Noninvasive positive pressure ventilation (NPPV) or bi-level/phasic positive airway pressure (BiPAP) ventilation consists of two level settings which include the inspiratory positive airway pressure (IPAP) that is initially around 10 to 12 cmH₂O and titrated upwards in small increments according to patient comfort and tolerability. The second level, known as the expiratory positive airway pressure (EPAP), is the baseline airway pressure that is usually maintained at a minimum of 4 or 5 cmH₂O, particularly in patients who are exhibiting low lung volumes or pulmonary edema. It is important to exercise caution should one need to increase the EPAP in patients with known or suspected hypovolemic states or atrial fibrillation to avoid hypotensive crisis due to a decrease in venous return. Studies have shown that BiPAP is better tolerated by patients compared to invasive ventilation, as well as due to technological advances. As experience was gained, the indications widened and NPPV became available in many more centers, including non-specialists centers. Numerous studies have shown benefits of using NPPV to manage exacerbations of chronic obstructive pulmonary disease (COPD). NPPV has also shown to be beneficial in patients with neuromuscular and chest-wall disease, patients with cardiogenic pulmonary edema and in patients with severe asthma. Studies have also shown beneficial outcomes in patients with ‘do-not-intubate’ status, patients with acute hypoxic respiratory failure and patients who either failed weaning or were at risk of failing extubation.

Complications of NPPV include nasal congestion, facial skin reddening, eye irritation, nasal bridge ulceration, aspiration and gastric distension. However, compared to invasive mechanical ventilation, there are few serious risks associated with NPPV - especially risk of barotrauma, which is greatly reduced. Major drawbacks with NPPV are that it requires a cooperative patient and that it does not protect the airway. However, these drawbacks can be minimized through patient education and the use of experienced and well-trained medical and specialist respiratory nursing personnel who are experienced with NPPV techniques. Risks of aspiration are always of concern when using NPPV, but this also can be managed through careful patient monitoring and ready access to suction equipment. Current ATS/ERS guidelines state that if patients do not begin to respond to a trial of NPPV within 1-2 h (indicated by worsening of ABGs and/or pH), it is recommended that intubation and conventional mechanical ventilation be considered.

NPPV is not a new technique as it was first used successfully to treat patients with neuromuscular disease in the early 1960s. But the technique did not gain acceptance outside a few specialist centers. However, over the last 15 years, there has been resurgence in the use of NPPV, mainly due to the emergence of high quality clinical trials evaluating its usefulness, as well as due to technological advances. As experience was gained, the indications widened and NPPV became available in many more centers, including non-specialists centers. Numerous studies have shown benefits of using NPPV to manage exacerbations of chronic obstructive pulmonary disease (COPD). NPPV has also shown to be beneficial in patients with neuromuscular and chest-wall disease, patients with cardiogenic pulmonary edema and in patients with severe asthma. Studies have also shown beneficial outcomes in patients with ‘do-not-intubate’ status, patients with acute hypoxic respiratory failure and patients who either failed weaning or were at risk of failing extubation.

ATS/ERS COPD guidelines recommend that NPPV should be offered to patients with exacerbations after optimal medical therapy and oxygenation, respiratory acidosis (pH <7.36) and/or persistence of excessive breathlessness. In addition, the ATS/ERS guidelines also state that if pH is <7.25, NPPV should be administered in the intensive care unit (ICU) and intubation should be readily available. However, if pH is <7.30, NPPV should be delivered under controlled environments, such as an intermediate ICU and/or high-dependency unit (HDU). Therefore, NPPV in acute respiratory failure (ARF), of whatever etiology, can be applied in the ICU, emergency ward, specialty step-down units or respiratory wards where appropriately trained staff is readily available.

The majority of physicians and specialist respiratory nurses are familiar with the use of BiPAP for the management of obstructive sleep apnea. This and continuous positive airway pressure (or CPAP) are the most common modes of ventilation used in noninvasive management of ARF. Recent studies have shown that increasing numbers of patients are managed with NPPV outside of the ICU. Although this may be due to the ever increasing pressure on ICU occupancy, it may also be due to improved comfort with the use of NPPV for respiratory failure, on the part of physicians and specialist respiratory nurses. In the current issue of this journal, George and co-workers report on the benefits of using NPPV in patients presenting with ARF of diverse etiology in a developing country. This prospective observational study was conducted in an ICU setting of a tertiary referral university hospital in south India. Patients were eligible if they presented with ARF without a clinically indicated need for immediate endotracheal intubation. The success rate with NPPV was 85%, with 34 of 40 patients weaned successfully. Significant improvements were observed at 1 h following initiation of NPPV in pH and PaCO₂. In addition, clinical improvements continued up to the time of weaning and were maintained post-weaning. There is little doubt that this study has demonstrated clear benefits of NPPV in patients presenting with...
ARF of diverse etiology. Previous studies conducted in India in both COPD patients and those with diverse etiology[13,14] provide similar conclusions. Furthermore, numerous studies conducted in developed nations provide comparable results.[15] Due to the widespread use, knowledge and many years of experience with NPPV, there is no reason to believe that there would be any difference in NPPV success rates between developing and developed countries. One of the major controversies regarding the use of NPPV for ARF outside of the ICU setting (i.e., hospital ward) has to do with an organization’s ability to provide safe, effective care which is at par with that received by patients in the ICU. These requirements also apply to the use of NPPV in both developing and developed countries. All staff involved in the care of patients should be very familiar with, and skilled in, the application and monitoring of NPPV, to assure high success rates. Clearly in the study by George and co-workers, the staff was well trained and hence the very high success rate.

NPPV has clearly become the standard of care in the management of ARF and has proven benefits in a number of clinical settings.[16] Whether it is in developing or developed countries, the outcomes remain comparable; and increase in the use of NPPV provides obvious economic benefits in countries with limited resources. As studies have shown that the use of NPPV is a highly cost-effective option as it reduces both costs and deaths,[17] it would be particularly welcomed in developing countries. Institutions that are not utilizing NPPV to treat patients with ARF where it is clearly indicated are not offering therapy that meets current minimum standards. Efforts must be undertaken to ensure that institutions under-utilizing or not currently using NPPV acquire the necessary knowledge, skill and staff to offer this proven and effective therapy to their patients.

REFERENCES


FELIX S. F. RAM
School of Health Sciences, Massey University, Auckland, New Zealand.
E-mail: fsfram@yahoo.co.uk