

FEV₁ (0.23 litres, 95% CI -0.06 to 0.5; $p=0.113$) and VAS (-10.1 mm, 95% CI -24.9 to 4.7; $p=0.174$) after correcting for the baseline sputum eosinophil count.

Conclusion Our data suggest that there is not a large difference in response to oral prednisolone in patients with asthma with sputum eosinophilia and mixed granulocytic phenotypes. Larger studies may highlight small, albeit clinically important, differences.

NIV: clinical aspects

S51 A RANDOMISED TRIAL OF AUTOVARIABLE POSITIVE AIRWAY PRESSURE VS STANDARD NON-INVASIVE VENTILATION IN PATIENTS WITH COPD WITH CHRONIC VENTILATORY FAILURE

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Introduction and Objectives Chronic ventilatory failure secondary to chronic obstructive pulmonary disease (COPD) is the most common indication for domiciliary non-invasive ventilation (NIV) in Europe. The aim of this study was to establish the efficacy and tolerability of a novel autovariable positive airway pressure (iVAPS, ResMed, Australia) ventilator compared with standard NIV (NIPPY, B and D electromedical, UK) in ventilator-naïve patients with COPD.

Methods Patients with chronic ventilatory failure secondary to COPD starting domiciliary NIV were randomised to receive iVAPS or standard NIV and followed-up at 1 and 3 months with repeat blood gas measurements, overnight pulse oximetry and quality of life scores (SF-36 and SGRQ).

Results Preliminary data of 21 patients are presented here. Ten were males, mean age 67 (SD 9.00) years, mean forced expiratory volume in 1 s (FEV₁) 0.62 (SD 0.24) litres, mean PaCO₂ 8.49 (SD 1.4) kPa, mean PaO₂ 6.79 (SD 0.85) kPa, mean SpO₂ 85.4% (SD 4.16%). Eleven were randomised to iVAPS and 10 to NIPPY. Three patients died (1 iVAPS and 2 NIPPY) before their first reassessment. At baseline there was no difference in age, body mass index, FEV₁, PaO₂, PaCO₂ and mean SpO₂ overnight between the two groups. At 3 months, on iVAPS there was a significant fall in mean PaCO₂ of 1.98 kPa (SD 1.68, $p=0.008$) and rise in mean PaO₂ of 1.14 kPa (SD 1.07, $p=0.02$). On NIPPY, a small but insignificant improvement was seen in mean PaCO₂ and mean PaO₂. Comparing the two groups for improvement in daytime blood gases, no significant differences were observed. Nocturnal oxygenation improved similarly on both the ventilators (mean nocturnal SpO₂ improved by 3.0% on iVAPS and 5.63% on NIPPY). No difference was observed in the tolerability, comfort of use or hours of use (mean usage per night on iVAPS 6.4 h and on NIPPY 5.22 h, $p=0.38$) between the ventilators.

Conclusion iVAPS was shown to be effective in improving daytime PCO₂ and PO₂ and was well tolerated in patients with COPD with chronic ventilatory failure. It was at least as effective as standard NIV.

S52 ACTIVITY LEVELS AT INITIATION OF HOME MECHANICAL VENTILATION IN PATIENTS WITH OBESITY HYPOVENTILATION SYNDROME

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Introduction The levels of physical activity in patients with obesity hypoventilation syndrome (OHS) have not previously been

measured. Although in simple obesity a relationship between anthropometrics and physical activity has been reported (*NEJM*;332:621), the effect of daytime somnolence, accompanying sleep-disordered breathing in OHS, on activity has not been investigated. We hypothesised that low activity levels would be associated with the degree of hypersomnolence and daytime arterial partial pressure of oxygen (PaO₂) and carbon dioxide (PaCO₂).

Methods Consecutive patients admitted for initiation of home mechanical ventilation (HMV) were provided with Actiwatchs (Phillips-Respironics, Murrayville, USA) to monitor physical activity. The monitors were continuously worn for 7 days and returned with a diary card identifying sleep and nap times. Activity counts were analysed during daytime waking hours to produce mean and peak activity counts/day and the average number of minutes of sedentary (<40 counts/min) and moderate (>1500 counts/min) activity/day. Baseline anthropometric and arterial blood gases (ABG) were taken prior to initiation of HMV.

Results Ten patients (3 male) with mean age of 55.8 (9.6) years and Epworth Sleepiness Scores (ESS) of 14 (3.6). Mean body mass index (BMI) was 51.4 (8.7) kg/m², waist circumference 139.6 (18.8) cm and fat free mass (FFM) 62.7 (18.5) kg. At initiation of ventilation, PaCO₂ was 7.27 (1.34) kPa and PaO₂ was 8.2 (1.94) kPa. Activity data showed that time spent in moderate activity was 7.2 (10) min/day and sedentary activity 409 (200) min/day. There was an inverse correlation between BMI and both mean activity ($r^2=0.56$; $p=0.01$) and peak activity ($r^2=0.50$, $p=0.02$). There was a similar relationship between waist circumference and mean activity ($r^2=0.67$, $p=0.0038$) and peak activity ($r^2=0.62$, $p=0.0073$). However, there was no correlation between ESS, FFM, PaCO₂ or PaO₂ and mean or peak activity.

Conclusions These data demonstrate extremely low levels of physical activity in patients with OHS at initiation of HMV. In contrast to our hypothesis, there were no correlations between activity and daytime somnolence or gas exchange, and the most relevant predictor of low activity was the degree of obesity. Furthermore, in contrast to previous data in simple obesity, FFM was not correlated with higher activity levels. Further studies are required to investigate the changes in physical activity following treatment with HMV.

S53 DIFFERENTIATION BETWEEN HYPERCAPNIC OBSTRUCTIVE SLEEP APNOEA (OSA), COMBINED OSA AND OBESITY HYPOVENTILATION SYNDROME (OHS) AND LONE OHS IN CLINICAL PRACTICE

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Background Respiratory complications of obesity are increasingly common. The definition of obesity hypoventilation syndrome (OHS) is an overlap between daytime hypercapnia and sleep-disordered breathing in obese patients. This description could more clearly be defined as obesity-related respiratory failure (ORRF) incorporating three separate groups: hypercapnic obstructive sleep apnoea (OSA), combined OSA and OHS (OSA-OHS) and lone OHS. However, distinguishing between these groups in clinical practice is often difficult without detailed nocturnal physiological monitoring. We hypothesised that clinical anthropometric data would distinguish between OSA, combined OSA-OHS and OHS.

Method Data of 88 patients initiated on home mechanical ventilation from August 2005 to June 2008 were analysed from a purpose-designed electronic discharge summary database. The groups were defined by detailed overnight physiological studies.

Abstract S53 Table 1

	OSA group n = 37	OSA-OHS + OHS group n = 51
	n (%)	n (%)
Epworth Sleepiness Scale	14.8 ± 6.3	15.9 ± 6.3
Weight (kg)	125.0 ± 31.4	141.0 ± 37.2*
BMI (kg.m ⁻²)	44.9 ± 12.6	52.7 ± 14.3*
Elevated jugular venous pressure	15 (40.5)	26 (50.9)
Peripheral oedema	21 (56.8)	38 (74.5)
FVC (litres)	2.5 ± 1.3	1.8 ± 0.8*
FEV ₁ /FVC	79.6 ± 14.5	75.2 ± 12.2
PaCO ₂ (kPa)	6.2 ± 1.0	7.3 ± 1.2*
PaO ₂ (kPa)	9.3 ± 2.0	7.6 ± 1.3*
HCO ₃ ⁻ (mmol/l)	27.5 ± 3.4	31.5 ± 3.7*
Haematocrit (%)	43.6 ± 10.4	47.3 ± 7.0

*p<0.05 for comparison between groups.

BMI, body mass index; FEV₁, forced expiratory volume in 1 s; FVC, forced vital capacity; OHS, obesity hypoventilation syndrome; OSA, obstructive sleep apnoea.

As the proportion of OHS was low (n = 8), we combined OSA-OHS and OHS for comparative purposes.

Results 42% of patients had OSA and 58% had OSA-OHS or lone OHS. The mean age was 52 (16) and 55 (15) years, respectively, with 70% males in the OSA group and 49% males in the OSA-OHS and OHS group. The results are shown in table 1.

Conclusion Although there was no difference in subjective somnolence between the groups, body weight and body mass index (BMI) were higher in the patients with OSA-OHS and OHS compared with the patients with hypercapnic OSA. Furthermore, these patients had an increased prevalence of the clinical features of cor pulmonale. As a consequence of the higher BMI, there was a greater restrictive lung defect in the patients with OSA-OHS compared with those with OSA, possibly exacerbating the more pronounced gas exchange impairment.

Interestingly, despite the greater level of hypoxia there was no difference in the prevalence of secondary polycythaemia between the groups. In conclusion, in obese patients with hypercapnia, clinical features provide useful data to distinguish between patients with hypercapnic OSA, OSA-OHS and OHS based on body composition, signs of right heart failure, lung volume and gas exchange.

S54 SEASONAL INFLUENZA: IMPACT ON NON-INVASIVE VENTILATION (NIV) ADMISSIONS AND NIV FAILURES (INTUBATIONS AND DEATHS)

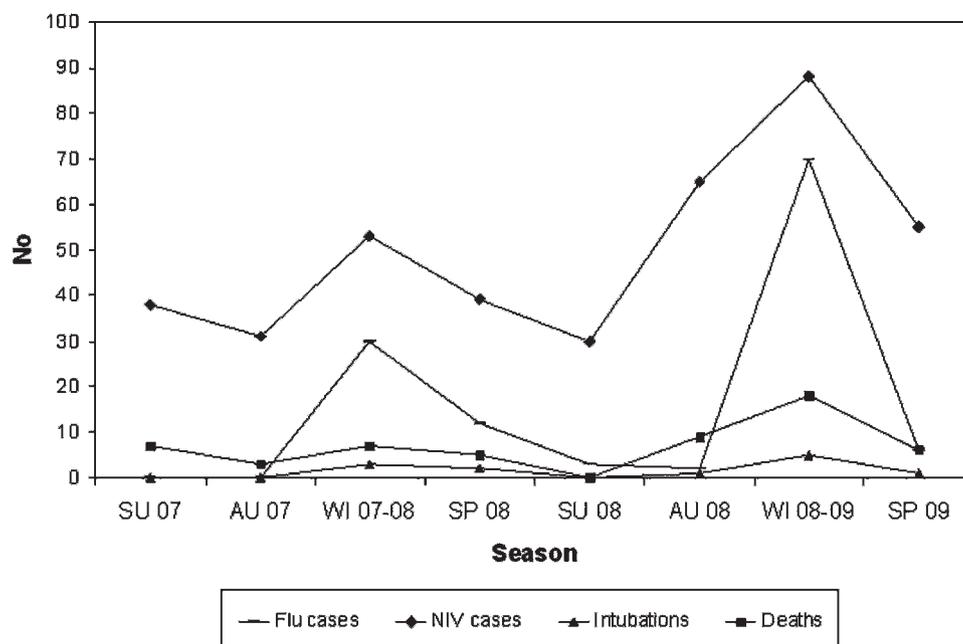
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Introduction Outbreaks of influenza (flu) have major impacts on hospital admissions and mortality. The usual flu rate for the 50th week of the year over the past 9 years in England is ~23 cases per 100 000 population, but in 2008 it stood at 39.5 (Royal College of General Practitioners data). The Midlands was particularly badly hit by this outbreak, with a prevalence of 56 per 100 000. Such surges put pressures on health services, but there are few data on their impact on non-invasive ventilation (NIV) service providers. We hypothesised that seasonal flu outbreaks impact on NIV service requirements with adverse effects on admissions and outcomes, especially intubation rates and mortality.

Methods The Birmingham Heartlands hospital 11-bedded physiotherapy-run NIV service has on average 180 admissions/year for the treatment of acute hypercapnic respiratory failure. 72% are chronic obstructive pulmonary disease (COPD) exacerbations, intubation rate is 3.5% and mortality is 15%. A retrospective observational study (June 2007 to May 2009) was undertaken to

Impact of Flu outbreaks on NIV activity



Abstract S54 Figure 1 AU, autumn; NIV, non-invasive ventilation; SP, spring; SU, summer; WI, winter.

determine if there is a relationship between confirmed hospital flu cases and the number of NIV admissions, intubations and deaths (ie, NIV therapy failure). In this study the following seasons were categorised as: summer, June to August; autumn, September to November; winter, December to February; and spring, March to May. Total flu cases stated includes types A and B.

Results Figure 1 shows the prevalence of confirmed hospital flu cases and the number of NIV admissions, intubations and deaths as a result of failure of therapy. Observation of the data suggests that seasonal peaks (as by hospital cases) do indirectly result in an increase in admissions requiring NIV and resultant rises in intubations and deaths. The data do not show how many NIV episodes were directly flu related.

Conclusions This observational study may suggest that seasonal outbreaks of community flu and therefore the resultant increase in hospital flu admissions may have an impact on the workload of NIV units, with an increase in admissions requiring NIV and ultimately an increase in the requirement for invasive ventilatory support and death. Predicting outbreaks of flu may allow better workforce planning for NIV units to cope with surges in activity.

S55 NON-INVASIVE VENTILATION IN MOTOR NEURON DISEASE: QUALITATIVE ACCOUNTS OF INITIATION AND IMPACT

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Introduction Non-invasive ventilation (NIV) can palliate symptoms of nocturnal hypoventilation in motor neuron disease (MND) and improve quality of life. There has been no qualitative description of how patients' thoughts and feelings may evolve whilst making the transition onto NIV and how physical/psychological changes are perceived by patients.

Methods 10 patients with MND participated in semi-structured interviews before being established on NIV and again 3 months following NIV initiation. Interviews were transcribed verbatim before undergoing thematic analysis. Salient themes were used to provide a phenomenological narrative.

Results Pre-NIV, framing in regard to disease progression was an important determinant of early emotional response. For some, NIV represented a negative "milestone" in physical decline, whilst for others, an opportunity/hope for improvement. Most were reluctant to consider "realities" of NIV until use was imminent, with resignation and anxiety common themes. Resistance increased where the link between ventilation and actual symptoms was poorly understood, creating conflict between subjective/objective need for treatment. Most patients perceived no subjective need for ventilation pre-NIV, describing decision making as led by professionals and family members. Reports of having "no choice" were common; however, after ventilation many patients reported that the non-invasive nature of treatment did give them choice which reassured and empowered them. Post-NIV, most reported improved sleep/energy levels; negative aspects were outweighed by positive physical effects. However, managing expectation was important; a minority finding effects disappointing or the struggle to adjust to the machine actually increasing sleep disturbance and anxiety. Patients reporting no effect were still motivated to continue "just in case" fearing no change with NIV might equate to significant physical decline without NIV.

Conclusion The diversity of experience and feeling amongst patients demonstrates that the physical and emotional landscape continually shifts in MND. Prior to treatment, perceptions of NIV ranged from alarm, with NIV seen as a marker of severe decline, to positivity as a

potentially beneficial therapy. Some expectations were unrealistic, which correlated with later disappointment. In general, patients appeared ambivalent pre-NIV; however, following initiation of NIV they reported improved sleep and energy levels. This work suggests managing expectations is a central issue in using NIV in MND.

Epidemiology of chronic respiratory disease

S56 EVIDENCE FOR ASSOCIATION BETWEEN SARCOIDOSIS AND PULMONARY EMBOLISM FROM 30-YEAR RECORD LINKAGE STUDY

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Introduction Sarcoidosis is a multisystem disorder of unknown aetiology, characterised by the formation of non-caseating granuloma. A higher than expected incidence of pulmonary embolism (PE) was observed anecdotally in our Sarcoidosis Clinic over a 3-year period, raising the question of disease association.

Methods We carried out a retrospective cohort analysis using data from a well-established record linkage data set in Oxford ("ORLS"; years 1963–1998), and a more recent record linkage data set covering England ("England"; 1999–2005), to compare rate ratios (RRs) for pulmonary embolism and deep vein thrombosis (DVT) between people admitted to hospital for sarcoidosis and a reference cohort for all ages and those below 65 years. RRs of myocardial infarction, subarachnoid haemorrhage, abdominal aortic aneurysm and cardiac failure were also analysed as controls. The reference cohorts comprised individuals with various minor medical and surgical conditions as main diagnoses (eg, squint, otitis media and nasal polyps). They were standardised by age, gender, year of first admission and district of residence. Rates of PE and control conditions were calculated based on person-years at risk, relative to that in the reference cohort. The confidence interval for the rate ratio and χ^2 statistics for its significance were calculated.

Results We found a significantly increased RR for PE in patients with sarcoidosis, for patients both above and below 65 years of age, and in both data sets (RR 1.87, 95% CI 0.96–3.27 (ORLS); RR 2.72; 95% CI 1.52 to 4.50 (England) for all age patients). The RR of cardiac failure in sarcoidosis (RR 1.78, 95% CI 1.09 to 2.75 (ORLS); RR 3.23; 95% CI 2.02 to 4.89 (England) for all age patients), but not of other control diseases, was also increased.

Conclusions There appears to be an increase in susceptibility to PE, but not of control acute vascular incidents such as myocardial infarction and subarachnoid haemorrhage in patients with sarcoidosis. This supports anecdotal clinical observations, and suggests a link between coagulopathy and sarcoidosis, with clinical implications for management of these patients.

S57 INCREASING PREVALENCE OF SPIROMETRY-DEFINED COPD IN MIDDLE AGED MEN AND WOMEN IN SCOTLAND, 1995–2003

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Background Chronic obstructive pulmonary disease (COPD) is a growing public health problem. We examined the prevalence of spirometry-defined COPD over time in a nationally representative sample of the Scottish population.