High Flow Nasal Cannula compared to conventional oxygen therapy or non-invasive ventilation immediately post-extubation

A systematic review and meta-analysis

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Background

- Reintubation is associated with increased mortality and hospital length of stay
- Prevention of post-extubation respiratory failure is key
  - Conventional oxygen therapy (COT), non-invasive ventilation (NIV), high flow nasal cannula (HFNC)
- HFNC has potential advantages over COT and NIV
- Previous meta-analyses limited by heterogeneous populations and inconsistent results

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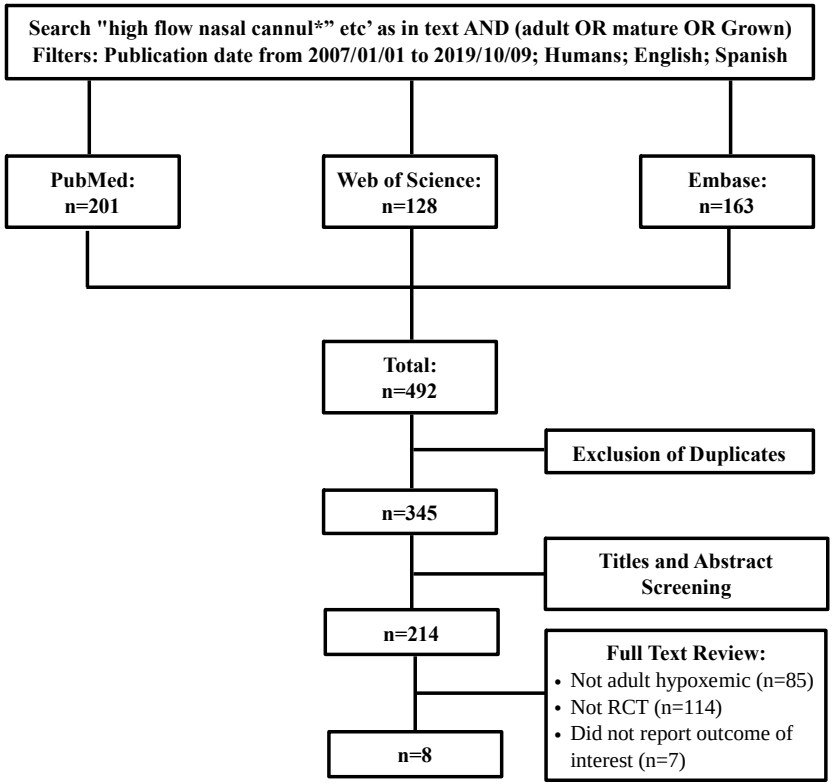
Methods/Results



HFNC vs COT (n=5) **HFNC vs NIV (n=3)**

Outcomes

- **Reintubation**
- **Mortality**
- **Post-extubation respiratory failure**
- **Use of NIV**
- **ICU and hospital length of stay**
- **Comfort**
- **Complications**

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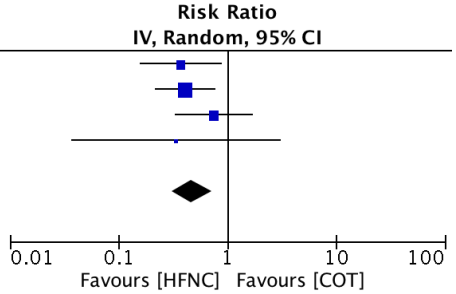
Results: HFNC vs. COT

Reintubation

Study or Subgroup	HFNC Events	HFNC Total	COT Events	COT Total	Weight	Risk Ratio IV, Random, 95% CI	Year
Maggiore 2014	6	53	16	52	23.9%	0.37 [0.16, 0.87]	2014
Hernandez 2016 (low risk)	13	264	32	263	45.4%	0.40 [0.22, 0.75]	2016
Fernandez 2017	9	78	12	77	27.1%	0.74 [0.33, 1.66]	2017
Song 2017	1	30	3	30	3.6%	0.33 [0.04, 3.03]	2017
Total (95% CI)		**425**		**422**	**100.0%**	**0.46 [0.30, 0.70]**	
Total events	29		63				

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 1.85$, df = 3 (P = 0.60); $I^2 = 0\%$
Test for overall effect: Z = 3.61 (P = 0.0003)

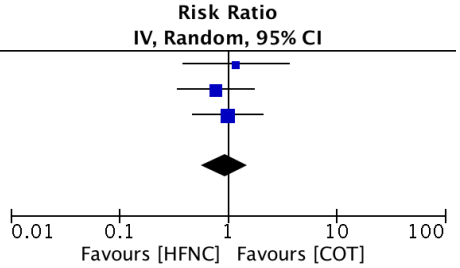


- Moderate certainty

Mortality

Study or Subgroup	HFNC Events	HFNC Total	COT Events	COT Total	Weight	Risk Ratio IV, Random, 95% CI	Year
Maggiore 2014	6	53	5	52	19.0%	1.18 [0.38, 3.62]	2014
Hernandez 2016 (low risk)	10	264	13	263	36.8%	0.77 [0.34, 1.72]	2016
Fernandez 2017	12	78	12	77	44.2%	0.99 [0.47, 2.06]	2017
Total (95% CI)		**395**		**392**	**100.0%**	**0.93 [0.57, 1.52]**	
Total events	28		30				

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.42$, df = 2 (P = 0.81); $I^2 = 0\%$
Test for overall effect: Z = 0.29 (P = 0.77)



- Moderate certainty

- Reduction in post-extubation respiratory failure (very low certainty)
- No effect on ICU length of stay (high certainty)

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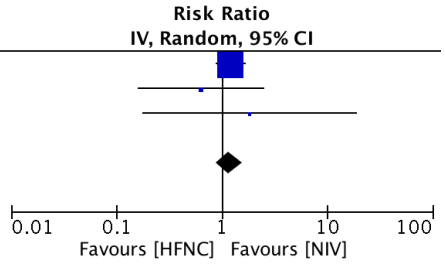
Results: HFNC vs. NIV

Reintubation

Study or Subgroup	HFNC Events	HFNC Total	NIV Events	NIV Total	Weight	Risk Ratio IV, Random, 95% CI	Year
Hernandez 2016 (High Risk)	66	290	60	314	93.5%	1.19 [0.87, 1.63]	2016
Theerawit 2017	3	43	5	45	4.8%	0.63 [0.16, 2.47]	2017
Jing 2019	2	22	1	20	1.7%	1.82 [0.18, 18.55]	2019
Total (95% CI)		**355**		**379**	**100.0%**	**1.16 [0.86, 1.57]**	
Total events	71		66				

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.94$, df = 2 (P = 0.62); $I^2 = 0\%$
Test for overall effect: Z = 0.98 (P = 0.33)

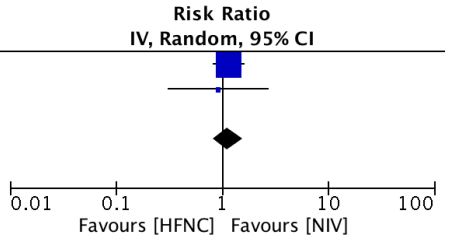


- Low certainty

Mortality

Study or Subgroup	HFNC Events	HFNC Total	NIV Events	NIV Total	Weight	Risk Ratio IV, Random, 95% CI	Year
Hernandez 2016 (High Risk)	59	290	56	314	91.5%	1.14 [0.82, 1.59]	2016
Jing 2019	5	22	5	20	8.5%	0.91 [0.31, 2.68]	2019
Total (95% CI)		**312**		**334**	**100.0%**	**1.12 [0.82, 1.53]**	
Total events	64		61				

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.15$, df = 1 (P = 0.69); $I^2 = 0\%$
Test for overall effect: Z = 0.70 (P = 0.48)



- Moderate certainty

- No effect on post-extubation respiratory failure (very low certainty)
- Reduction in ICU length of stay (moderate certainty)

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Conclusions

- HFNC use after extubation
  - Reduces rates of reintubation when compared with COT
  - Does not reduce rates of reintubation when compared to NIV
  - Decreased ICU length of stay compared to NIV
  - Has no impact on mortality

- Limitations:
  - Inability to pool complications
  - Lack of available subgroup data
  - Heterogeneous populations

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