

Online Supplement

ADDITIONAL RESULTS

Details of remaining bivariate comparisons between pre- and post-NSECH groups are shown in Table E1, with the full regression tables shown for both non-ventilated (Table E2) and ventilated (Table E3) patients.

Table E1: Additional bivariate comparisons

	Pre-NSECH	Post-NSECH	p value
All patients			
Female (%)	2174 (55.1)	1327 (56.5)	0.29
CPAP (%)	13 (0.3)	4 (0.2)	0.32
Dementia (%)	191 (4.8)	105 (4.5)	0.54
Cardiovascular disease (%)	1836 (46.6)	1130 (48.1)	0.24
Stroke (%)	33 (0.8)	24 (1.0)	0.49
Active cancer (%)	259 (6.6)	178 (7.6)	0.14
CXR with heart failure (%)	119 (3.0)	95 (4.0)	0.031
Non-ventilated patients			
Age mean (SD)	73.2 (10.6)	72.4 (10.5)	0.013
Female (%)	1859 (54.6)	1115 (55.7)	0.46
Critical care admission (%)	23 (0.7)	9 (0.4)	0.36
Charlson index Median (IQR)	3.00 (0-10)	3.00 (0-12)	0.0066
Dementia (%)	171 (5.0)	98 (4.9)	0.85
Cardiovascular disease (%)	1596 (46.9)	971 (48.5)	0.26
Stroke (%)	27 (0.8)	19 (0.9)	0.54
Active cancer (%)	230 (6.8)	153 (7.6)	0.23
Admitted from institutional care (%)	189 (5.6)	113 (5.6)	0.90
CXR with pneumonia (%)	658 (19.3)	344 (17.2)	0.050
CXR with heart failure (%)	80 (2.4)	63 (3.14)	0.080
Under respiratory consultant (%)	1509 (44.3)	1303 (65.1)	<0.0001
Ventilated patients			
Age mean (SD)	69.3 (10.6)	69.6 (10.0)	0.67
Female (%)	315 (58.3)	212 (61.3)	0.40
Critical care admission (%)	50 (9.3)	29 (8.4)	0.72
Charlson index Median (IQR)	4.00 (0-13)	4.00 (0-13)	0.95
Dementia (%)	20 (3.7)	7 (2.0)	0.17
Cardiovascular disease (%)	240 (44.4)	159 (46.0)	0.68
Stroke (%)	6 (1.1)	5 (1.4)	0.76
Active cancer (%)	29 (5.4)	25 (7.2)	0.31
Admitted from institutional care (%)	28 (5.2)	20 (5.8)	0.76
CXR with pneumonia (%)	124 (23.0)	58 (16.8)	0.027
CXR with heart failure (%)	39 (7.2)	32 (9.2)	0.31
Under respiratory consultant (%)	485 (89.8)	335 (96.8)	0.0001

Data is mean (SD) or absolute number (%).
NSECH = Northumbria Specialist Emergency Care Hospital, CPAP = continuous positive airways pressure, CXR = Chest X-Ray

Table E2. Regression analysis (for non-ventilated patients)

		B	S.E.	OR (95% confidence intervals)	P value
Full Model	Age in years	.052	.007	1.05 (1.04-1.07)	<0.0001
	Male	.007	.124	0.993 (0.78-1.27)	0.95
	Any Cardiovascular disease	.296	.141	1.34 (1.02-1.77)	0.036
	CXR evidence of pneumonia	.284	.143	1.33 (1.00-1.76)	0.047
	Season (November to April)	-.230	.128	0.794 (0.62-1.02)	0.071
	NSECH open	-.362	.134	0.70 (0.54-0.91)	0.0070
	Charlson score 0				<0.0001
	Charlson score 1-5	-.120	.214	0.89 (0.58-1.35)	0.58
	Charlson score >5	.853	.160	2.35 (1.72-3.21)	<0.0001
	Dementia	-.223	.232	0.80 (0.51-1.26)	0.34
	In nursing home	.694	.203	2.00 (1.35-2.98)	0.001
	Constant	-7.048	.610	0.001	<0.0001
Independent predictors	Age in years	.052	.007	1.05 (1.04-1.07)	<0.0001
	Any Cardiovascular disease	.315	.138	1.37 (1.05-1.80)	0.022
	CXR evidence of pneumonia	.284	.142	1.33 (1.01-1.76)	0.046
	NSECH open	-.383	.134	0.68 (0.52-0.89)	0.0042
	Charlson score 0				<0.0001
	Charlson score 1-5	-.137	.213	0.87 (0.57-1.32)	0.52
	Charlson score >5	.802	.154	2.23 (1.65-3.02)	<0.0001
	In nursing home	.624	.189	1.87 (1.29-2.70)	0.001
Constant	-7.302	.543	0.001	<0.0001	

B = Beta coefficient, S.E. = Standard Error, OR = odds ratio, CXR= Chest X-Ray, Cardiovascular disease= cardiovascular disease and/or stroke disease – full list in online supplement.

Table E3. Regression analysis (for ventilated patients)

		B	S.E.	OR (95% confidence intervals)	P value
Full model	Age in years	.049	.011	1.05 (1.03-1.07)	<0.0001
	Male	-.518	.203	1.68 (1.13-2.50)	0.011
	Any Cardiovascular disease	.011	.234	1.01 (0.64-1.60)	0.96

	CXR evidence of pneumonia	-.404	.250	0.67 (0.41-1.09)	0.11
	Season (Nov to April)	-.059	.201	0.94 (0.64-1.40)	0.77
	Post-NSECH	-.679	.217	0.51 (0.33-0.78)	0.0017
	Charlson score 0				0.0091
	Charlson score 1-5	-.857	.304	0.42 (0.23-0.77)	0.0049
	Charlson score >5	.003	.256	1.00 (0.61-1.66)	0.99
	Dementia	.441	.471	1.55 (0.62-3.91)	0.35
	In nursing home	.122	.409	1.13 (0.51-2.52)	0.77
	Constant	-3.904	.824	0.007	<0.0001
Independent predictors model	Age in years	.050	.010	1.05 (1.03-1.07)	<0.0001
	Male	-.489	.199	1.63 (1.10-2.41)	0.014
	Post-NSECH	-.663	.213	0.52 (0.34-0.78)	0.0018
	Charlson score 0				0.0083
	Charlson score 1-5	-.840	.302	0.43 (0.24-0.78)	0.0054
	Charlson score >5	.031	.218	1.03 (0.67-1.58)	0.89
	Constant	-4.115	.747	0.006	<0.0001

B = Beta coefficient, S.E. = Standard Error, OR = odds ratio, C.I. = Confidence interval, Cardiovascular disease= cardiovascular disease and/or stroke disease – full list in online supplement.

Full list of comorbidities

Below is the full list of comorbidities used in coding searches to identify comorbidity.

- a. Dementia/Delirium
 - i. F00 Dementia in Alzheimer disease
 - ii. F01 Vascular dementia
 - iii. F02 Dementia in other diseases classified elsewhere
 - iv. F03 Unspecified dementia
 - v. F05.1 Delirium superimposed on dementia
- b. Cardiovascular comorbidities
 - i. I5-9 Chronic rheumatic heart diseases
 - ii. I11.0, Hypertensive Heart Disease with or without heart failure
 - iii. I13.0, I13.2, Hypertensive heart disease with, with renal failure (cardiorenal syndromes)
 - iv. I20 - I28, Ischaemic Heart Diseases, Pulmonary Heart Diseases and diseases of pulmonary circulation
 - v. I34 - I36, Mitral, Aortic & tricuspid valve disorders
 - vi. 41 Myocarditis
 - vii. I42 - I43, Cardiomyopathies
 - viii. I44.7, Left bundle branch block
 - ix. I45.1, Right bundle branch block
 - x. I46, Cardiac Arrest
 - xi. I48, Atrial fibrillation and atrial flutter
 - xii. I50, Heart Failure
 - xiii. I51.0, Cardiac septal defects
 - xiv. I70 - I79 Diseases of arteries, arterioles and capillaries
- c. Stroke
 - i. I60 Subarachnoid haemorrhage
 - ii. I61 Intracerebral haemorrhage

- iii. I62 Non-traumatic intracranial haemorrhage
- iv. I63 Cerebral infarction
- v. I64 Stroke, not specified
- vi. I69 Sequelae of cerebrovascular disease
- d. Malignancy (C00-C97)
 - i. Any active malignancy during spell

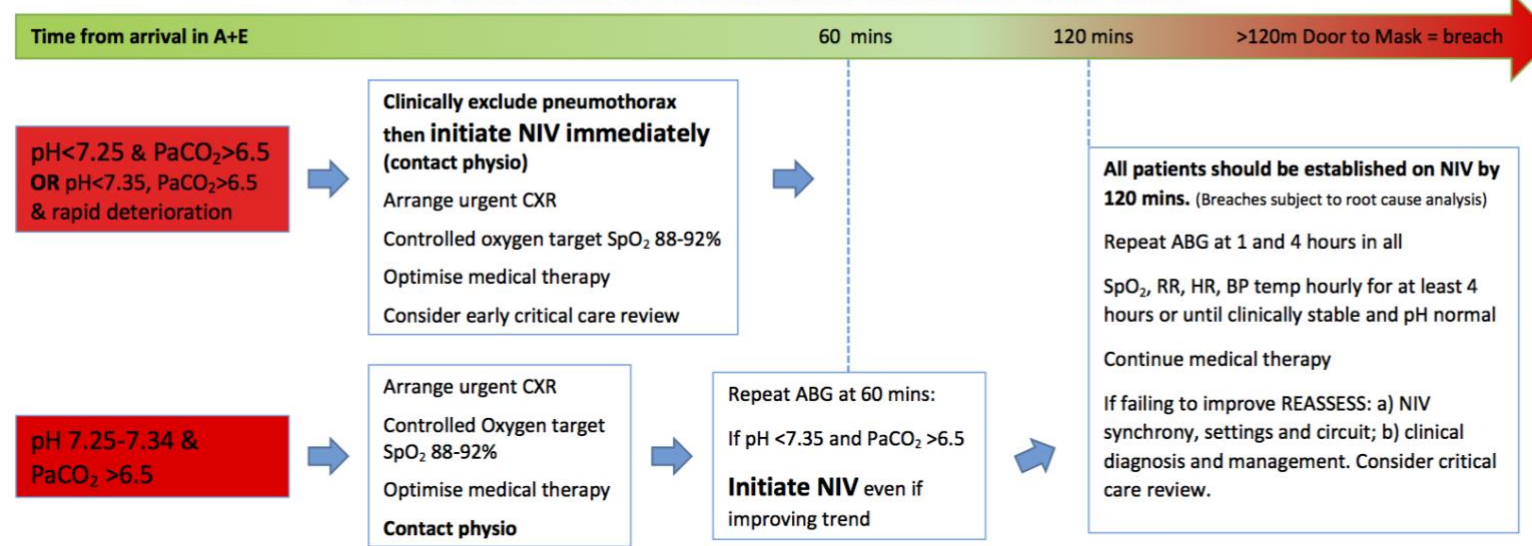
The Northumbria NIV wallchart

The Northumbria NIV wallchart is provided (Figure E1). This is placed in clinical areas, such as the Emergency Department and Respiratory Support Unit, within the trust to guide to clinicians. It is important to note that the wallchart does not include specifics such as ventilation pressures. This is to ensure only trained and competency assessed staff are providing NIV to the patient. Our full NIV guideline is available by contacting the corresponding author.

Figure E1. The Northumbria NIV guideline wallchart for use in clinical areas.

This wall chart should **always** be used in conjunction with the full NIV guideline. Decompensated type 2 respiratory failure is a medical emergency. NIV dramatically improves survival. Delayed NIV initiation is associated with increased mortality. NIV 'buys time': DO NOT neglect standard medical therapy.

Acute Non-Invasive Ventilation Guideline Wall Chart



<p>Indications: PRIOR TO Specialist Approval:</p> <p>pH < 7.35 and PaCO₂ > 6.5 due to:</p> <ul style="list-style-type: none"> Exacerbation of COPD Obesity hypoventilation syndrome (OHS) Chest wall deformity Neuromuscular disease Left ventricular failure (CPAP first line) 	<p>Indications: ONLY with Specialist Approval:</p> <p>pH < 7.35 and PaCO₂ > 6.5 due to <u>other conditions</u> including:</p> <ul style="list-style-type: none"> CF / bronchiectasis Immunocompromised patient Chronic asthma (airways remodeling) <p>Compensated Hypercapnia (pH ≥ 7.35) with / due to:</p> <ul style="list-style-type: none"> Progressive fatigue / drowsiness Neuromuscular disease Chest wall deformity 	<p>Absolute Contra-indications:</p> <ul style="list-style-type: none"> Facial deformity preventing mask seal Facial Burns Fixed upper airway obstruction <u>Undrained</u> pneumothorax (<i>urgent chest drain</i>) <p><i>NB low GCS presumed due to hypercapnia: NIV if otherwise appropriate and improving within 2 hours. Consider critical care review.</i></p>	<p>Consider Intubation:</p> <ul style="list-style-type: none"> Clinical deterioration despite optimisation of NIV, including: <ul style="list-style-type: none"> Progressive respiratory acidaemia (pH < 7.25 and falling, rising PaCO₂) Persistent severe acidaemia (especially pH < 7.15) PaO₂ < 6 kPa despite FiO₂ 100% on NIV GCS < 8 Marked agitation limiting adherence Life-threatening arrhythmia or haemodynamic instability Cardio-respiratory arrest / Peri-arrest Contra-indication to NIV
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