

# Domiciliary Non-Invasive Ventilatory Devices –A General Hospital Experience

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## SUMMARY

Treatment for chronic respiratory failure has advanced since the introduction of domiciliary non-invasive ventilatory devices. This has given a new light of hope for patients with chronic respiratory failure secondary to various causes. We report a series of patients with respiratory failure of different origins and types of management that they received. Four patients received bilevel positive airway pressure (BiPAP) and one patient received continuous positive airway pressure (CPAP).

## KEY WORDS:

*Chronic respiratory failure, BiPAP, CPAP, Non-invasive ventilation*

## INTRODUCTION

Few areas in respiratory medicine have advanced as rapidly as non-invasive ventilation<sup>1</sup>. Not only has nasal intermittent positive pressure ventilation (NIPPV) been confirmed as effective therapy in acute hypercapnic exacerbations of chronic obstructive pulmonary disease (COPD), it has an increasing role in acute respiratory failure due to non-COPD causes. The application of NIPPV in chronic ventilatory failure has been extended from conventional indications in chest wall and stable neuromuscular-skeletal disease<sup>1</sup>.

### Case 1

A 63 years old Malay lady who was a rubber tapper first presented to a district hospital with complaint of progressive shortness of breath for more than 10 years but worsened in the last one month which forced her to stop working. Clinically she had severe kyphoscoliosis and had signs of hypercapnoea. Arterial blood gases (ABG) indicated type II respiratory failure with overnight desaturation. (Table I) The minimum desaturation was 80%. She was diagnosed to have chronic hypoventilation secondary to severe kyphosis and was prescribed with a domiciliary BiPAP (Figure 1) Table I shows her arterial blood gas pre and post BiPAP.

### Case 2

A 44 year old malay man, an-ex-smoker of 20 pack years who has bronchiectasis and bullae confirmed on high resolution computed tomography of the thorax (HRCT). Clinically, he was clubbed, oxygen saturation was 85% had signs of hypercarbia and had bilateral coarse crepitations till the mid-zones. He was prescribed with a domiciliary BiPAP.

### Case 3

A 35 year old malay lady was diagnosed via muscle biopsy to have limb girdle muscular dystrophy for the last eight years.

She required monthly admissions due to Type II respiratory failure. She had poor respiratory effort with respiratory acidosis.

### Case 4

WAWM, a 55 year old obese female (BMI 41) was admitted with Type II Respiratory Failure. A limited channel polysomnograph done a month later showed severe obstructive apnoea with an apnoea hypopnoea index (AHI) of 11.9, deepest desaturation of 87% based on a 91/2 hours of sleep duration (she was prescribed with a domiciliary BiPAP (IPAP 10cm H2O, EPAP 4) and set at a respiratory rate of 16 per minute.

### Case 5

MAAJ is a 43 year old male who had to resign from work as a human resource manager five years previously because of frequent episodes of dozing off while at work. A polysomnography study was done in another hospital and was consistent with severe obstructive apnoea. He had loud snoring and his Epworth Sleepiness Score (ESS) was 22/24. His BMI was 72. He had Type II respiratory failure.

## DISCUSSION

Evidence for the use of NIPPV in acute respiratory failure secondary to acute exacerbation of COPD has been well established. There have been eight prospective randomized controlled trials (RCT) of NIPPV in acute exacerbations of COPD published, both within and outside of the intensive care unit (ICU)<sup>1,2,3,4</sup>. Assisted ventilation may be long-term, thus dependency may occur in patients with chronic respiratory failure. This has created an avenue for the use of home assisted ventilation or domiciliary non-invasive ventilation. Not only have the numbers of individuals receiving home ventilation increased over the last decade, but there has also been a widening of indications for these techniques<sup>1</sup>.

In this paper we presented five patients with different diagnoses who received non-invasive assisted respiratory devices for Type II chronic respiratory failure (CRF). They are CRF due to:

- 1) Hypoventilation in severe kyphosis,
- 2) Cor pulmonale secondary to COPD as a result of severe bronchiectasis and lung bullae,
- 3) Diaphragmatic muscle weakness in muscular dystrophy
- 4) Obesity hypoventilation syndrome
- 5) Severe obstructive sleep apnoea secondary to morbid obesity

*This article was accepted: 1 December 2008*

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**Table I: Neural tube defects status versus MTHFR 677 Genotype of individual**

<b>CASE 1</b>	<b>Pre – BiPAP</b>		<b>Post – BiPAP one month later</b>
ABG	PH	7.32	7.36
	PCO2 (mmHg)	44.2	26.7
	PO2 (mmHg)	68.2	76.8
	HCO3 ( mmol/l )	35.5	13.1
	Base excess	+2	+ 2
	SPO2	95.2%	95.6%
<b>CASE 2</b>	<b>Pre-BiPAP</b>		<b>One month after BiPAP usage</b>
ABG	PH	7.34	7.36
	PCO2 (mmHg)	69	51
	PO2 (mmHg)	57	133
	HCO3 (mmol/l)	36	22
	Base Excess	+8	-6
	SpO2	87%	98%
<b>CASE 3</b>	<b>Pre non invasive ventilator</b>		<b>Post non invasive ventilator</b>
ABG	PH	7.34	7.44
	PCO2 (mmHg)	53	31
	PO2 (mmHg)	73	83
	HCO3 (mmol/l)	31	24
	Base excess	+3	+2
	SpO2	94%	98%
<b>CASE 4</b>	<b>On admission</b>		<b>2 months after BiPAP</b>
ABG	PH	7.28	7.46
	PCO2	55	33.4
	PO2	47	76.7
	HCO3	26	23.6
	Base excess	+2	-2
	SpO2	87%	96.1%
<b>CASE 5</b>	<b>Pre-BiPAP</b>		<b>Post venesection and CPAP</b>
ABG	PH	7.35	7.38
	PCO2	66.4	54
	PO2	47.1	71
	HCO3	23	24
	Base excess	-1	+1
	SPO2	79.7%	93%



**Fig. 1:** Lateral view of the patient (Case 1)

The second and fifth patients also benefited from venesections.

Starting home ventilation is a major undertaking for the individual and his/her family which has major social and financial implications<sup>1</sup>. Thus, it is imperative that all standard non-ventilatory therapeutic options have been fully explored before embarking on respiratory support.

The consensus on the clinical indications for NIPPV in chronic respiratory disease was published in 1999<sup>5</sup>. Among the neuromuscular diseases, the most common disorders requiring NIPPV are sequelae of polio, spinal cord injury, neuropathies, myopathies and dystrophies, amyotrophic lateral sclerosis, chest wall deformities and kyphoscoliosis. In COPD, the most common obstructive lung diseases would include chronic bronchitis, emphysema, bronchiectasis and cystic fibrosis.

The presence of obstructive sleep apnoea is likely to exacerbate nocturnal hypoventilation in restrictive and obstructive lung disease patients and therefore add to the indications for nocturnal ventilatory support<sup>1</sup>.

The aim of NIPPV is to improve acidosis, maintain a PCO2 of less than 40mmHg and a PO2 of more than 80 mmHg<sup>5</sup>. This aim was achieved in almost all the patients that we presented. Those who did not had only recently started on the NIPPV

and need to be assessed for longer period of time but we are confident that they will achieve the targets during future follow-up. Our patients had required less admissions and hospital stay was shorter. This has definitely contributed to improved quality of life.

**CONCLUSION**

Domiciliary non-invasive ventilatory devices use in chronic respiratory failure due to various causes is beneficial and cost-effective. We believe this method of treating patients with chronic respiratory failure should be used widely in properly selected patients in our country.

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