High flow nasal cannula oxygen versus conventional oxygen therapy and non-invasive ventilation in Emergency Department patients: a systematic review and meta-analysis.

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Argomento: Insufficienza respiratoria acuta e ventilazione meccanica

Background Acute respiratory failure (ARF) is a common cause of presentation to the Emergency Department (ED). High flow nasal cannula (HFNC) has been introduced as an alternative way to administer oxygen. The efficacy of HFNC has been assessed in several randomized controlled trials (RCTs) and meta-analyses: however, results were contradictory, and none of published meta-analysis was focused on ED patients. We performed a systematic review and meta-analysis of RCTs comparing HFNC to conventional oxygen therapy (COT) and non-invasive ventilation (NIV) exclusively in ED setting.

Methods Inclusion criteria were: RCTs on adult patients with ARF admitted to the ED, investigating HFNC versus COT or other modes of ventilation. Trials comparing HFNC support outside the ED, or published as an abstract, or non-randomized were excluded.

Results Five RCTs met the inclusion criteria: four compared HFNC to COT and one HFNC to NIV. Overall, 775 patients with heterogeneous ARF were analyzed. We performed a meta-analysis of the four studies comparing HFNC and COT. There were no differences in intubation requirement, treatment failure, hospitalization and mortality. Intolerance was significantly higher with HFNC (RR 6.81, 95% CI 1.18-39.19; p = 0.03). In the only available RCT comparing HFNC to NIV, no difference was found for intubation rate, treatment failure, tolerance and dyspnea.

Conclusions We did not find any benefit of HFNC compared to COT and NIV in terms of intubation requirement, treatment failure, hospitalization and mortality in ED patients presenting for ARF; on the contrary, COT resulted to be better tolerated.

Figure 1. Intubation requirement

	HEN	С	Contr	rol		Risk Ratio	Risk Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI	M-H, Random, 95% CI
Bell 2015	0	48	1	52	26.3%	0.36 [0.02, 8.64]	
Jones 2016	1	165	3	138	45.0%	0.28 [0.03, 2.65]	
Makdee 2017	2	63	0	65	28.7%	5.16 [0.25, 105.32]	
Rittayamai 2015	0	20	0	20		Not estimable	
Total (95% CI)		296		275	100.0%	0.69 [0.12, 4.12]	
Total events	3		4				
Heterogeneity: Tau² =	0.53; Ch	i ² = 2.53	2, df = 2 (P = 0.2	8); I ² = 21	%	
Test for overall effect:	Z = 0.41	(P = 0.6	i8)				Favours [HFNC] Favours [Control]

Figure 2: Treatment failure

	HFN	С	Contr	ol		Risk Ratio	Risk Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI	I M-H, Random, 95% CI
Bell 2015	10	48	2	52	32.4%	5.42 [1.25, 23.48]] — — — — — — — — — — — — — — — — — — —
Jones 2016	6	165	10	138	38.9%	0.50 [0.19, 1.35]	j — = +
Makdee 2017	3	63	2	65	28.7%	1.55 [0.27, 8.95]]
Rittayamai 2015	0	20	0	20		Not estimable	
Total (95% CI)		296		275	100.0%	1.50 [0.33, 6.82]	
Total events	19		14				
Heterogeneity: Tau ² =	1.28; Ch	i² = 7.2	2, df = 2 (P = 0.0	%		
Test for overall effect:	Z = 0.52	(P = 0.6	i0)				Favours [HFNC] Favours [Control]

Figure 3: Rate of hospitalization

	HFNC		Control		Risk Ratio		Risk Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% Cl	M-H, Random, 95% Cl
Bell 2015	43	48	48	52	73.9%	0.97 [0.86, 1.10]	
Makdee 2017	25	63	20	65	14.6%	1.29 [0.80, 2.07]	
Rittayamai 2015	10	20	13	20	11.5%	0.77 [0.45, 1.32]	-•+
Total (95% CI)		131		137	100.0%	0.98 [0.81, 1.20]	•
Total events	78		81				
Heterogeneity: Tau ² = Test for overall effect:	0.01; Chi Z = 0.15 (i ^z = 2.5: (P = 0.8	2, df = 2 (18)	P = 0.2	%	0.02 0.1 1 10 50 Favours [HFNC] Favours [Control]	

Figure 3: All-cause mortality at the longest available follow-up

	HEN	С	Cont	Ior		Risk Ratio	Risk Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI	M-H, Random, 95% CI
Jones 2016	15	165	11	138	94.8%	1.14 [0.54, 2.40]	
Makdee 2017	1	63	0	65	5.2%	3.09 [0.13, 74.55]	
Total (95% CI)		228		203	100.0%	1.20 [0.58, 2.48]	-
Total events	16		11				
Heterogeneity: Tau ² =	0.00; Ch	² = 0.3	6, df = 1 (P = 0.5	5); I ^z = 09	6	
Test for overall effect	Z = 0.50	(P = 0.8	62)		Favours [HFNC] Favours [Control]		

Figure 5: Treatment intolerance

	HFNC		Control		Risk Ratio			Risk Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% Cl		M-H, Random, 95% CI
Bell 2015	0	48	0	52		Not estimable		
Jones 2016	14	165	0	138	38.8%	24.28 [1.46, 403.41]		
Makdee 2017	1	63	0	65	30.2%	3.09 [0.13, 74.55]		
Rittayamai 2015	1	20	0	20	31.0%	3.00 [0.13, 69.52]		
Total (95% CI)		296		275	100.0%	6.81 [1.18, 39.19]		
Total events	16		0					
Heterogeneity: Tau ² =	0.00; Ch	i² = 1.5						
Test for overall effect:	Z = 2.15	(P = 0.0	13)				0.01	Favours [HFNC] Favours [Control]