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Appendix table 1a. Baseline characteristics between admission oxygen saturation groups in those receiving supplemental oxygen

	<88%	88-92%	93-96%	97-100%	p (across all 4 groups)	p (88-92% v 97-100%)
Died/ n (%); (total = 1027)	25 / 147 (17)	25 / 282 (9)	44 / 375 (12)	38 / 223 (17)	0.012	0.006
Age, years, (SD)	72.5 (9.0)	73.8 (10.3)	72.8 (9.9)	73.7 (10.1)	0.413	0.900
Current smoker, %	35.2	40.6	39.7	37.6	0.682	0.522
Female, %	37.9	44.6	45.3	45.3	0.434	0.928
Institutional care, %	6.4	7.9	5.4	8.5	0.430	0.826
Preadmission FEV1, L, (SD)	0.87 (0.38)	0.94 (0.42)	0.91 (0.39)	0.91 (0.45)	0.305	0.415
Preadm. FEV1 % predicted, (SD)	39.1 (15.4)	43.0 (17.8)	41.7 (17.2)	41.6 (18.4)	0.210	0.382
DECAF Score, (IQR)	2 (1-3)	2 (1-3)	2 (1-3)	2 (1-3)	<0.001	0.368
eMRCD Score, (IQR)	5a (4-5a)	5a (4-5b)	5a (4-5a)	5a (4-5b)	0.583	0.971
NEWS2-Sats, (SD)	9.9 (2.5)	7.8 (2.7)	5.8 (2.5)	4.8 (2.4)	<0.001	<0.001
Eosinopenia less than 0.05, %	60.7	60.3	51.1	44.1	<0.001	<0.001
CXR consolidation, %	43.0	33.0	29.0	25.5	0.003	0.078
pH less than 7.35 / 7.3, %	53.8 / 34.9	18.9 / 9.7	26.1 / 12.3	31.5 / 20.1	<0.001 / <0.001	0.001 / 0.001
AF, %	18.8	12.5	16.1	16.1	0.359	0.248
Pulse rate, (SD)	108 (22)	104 (19)	104 (21)	106 (21)	0.170	0.380
Respiratory rate, (SD)	27.1 (7.7)	25.0 (6.4)	25.2 (6.5)	26.3 (6.9)	0.009	0.033
BP, systolic, mmHg (SD)	136 (31)	135 (25)	139 (28)	141 (26)	0.045	0.009
Temperature, ^{O}C, (SD)	36.9 (1.1)	36.9 (1.0)	36.9 (0.9)	36.7 (0.9)	0.067	0.012
Temperature 38°C or more, %	18.3	13.7	11.9	6.6	0.006	0.013
Charlson Index, (IQR)	2 (1-3)	2 (1-3)	2 (1-3)	2 (1-3)	0.601	0.214
Cor-pulmonale, %	23.9	7.8	8.5	7.7	<0.001	1.000
Cerebrovascular disease, %	7.5	13.5	12.9	12.9	0.265	0.446
IHD, %	27.0	27.4	32.2	26.7	0.416	0.841
Left sided Heart failure, %	15.7	13.3	11.6	9.4	0.289	0.207
Diabetes, %	14.1	13.6	12.3	10.4	0.645	0.276
pO2, kPa (SD)	8.9 (5.7)	8.7 (3.0)	10.2 (4.6)	13.9 (9.4)	<0.001	<0.001
pCO2, kPa (SD)	8.4 (3.5)	6.6 (2.4)	6.6 (2.1)	7.2 (3.2)	<0.001	0.016
HCO3, mmol/L, (SD)	31.5 (9.3)	29.2 (6.9)	29.1 (6.2)	29.4 (6.2)	0.039	0.647
Albumin <36 g/l, %	32.3	25.6	24.7	19.7	0.043	0.107
CRP, mg/L, (SD)	98.1 (122.8)	91.0 (107.2)	84.5 (101.7)	68.5 (89.4)	0.030	0.011
WCC, 10^{9}/L, (SD)	14.1 (8.7)	13.2 (5.7)	13.8 (6.8)	13.2 (8.2)	0.459	0.929
Treated with NIV, %	51.7	19.6	20.5	25.4	<0.001	0.131

Data are shown as means with standard deviations (SD), medians with interquartile range (IQR), or percentages (%). Statistical tests used were Anova or Welsh for 4 means; independent T test for 2 means, independent samples Kruskal Wallis for 4 medians, Mann Whitney for 2 medians; and Fishers exact test for proportions

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Appendix table 1a, comments.

The PaO2 values are higher in the oxygen saturation group of <88% (8.9kPa), than they are for the oxygen saturation range of 88-92% (8.7kPa), which appears contradictory. This observation can be accounted for by 1) patients in the "admission saturations 87% or less" group are more likely to be put on oxygen between their original admission saturation and their blood gas being performed, and 2) the fact the data for the "admission saturations 87% or less" group is skewed to the right (87% or less group= Median 7.1; 88-92%= median 8.2)

Appendix table 1b. Baseline characteristics between admission oxygen saturation groups in those not receiving supplemental oxygen

	<88%	88-92%	93-96%	97-100%	p
Died/ n (%); (total = 1618)	37 / 401 (9.2)	35 / 479 (7.3)	20 / 569 (3.5)	4 / 169 (2.6)	<0.001
Age, years, (SD)	73.6 (10.3)	73.8 (9.9)	72.5 (10.4)	70.8 (11.2)	0.007
Current smoker, %	42.4	43.2	41.9	40.7	0.938
Female, %	40.1	44.1	53.1	50.5	<0.001
Institutional care, %	7.5	4.2	3.3	4.7	0.030
Preadmission FEV1, L, (SD)	0.98 (0.45)	1.06 (0.46)	1.13 (0.50)	1.13 (0.49)	<0.001
Preadmission FEV1 % predicted, (SD)	44.7 (18.7)	47.4 (17.1)	48.3 (18.4)	48.6 (20.3)	0.020
DECAF Score, (IQR)	2 (1-3)	1 (1-2)	1 (0-2)	1 (0-2)	<0.001
eMRCD Score, (IQR)	4 (4-5a)	4 (4-5a)	4 (4-5a)	4 (4-5a)	0.030
NEWS2-Sats, (SD)	7.6 (2.2)	6.0 (2.5)	4.2 (2.2)	3.3 (2.1)	<0.001
Eosinopenia less than 0.05, %	58.4	50.1	42.7	43.7	<0.001
CXR consolidation, %	38.4	29.6	24.5	18.4	<0.001
pH less than 7.35 / 7.3, %	28.3 / 15.2	9.6 / 4.6	11.0 / 4.5	12.7 / 4.7	<0.001
AF, %	13.5	15.7	17.4	14.8	0.412
Pulse rate, (SD)	104 (21)	102 (21)	98 (20)	98 (22)	<0.001
Respiratory rate, (SD)	27.4 (6.6)	24.6 (5.6)	23.4 (5.3)	23.8 (6.0)	<0.001
BP, systolic, mmHg (SD)	139 (31)	139 (27)	136 (26)	142 (25)	0.019
Temperature, ^{O}C, (SD)	36.9 (0.9)	36.9 (0.9)	36.8 (0.9)	36.8 (0.8)	0.050
Temperature 38°C or more, %	14.5	13.8	11.1	9.0	0.154
Charlson Index, (IQR)	2 (1-3)	2 (1-3)	2 (1-3)	2 (1-3)	0.826
Cor-pulmonale, %	13.5	5.0	4.9	5.8	<0.001
Cerebrovascular disease, %	13.5	11.7	13.0	17.9	0.141
IHD, %	25.5	28.6	33.4	29.5	0.059
Left sided Heart failure, %	10.7	9.2	8.6	9.5	0.734
Diabetes, %	14.2	14.4	13.9	16.5	0.856
pO2, kPa (SD)	8.5 (4.4)	8.6 (3.2)	9.3 (3.8)	9.9 (4.8)	<0.001
pCO2, kPa (SD)	7.0 (2.5)	5.8 (1.7)	5.5 (1.7)	5.4 (1.9)	<0.001
HCO3, mmol/L, (SD)	30.1 (7.4)	28.0 (5.4)	26.7 (4.8)	26.0 (5.9)	<0.001
Albumin <36 g/l, %	28.3	22.2	18.7	16.9	<0.001
CRP, mg/L, (SD)	99.3 (114)	75.0 (93.6)	70.9 (89.8)	48.9 (66.0)	<0.001
WCC, 10^{9}/L, (SD)	13.1 (6.3)	12.9 (5.5)	13.5 (12.4)	12.6 (5.4)	0.491
Treated with NIV, %	32.2	8.2	3.9	6.0	<0.001

Appendix table 2. Relationship between admission oxygen saturation group and inpatient mortality in multivariate analysis in patients receiving supplemental oxygen.

	Died / total	Multivariate analysis		
		RR	95% CI	P value
Oxygen saturations				
- 88-92%	25 / 282	1	Reference	-
- 97-100%	38 / 223	2.00	1.38 - 2.90	<0.001
- 93-96%	44 / 375	1.36	0.92 – 2.02	0.127
- 87% or less	25 / 147	1.32	0.85 – 2.03	0.214
NEWS2-sats	-	1.11	1.05 – 1.18	<0.001
DECAF	-	1.78	2.03 – 2.95	<0.001

CI= confidence interval, DECAF= dyspnoea, eosinopenia, chest x-ray consolidation,

acidaemia, atrial fibrillation, NEWS2= National Early Warning Score, RR= Relative Risk.

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Appendix table 3. Relationship between admission oxygen saturation group and inpatient mortality in multivariate analysis in patients receiving supplemental oxygen, with and without hypercapnia.

	Died/ total	Multivariate analysis		
		RR	95% CI	P value
Normocapnia	N= 50 / 476			
Oxygen saturations				
- 88-92%	9 / 139	1	Reference	-
- 97-100%	16 / 105	3.27	1.66 – 6.45	0.001
- 93-96%	17 / 184	2.28	1.15 – 4.51	0.018
- 87% or less	8 / 47	2.14	1.04 – 4.37	0.038
NEWS2-sats		1.09	1.01 – 1.18	0.033
DECAF		2.00	1.73 – 2.32	<0.001
Hypercapnia	N= 81 / 551			
Oxygen saturations				
- 88-92%	15 / 143	1	Reference	-
- 97-100%	22 / 118	1.60	1.07 – 2.40	0.025
- 93-96%	27 / 191	1.08	0.70 – 1.69	0.721
- 87% or less	17 / 99	1.05	0.64 – 1.71	0.861
NEWS2-sats		1.13	1.05 – 1.22	<0.001
DECAF		1.70	1.47 – 1.95	<0.001

CI= confidence interval, DECAF= dyspnoea, eosinopenia, chest x-ray consolidation,

acidaemia, atrial fibrillation, NEWS2= National Early Warning Score, RR= Relative Risk.

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Appendix table 4. Relationship between admission oxygen saturation group and inpatient mortality on univariate and multivariate analysis in patients without supplemental oxygen.

	Died/ total	Multivariate analysis		
		RR	95% CI	P value
Oxygen saturations	N = 96 / 1618			
- 88-92%	35/ 479	1	Reference	-
- 97-100%	4/ 169	0.54	0.20 – 1.43	0.216
- 93-96%	20/ 570	0.74	0.45 – 1.22	0.242
- 87% or less	37/ 401	0.93	0.61 – 1.41	0.731
NEWS2-sats		1.11	1.02 – 1.21	0.013
DECAF		2.18	1.90 – 2.50	<0.001

CI= confidence interval, DECAF= dyspnoea, eosinopenia, chest x-ray consolidation,

acidaemia, atrial fibrillation, NEWS2= National Early Warning Score, RR= Relative Risk.

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Appendix table 5. Odds ratios, 95% confidence intervals, and p values for one year mortality in patients treated with supplemental oxygen at admission grouped by admission oxygen saturations and baseline carbon dioxide.

		p value	Odds ratio	95% CI Lower	Upper
Normocapnia	88-92%		1.00	reference	
	97-100%	0.13	0.60	0.31	1.17
	93-96%	0.15	0.68	0.40	1.16
	<88%	0.81	0.90	0.40	2.03
Hypercapnia	88-92%		1.00	reference	
	97-100%	0.84	1.06	0.60	1.85
	93-96%	0.06	0.61	0.36	1.03
	<88%	0.99	1.00	0.55	1.82
All	88-92%		1.00	reference	
	97-100%	0.41	0.84	0.55	1.27
	93-96%	0.02	0.64	0.44	0.93
	<88%	0.95	1.01	0.63	1.62

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Appendix, multiple imputation

Multiple imputation is a statistical method which is used to deal with missing data.[1] Rather than impute a single missing value, multiple datasets are created and the values are pooled at the end of the analysis. As a consequence, the numerator and denominator can vary by a small number between each imputation dataset.

For example, for the 88-92% group the outcome for the five imputation sets are:
1) Died 24, survived 284 = 8.45%
2) Died 25, survived 283 = 8.83%
3) Died 24, survived 281 = 8.54%
4) Died 24, survived 281 = 8.54%
5) Died 25, survived 281 = 8.90%

These are pooled to give the following result. Died 24.4, survived 282.0 = 8.65%

When reporting the number of patients, we have rounded them to the nearest whole number (for example died 25, survived 282 = 8.9%). This accounts for the slight discrepancy in values if the numbers are calculated by hand from the reported digits which are rounded to the whole number. Furthermore, this is also why the sum of the number of patients in groups may be higher than the reported total group number.

[1] Rubin DB. Multiple imputation after 18+ years. *Journal of the American Statistical Association* 1996; **91**: 473-89.

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