

# **High Flow Nasal Cannula (HFNC)**

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# High-flow nasal cannula

- Humidified gas and can blend oxygen with air
- Perception that it is easy to use and comfortable
- Greater access to face and improved bonding & feeding
- Experience in children with Respiratory Tract Infection

# Indications for use of HFNC

- Signs of Respiratory Distress
- Slow to wean off CPAP
- Chronic Lung Disease with long term dependency on CPAP
- Alternative to CPAP with nasal trauma
- Alternative to CPAP following extubation
- ?? Early treatment of RDS

# Contraindications of HFNC

- The need for intubation and/or Mechanical Ventilation
- Unstable Respiratory Drive with recurrent apnoea
- Inability to maintain acceptable blood gases
- Upper airway abnormality e.g. Cleft, TOF, Choanal atresia

# Settings for HFNC

- Start at 4-6L/min
- Aim for oxygen saturations between 91-94%
- Maximum Flow 6L/min in infants <1 kg, can go higher in bigger babies
- Generation of higher distending pressure with decreasing weight and higher flow !
- Depends on leak around the nasal prongs

# Weaning

- If Fio<sub>2</sub> ,0.25

Reduce flow rate by 0.5L/min 12 hrly

- If Fio<sub>2</sub> 0.25 to 0.3

Reduce flow rate by 0.5L/min 24 hrly

- If FiO<sub>2</sub> >0.3

Do not wean flow rate

- When flow rate <2L/min, change to Low Flow oxygen therapy

# HFNC- Mode of action

- Reduction in respiratory dead space leading to Improved Tidal volume delivery
- Improved thoracic-abdominal synchrony
- Stabilisation of respiratory rate
- Prolonged inspiratory time

# **EVIDENCE FOR HF USE FROM CLINICAL TRIALS**

- 1. Post-extubation**
- 2. 'Weaning' from CPAP**
- 3. Primary support**



**HF vs. CPAP**

**POST-EXTUBATION**

**IN PRETERM INFANTS**



**Cochrane**  
**Library**

**Cochrane** Database of Systematic Reviews

## High flow nasal cannula for respiratory support in preterm infants (Review)

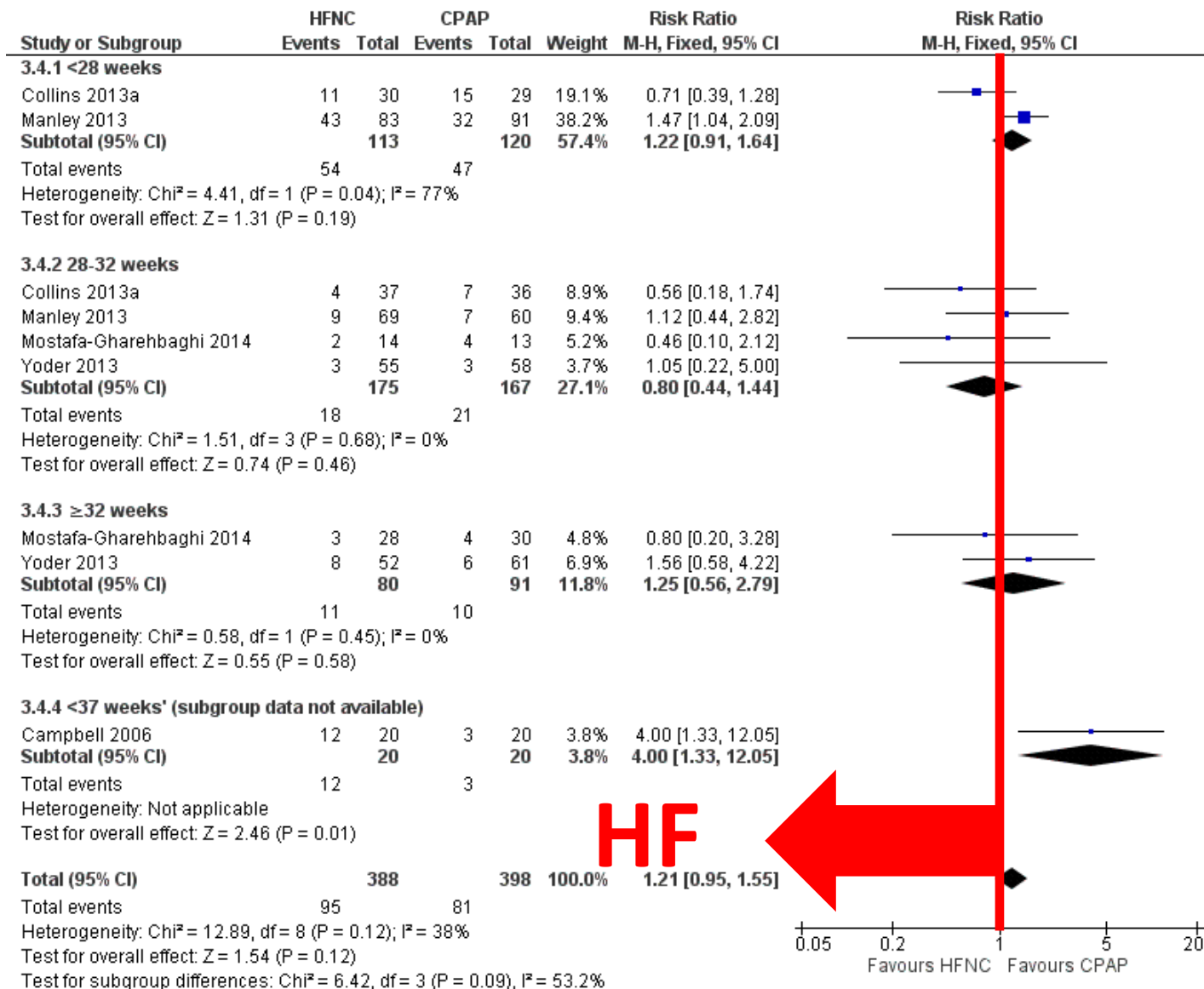
Wilkinson D, Andersen C, O'Donnell CPF, De Paoli AG, Manley BJ



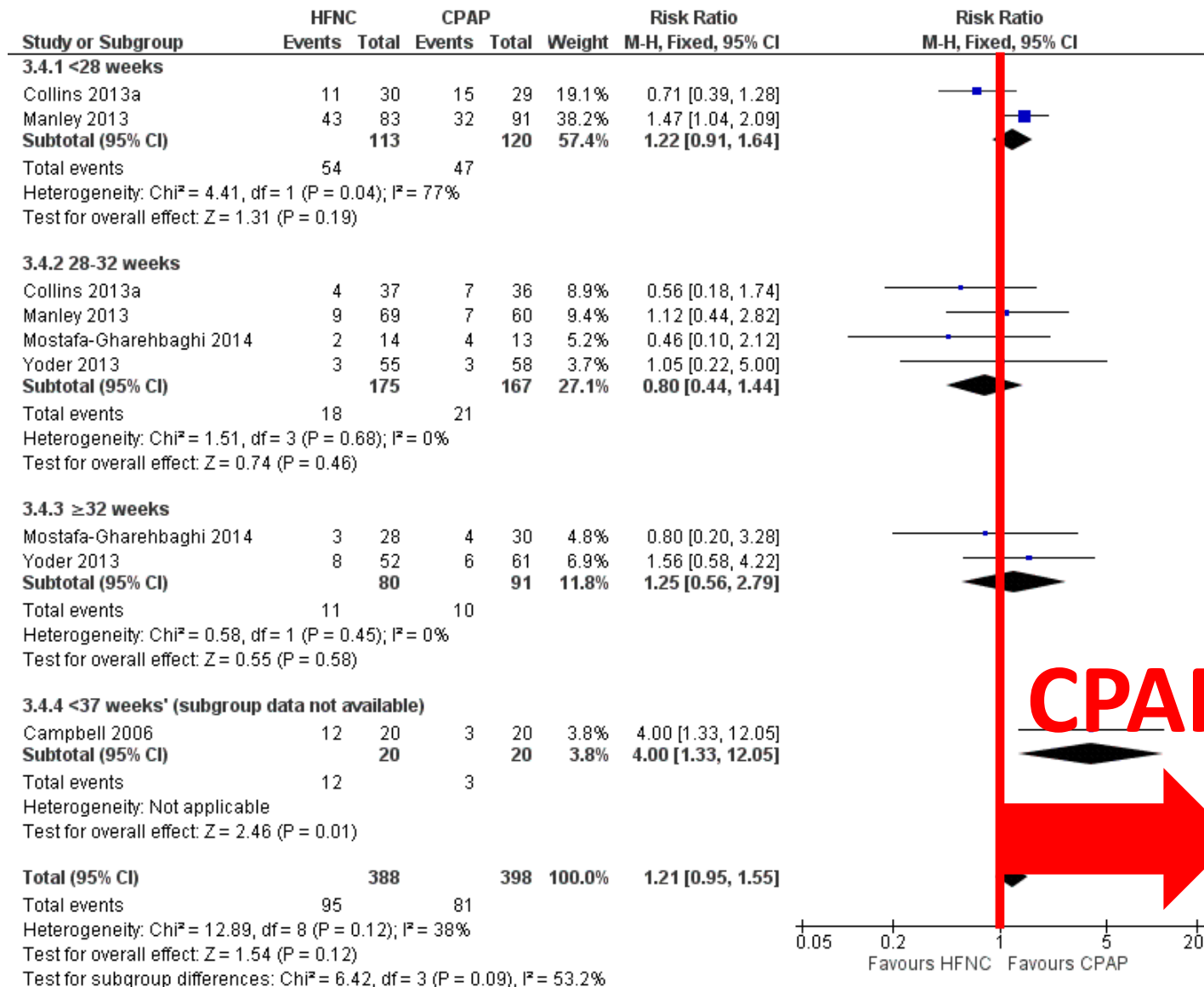
*Cochrane Database of Systematic Reviews* 2016, Issue 2. Art. No.: CD006405.

DOI: [10.1002/14651858.CD006405.pub3](https://doi.org/10.1002/14651858.CD006405.pub3).

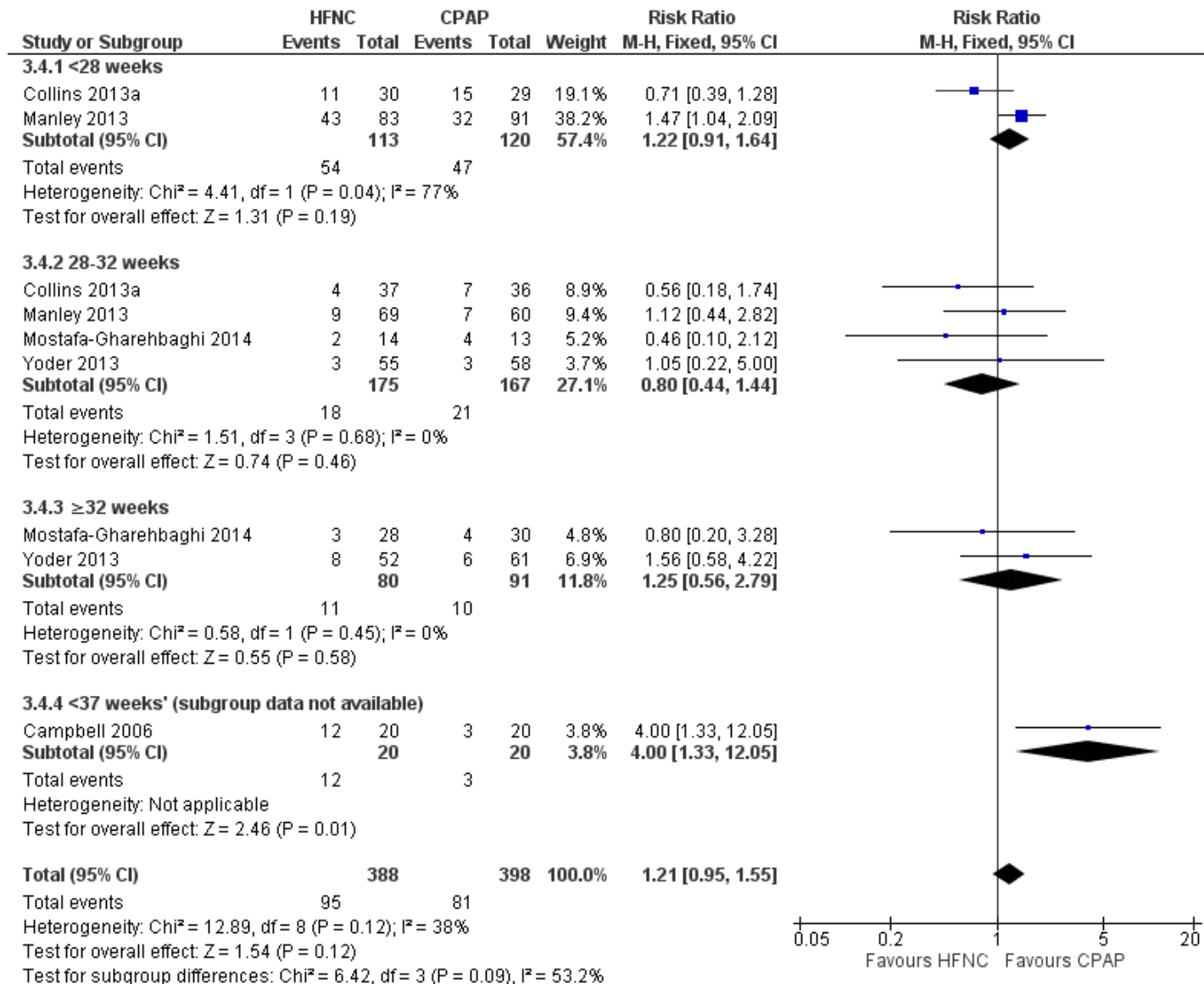
# Treatment Failure <7 Days



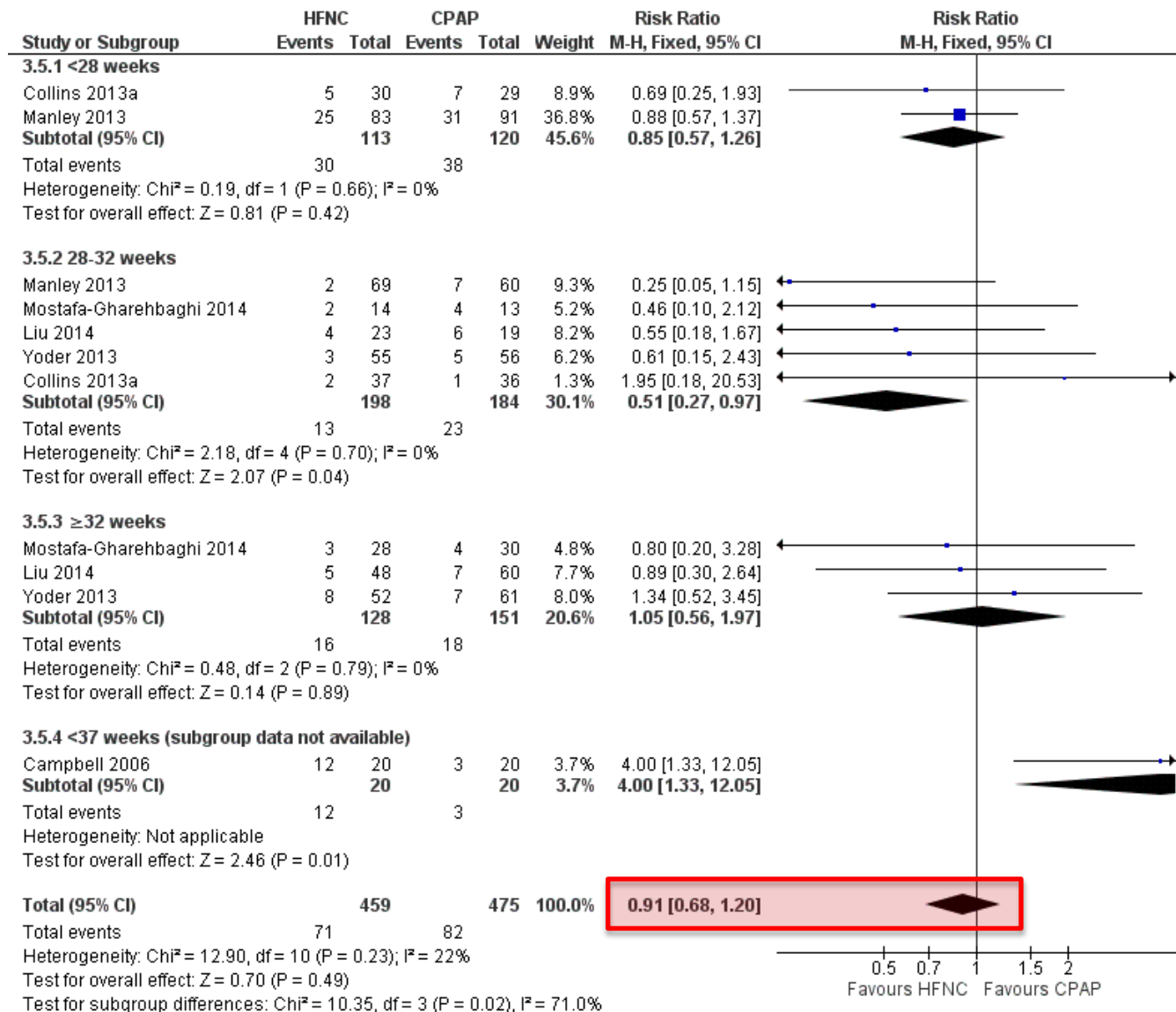
# Treatment Failure <7 Days



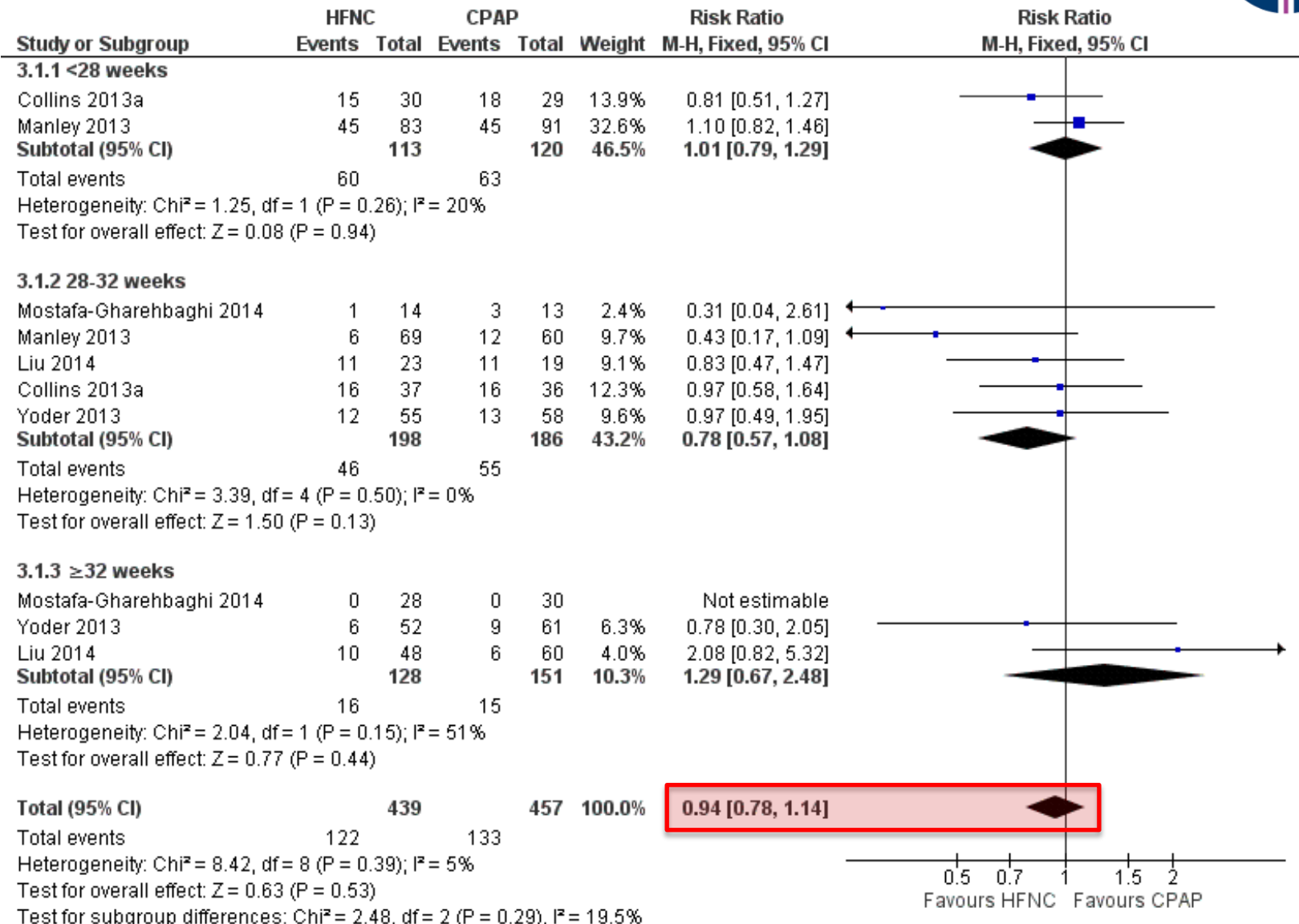
# Treatment Failure <7 Days



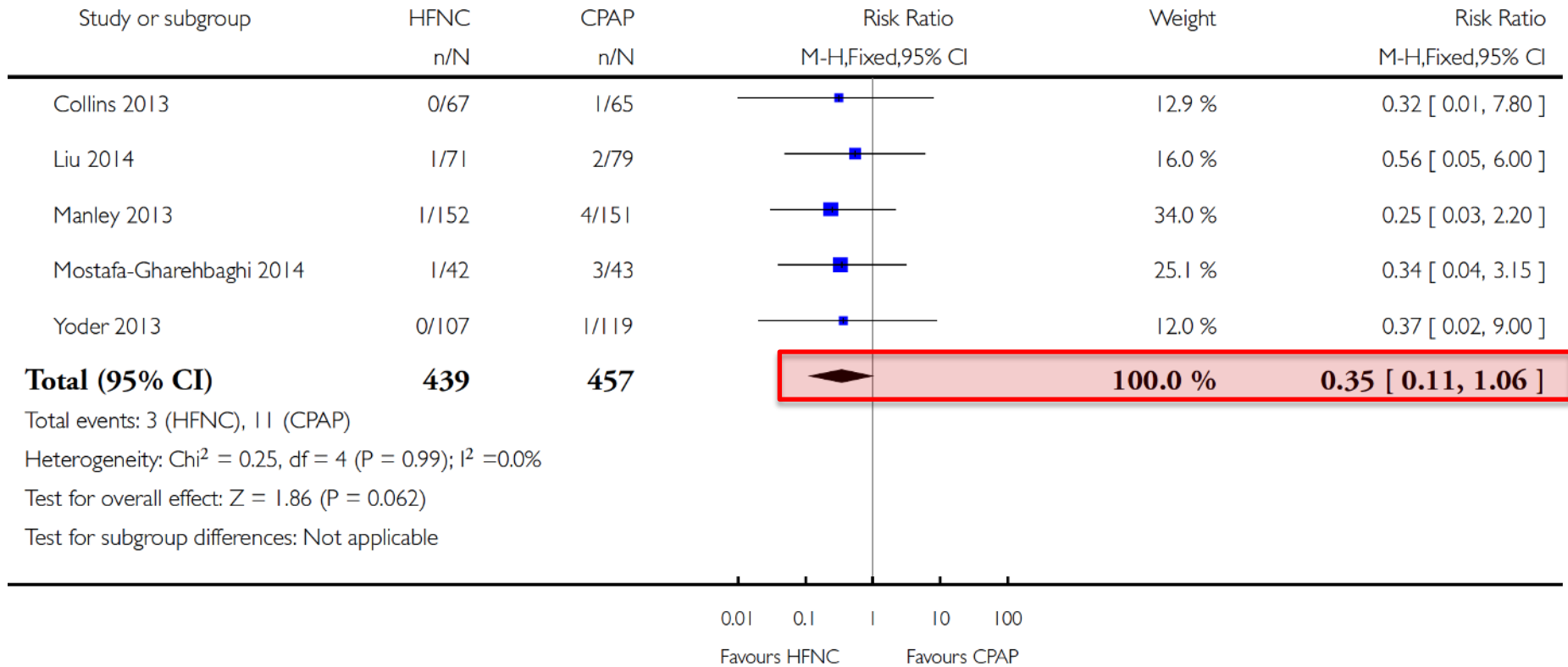
# Reintubation <7 Days



# Death or BPD

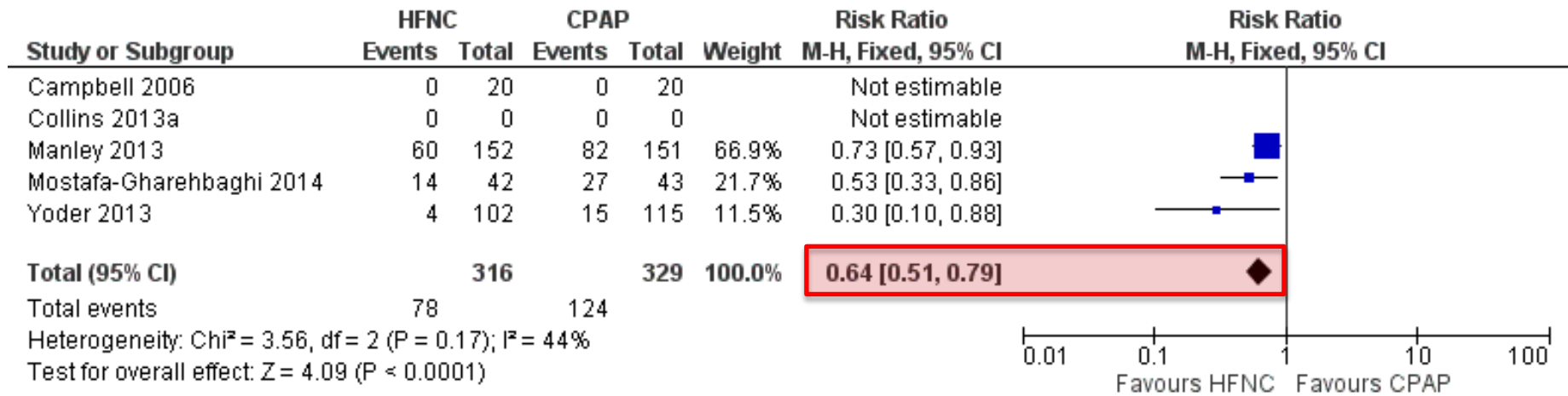


# Pneumothorax





# Nasal Trauma



# Conclusions

- High Flow can be used effectively and safely as post-extubation support
- Rescue CPAP should be available
- Care should be taken with the most preterm infants (particularly <26 weeks)

**HF TO**

**'WEAN' FROM CPAP**

**IN PRETERM INFANTS**

# HF To 'Wean' From CPAP

- Only 2 small RCTs with conflicting results
- No difference in successful weaning from CPAP
- HF use may result in longer durations of respiratory support and supplemental oxygen
- Previous studies have demonstrated the quickest way to wean CPAP is the 'cold turkey' approach

*Using HF to 'wean' from CPAP is discouraged*

**HF vs. CPAP/NIPPV**  
**AS PRIMARY SUPPORT**  
**FOR PRETERM INFANTS**

# HF As Primary Support: Issues With Current Data

- Only about 450 preterm infants in RCTs
  - No extremely preterm infants
- Data are from trials that are small/pilot studies, subgroups, interim analyses

# Nasal High Flow as Primary Respiratory Support for Preterm Infants - an international, multi-centre, randomised, controlled, non-inferiority trial

Calum Roberts, Louise Owen, Brett Manley, Dag Helge Frøisland, Susan Donath, Kim Dalziel, Margo Pritchard, David Cartwright, Clare Collins, Atul Malhotra, and Peter Davis for the HIPSTER Trial Investigators



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# Patients – Inclusion Criteria

- Infants born at 28 to 36+6 weeks' gestation
- No previous endotracheal ventilation or surfactant
- Decision by the attending clinician to commence or continue non-invasive respiratory support after initial stabilisation/resuscitation



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# Patients – Exclusion Criteria

- Urgent requirement for intubation and ventilation
- Already meeting specified ‘treatment failure’ criteria
- Known major congenital anomaly or pneumothorax
- Had already received  $\geq 4$  hours of CPAP treatment



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# Intervention Group – High Flow

- Initial flow 6-8 litres per minute
- Fisher & Paykel ‘Optiflow Junior’ or Vapotherm ‘Precision Flow’ devices
- Cannulae sized as per manufacturers instructions
- Maximum flow 8 litres per minute



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# Control Group – CPAP

- Initial pressure 6-8 cm of water
- Mechanical ventilator, underwater ‘bubble’ system, or variable-flow device
- Short binasal prongs or nasal mask
- Maximum pressure 8 cm of water



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# Primary Outcome

- Treatment failure within 72 hours after randomisation



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# Treatment Failure Criteria

- An infant receiving maximal support (High Flow 8 litres per minute or CPAP 8 cm of water) and one or more of:
  - $FiO_2 \geq 0.40$
  - $pH \leq 7.20$  **plus**  $pCO_2 > 60$  mm Hg (8 kPa) on arterial or capillary blood gas, after  $\geq 1$  hour of allocated treatment
  - $> 1$  apnoea requiring positive pressure ventilation in 24 hours, or  $\geq 6$  requiring intervention in 6 hours
- Infants requiring urgent intubation and ventilation were considered to have treatment failure



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# Recruitment

- Recruitment began on May 27, 2013
- After review of primary outcome data for the first 515 infants, the data safety monitoring committee recommended the trial be stopped
- Recruitment ceased on June 16, 2015, at which time 583 infants had been randomised
- 564 infants were eligible to be included in analysis



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# Primary Outcome

Treatment failure within 72 hours of randomisation



High Flow

VS



CPAP



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# Primary Outcome

Treatment failure within 72 hours of randomisation

High Flow

71/278

25.5%

VS

CPAP

38/286

13.3%

Risk difference for treatment failure with High Flow, **12.3%**, 95% confidence interval, 5.8 to 18.7% (**P<0.001**)



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# Intubation

within 72 hours of randomisation

High Flow

43/278

15.5%

VS

CPAP

33/286

11.5%

Risk difference for intubation with High Flow, **3.9%**, 95% confidence interval, -1.7 to 9.6% (P=0.17)



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# Secondary Outcomes

- No difference in BPD, death, or most other important outcomes
- HF infants received median 1 additional day of respiratory support
- CPAP infants more likely to have pneumothorax while on allocated support, but not overall
- CPAP infants more likely to have nasal trauma



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# Conclusions

- High Flow therapy results in a significantly higher rate of treatment failure than CPAP, when used as primary support for preterm infants with respiratory distress
- Use of primary High Flow with 'rescue' CPAP results in no difference in intubation rate or adverse outcomes



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# Conclusions

- Increasing experience and enthusiasm
- BUT
- Uncertainty remains about safety, efficacy and optimal flow rate
- Available information does not support HFNC as a current “Standard of Treatment” for non-invasive respiratory support

# Practice Points

## Based on Opinion & Evidence

- Selection of patients
- Optimal flow
- Weaning
- Failure criteria
- Prong size & devices
- Further research

# Suggested Reading

1. Manley BJ, Owen LS. High-flow nasal cannula: Mechanism, evidence and recommendations. *Seminars in Fetal & Neonatal Medicine*:2016;21:139-145
2. Nasal high-flow therapy for primary respiratory support. Robert et al. *NEJM* Sept 2016.