

Supplementary table 1. Baseline characteristics of patients by treatment group (for index episode only, N=661)

Characteristics	Total (n=661)	Missing, n(%)	Usual care (n=329)	Missing, n(%)	CPAP (n=332)	Missing, n(%)
Age (median, IQR)	77.3 (68.4 to 84.5)	0	77.7 (68.0 to 85.1)	0	77.0 (68.8 to 84.0)	0
Female, n (%)	290 (43.9)	0	147 (44.7)	0	143 (43.1)	0
Participants by year, n(%)						
2016	152 (23.0)	0	73 (22.2)	0	79 (23.8)	0
2017	253 (38.3)	0	134 (40.7)	0	119 (35.8)	0
2018	256 (38.7)	0	122 (37.1)	0	134 (40.4)	0
Rural cases, n (%)	33 (5.0)	0	14 (4.3)	0	19 (5.7)	0
Dispatch priority 1, n (%)	619 (93.8)	1 (0.1)	310 (94.5)	1 (0.3)	309 (93.1)	0
Daytime (7:00-19:00), n (%)	307 (46.4)	0	152 (46.2)	0	155 (46.7)	0
Initial observations						
Systolic BP<100mmHg n(%)	12 (1.8)	4 (0.6)	8 (2.4)	2 (0.6%)	4 (1.2)	2 (0.6)
Dyspnoea VAS, median (IQR)	9.0 (8.0 to 10.0)	44 (6.1)	9.0 (7.6 to 10.0)	22 (6.7)	9.0 (8.0 to 10.0)	18 (5.4)
Respiratory rate, median (IQR)	40.0 (32.0 to 44.0)	0	38.0 (32.0 to 42.0)	0	40.0 (34.0 to 45.0)	0
Respiratory rate≥30, n(%)	570 (86.2)	0	276 (83.9)	0	294 (88.6)	0
Temperature>38°C, n(%)	117 (19.2)	52 (7.9)	59 (19.3)	24 (7.3)	58 (19.1)	28 (8.4)
SpO ₂ , median (IQR)	84.5 (77.0 to 90.0)	1 (0.2)	85.0 (78.0 to 90.0)	0	84.0 (75.0 to 90.0)	1 (0.1)
Paramedic problem code, n(%)		0		0		0
Acute pulmonary oedema	212 (32.1)		96 (29.2)		116 (34.9)	
Asthma	41 (6.2)		24 (7.3)		17 (5.1)	
COPD	193 (29.2)		93 (28.3)		100 (30.1)	
Respiratory infection	84 (12.7)		45 (13.7)		39 (11.7)	
Other respiratory problem	72 (10.9)		32 (9.7)		40 (12.0)	
Other	59 (8.9)		39 (11.9)		20 (6.0)	

Supplementary table 2. Comparison of PREHOSPITAL primary and secondary outcomes by treatment group (for index episode only, ie N= 661)

Outcomes	Usual care (n=329)	Missing, n(%)	CPAP (n=332)	Missing, n(%)	% difference (95% CI)	Median difference (95% CI)	p-value
PRIMARY OUTCOMES							
Dyspnoea VAS score							
First, median (IQR)	9.0 (7.6 to 10.0)	22 (6.7)	9.0 (8.0 to 10.0)	18 (5.4)		0 (0 to 0)	0.27
Pre-ED arrival, median (IQR)	7.0 (5.0 to 8.5)	31 (9.4)	5.0 (3.0 to 7.0)	23 (6.9)		-2.0 (-2.2 to -1.5)	<0.001
Change (PreED-First), median (IQR)	-1.0 (-3.0 to 0.0)	31 (9.4)	-3.5 (-5.4 to -2.0)	23 (6.9)		-2.0 (-2.5 to -1.6)	<0.001
Respiratory rate							
First, median (IQR)	38.0 (32.0 to 42.0)	0	40.0 (34.0 to 45.0)	0		2.0 (0.0 to 4.0)	0.007
Pre-ED arrival, median (IQR)	32.0 (28.0 to 40.0)	0	28.0 (24.0 to 36.0)	2 (0.6)		-2.0 (-4.0 to -2.0)	<0.001
Change (PreED-First), median (IQR)	-4.0 (-9.0 to 0.0)	0	-8.0 (-14.0 to -4.0)	2 (0.6)		-4.0 (-6.0 to -4.0)	<0.001
RR>30 (First), n (%)	276 (83.9)	0	294 (88.6)	0	4.7 (-0.5 to 9.9)		0.08
RR>30 (PreED), n (%)	212 (64.4)	0	153 (46.4)	2 (0.6)	-18.0 (-25.5 to -10.5)		<0.001
SECONDARY OUTCOMES							
Oxygen saturation (SpO2)							
First, median (IQR)	85.0 (78.0 to 90.0)	0 (0.0)	84.0 (75.0 to 90.0)	1 (0.3)		-1.0 (-3.0 to 0.0)	0.13
Pre-ED arrival, median (IQR)	97.0 (93.0 to 99.0)	2 (0.6)	97.0 (92.8 to 100.0)	2 (0.6)		0.0 (0.0 to 1.0)	0.52
Change (PreED-First), median (IQR)	10.0 (5.0 to 17.0)	2 (0.6)	11.0 (7.0 to 18.0)	2 (0.6)		1.0 (0.0 to 3.0)	0.03
Time from arrival at scene to arrival at ED (mins), median IQR	35.0 (28.0 to 42.5)	0	37.0 (32.0 to 46.0)	0		3.0 (1.0 to 5.0)	0.001
Priority 1 transport to hospital, n (%)	123 (37.5)	1 (0.3)	158 (47.7)	1 (0.3)	10.2 (2.7 to 17.7)		0.008
30-day survival, n (%)	52 (15.8)	0	55 (16.6)	0	0.8 (-4.9 to 6.4)		0.79

Supplementary table 3 Comparison of INHOSPITAL primary and secondary outcomes by treatment group for those patients admitted to hospital (N=624)

Outcomes	Usual care (n=314)	Missing, n(%)	CPAP (n=310)	Missing, n(%)	% difference (95% CI)	Median difference (95% CI)	p-value
A. ED OUTCOME							
ED disposition, n (%)		0		0			0.18
Admitted to study hospital	293 (93.3)		290 (93.5)				
Discharged home	15 (4.8)		12 (3.9)				
Transferred to private hospital	2 (0.6)		7 (2.3)				
Died in ED	4 (1.3)		1 (0.3)				
ED discharge diagnosis				0			
APO	85 (27.2)	1 (0.3)	94 (30.3)		3.1 (-4.0 to 10.2)		0.38
COPD	173 (55.3)	1 (0.3)	179 (57.7)		2.4 (-5.4 to 10.2)		0.53
Pneumonia	73 (23.3)	1 (0.3)	60 (19.4)		-3.9 (-10.3 to 2.5)		0.23
Asthma	16 (5.1)	1 (0.3)	11 (3.5)		-1.6 (-4.8 to 1.6)		0.34
AMI	19 (6.1)	1 (0.3)	25 (8.1)		2.0 (-2.0 to 6.0)		0.33
Heart failure	42 (13.4)	1 (0.3)	46 (14.8)		1.4 (-4.1 to 6.9)		0.61
Sepsis	8 (2.6)	1 (0.3)	8 (2.6)		0.0 (-2.5 to 2.5)		0.98
ED interventions							
CPAP commenced in ED	44 (14.0)	0	NA		NA		NA
BiPAP commenced in ED	101 (32.2)	0	123 (39.7)	0	7.5 (0.0 to 15.0)		0.504
Intubation in ED, n (%)	15 (4.8)	0	6 (1.9)	0	-2.9 (-5.7 to -0.1)		0.049
B. INHOSPITAL OUTCOMES							
PRIMARY OUTCOME							
Hospital length of stay (hours), median (IQR)	Usual care (n=293) 103.6 (52.0 to 189.8)	0	CPAP (n=290) 114.2 (60.6 to 188.3)	0		7.6 (-5.7 to 21.0)	0.26

Hospital length of stay (days), median (IQR)	4.3 (2.2 to 7.9)	0	4.8 (2.5 to 7.8)	0	0.32 (-0.24 to 0.88)	0.26
SECONDARY OUTCOMES						
ICU Admission	49 (16.7)	0	42 (14.5)	0	-2.2 (-8.1 to 3.6)	0.46
Hospital diagnosis n(%)						0.90
COPD	94 (32.1)		97 (33.4)			
Heart failure	62 (21.2)		63 (21.7)			
Other resp disorders	45 (15.4)		34 (11.7)			
Influenza/Pneumonia	39 (13.3)		41 (14.1)			
AMI	12 (4.1)		20 (6.9)			
Other circ disorders	15 (5.1)		12 (4.1)			
Endocrine, nutritional and metabolic diseases	6 (2.0)		5 (1.7)			
Infectious and parasitic diseases	5 (1.7)		4 (1.4)			
Other diseases	14 (4.8)		13 (4.5)			
Unknown	1 (0.3)		1 (0.3)			
Survival, n (%)						
Survived to hospital discharge	260 (88.7)		257 (88.6)		-0.1 (-5.2 to 5.0)	0.97
Death within 7 days	26 (8.9)		27 (9.3)		1.9 (-4.0 to 7.8)	0.86
Death within 30 days	43 (14.7)		48 (16.6)		2.1 (-3.5 to 7.7)	0.53

Supplementary Table 4: Comparison of PREHOSPITAL outcomes by prehospital diagnostic group (N=708)

Condition	Outcomes	Usual care	Missing, n(%)	CPAP	Missing, n(%)	Median difference (95% CI)	p-value
APO		(n=101)		(n=125)			
	Change of dyspnoea VAS score (PreED-First), median (IQR)	-1.0 (-3.0 to 0.0)	9 (8.9)	-3.0 (-5.5 to -1.0)	10 (8.0)	-2.0 (-2.5 to -1.0)	<0.001
	Change of respiratory rate (PreED-First), median (IQR)	-4.0 (-8.0 to 0.0)	0	-8.0 (-12.0 to -4.0)	0	-4.0 (-6.0 to -2.0)	<0.001
		(n=87)		(n=110)			
	Hospital length of stay (hours), median (IQR)	109.6 (55.4 to 155.2)	0	83.9 (55.0 to 152.9)	0	-6.7 (-27.8 to 12.6)	0.47
COPD		(n=102)		(n=111)			
	Change of dyspnoea VAS score (PreED-First), median (IQR)	-1.0 (-3.0 to 0.0)	5 (4.9)	-4.0 (-5.0 to -2.0)	4 (3.6)	-2.0 (-3.0 to -1.5)	<0.001
	Change of respiratory rate (PreED-First), median (IQR)	-4.0 (-10.0 to 0.0)	0	-10.0 (-14.0 to -4.8)	1 (0.9)	-4.0 (-6.0 to -2.0)	<0.001
		(n=97)		(n=97)			
	Hospital length of stay (hours), median (IQR)	93.4 (53.2 to 192.0)	0	117.1 (55.6 to 205.5)	0	8.8 (-16.4 to 34.2)	0.48
Respiratory infection		(n=45)		(n=41)			
	Change of dyspnoea VAS score (PreED-First), median (IQR)	-1.0 (-3.0 to 0.0)	4 (8.9)	-3.0 (-5.0 to -1.8)	3 (7.3)	-2.0 (-2.9 to -0.6)	0.003
	Change of respiratory rate (PreED-First), median (IQR)	-4.0 (-10.0 to 0.0)	0	-8.0 (-14.0 to -3.0)	0	-4.0 (-6.0 to 0.0)	0.049
		(n=39)		(n=33)			
	Hospital length of stay (hours), median (IQR)	145.6 (41.7 to 238.5)	0	134.9 (83.7 to 209.0)	0	-20.0 (-64.9 to 33.4)	0.43

Supplementary Table 5. Comparison of Baseline characteristics between those with and without missing dyspnoea scores

Characteristics	Non-missing dyspnoea score (n=651)	Missing, n(%)	Missing dyspnoea score (n=57)	Missing, n(%)	% difference (95% CI)	Median difference (95% CI)	p-value
Age (median, IQR)	77.3 (68.3 to 84.1)	0	77.4 (65.7 to 87.2)	0		-0.65 (-4.1 to 2.8)	0.70
Female, n (%)	298 (45.8)	0	13 (22.8)	0	-23.0 (-34.5 to -11.5)		0.001
Participants by year, n(%)							0.41
2016	147 (22.6)	0	12 (21.1)	0			
2017	240 (36.9)	0	26 (45.6)	0			
2018	264 (40.6)	0	19 (33.3)	0			
Rural cases, n (%)	34 (5.2)	0	2 (3.5)	0	1.7 (-3.4 to 6.8)		0.57
Dispatch priority 1, n (%)	613 (94.3)	1 (0.2)	52 (91.2)	0	3.1 (-4.5 to 10.7)		0.35
Daytime (7:00-19:00), n (%)	306 (47.0)	0	21 (36.8)	0	10.2 (-2.9 to 23.3)		0.14
Initial observations							
Systolic BP<100mmHg n(%)	11 (1.7)	3 (0.5)	2 (3.6)	2 (3.5)	-1.9 (-6.9 to 3.0)		0.02
Respiratory rate, median (IQR)	40.0 (32.0 to 44.0)	0	38.0 (32.0 to 44.0)	0	0.0 (-2.0 to 2.0)		0.58
Respiratory rate≥30, n(%)	559 (85.9)	0	50 (87.7)	0	-1.8 (-10.7 to 7.1)		0.70
Temperature>38°C, n(%)	113 (18.7)	48 (7.4)	9 (18.4)	8 (14.0)	-0.9 (-12.5 to 10.8)		0.20
SpO2, median (IQR)	85.0 (78.0 to 90.0)	1 (0.2)	82.5 (74.3 to 88.0)	1 (1.8)		3.0 (0.0 to 5.0)	0.0500
Paramedic problem code, n(%)		0		0			0.07
Acute pulmonary oedema	207 (31.8)		19 (33.3)				
Asthma	37 (5.7)		5 (8.8)				
COPD	204 (31.3)		9 (15.8)				
Respiratory infection	79 (12.1)		7 (12.3)				
Other respiratory problem	71 (10.9)		7 (12.3)				
Other	53 (8.1)		10 (17.5)				