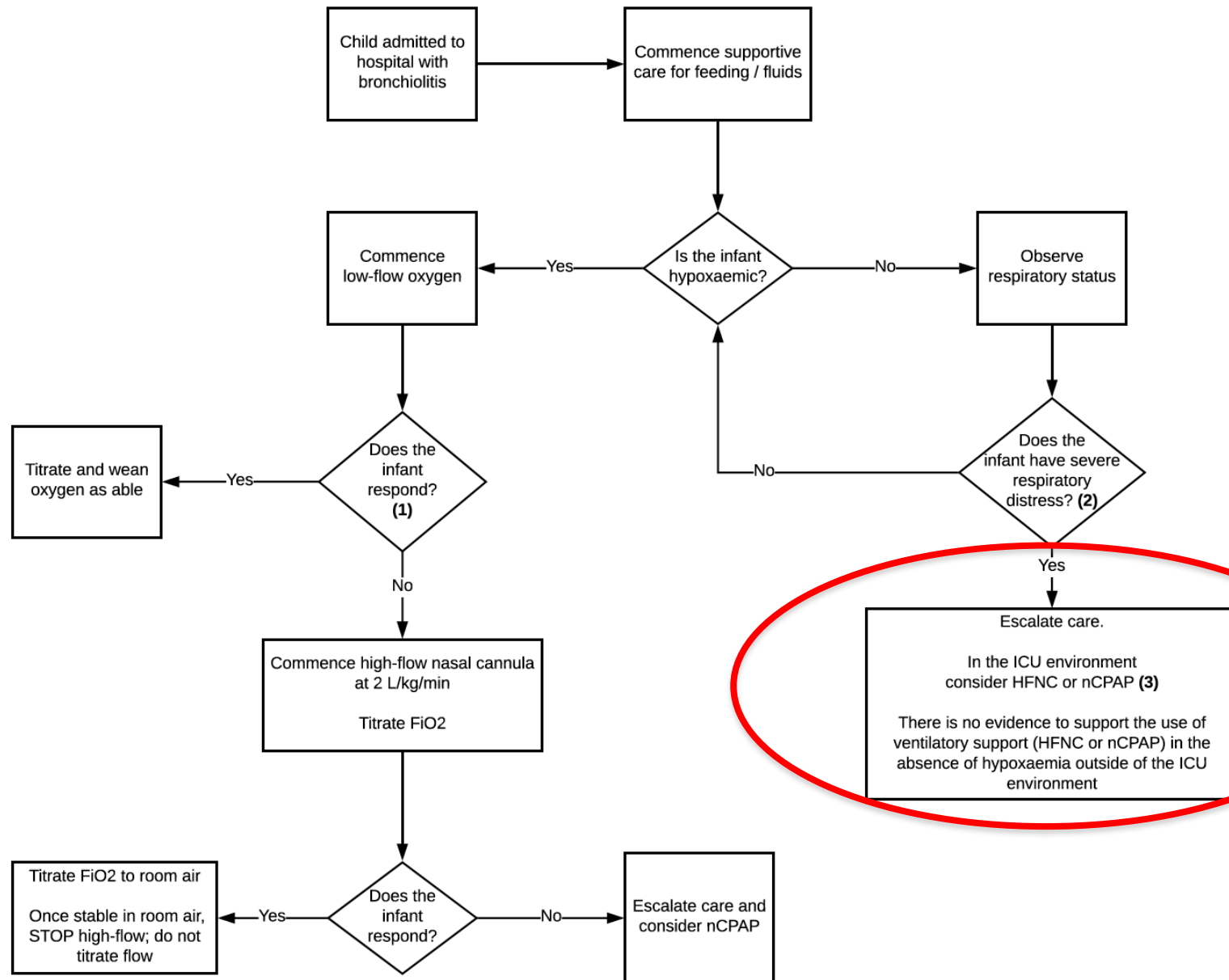


# How to use HFNC in bronchiolitis





# How to use HFNC in bronchiolitis



# Bronchiolitis



- High quality guidelines available
- Knowledge translation key
- High Flow
  - Not the panacea
  - Rescue only



# Questions



# PARIS II



## HFNC rates

Weight	High Flow rates	FPH Mode to use
0-12 kg	2L/kg/min Max 25 L/min	Junior mode
13-15 kg	30L/min	Adult mode
16-30 kg	35L/min	Adult mode
31-50 kg	40L/min	Adult mode
>50 kg	50L/min	Adult mode