

Noninvasive ventilation success: Combining knowledge and experience

P. Saxena, R. K. Mani

Noninvasive ventilation (NIV) provides ventilator support in an appropriate setting with the help of a mask or similar interface. Consequently, by avoiding tracheal intubation, NIV offers many important advantages: Reduction in pulmonary infections, barotrauma, and need for sedation. It is important to remember that NIV is for intermittent partial respiratory support and should not be seen as an alternative to invasive mechanical ventilation when the latter is clearly indicated.^[1]

In this issue a single-center prospective study from India by Purwar *et al.*^[2] is unique as the authors faithfully highlighted the complications associated with NIV usage in their unit with respect to the associated morbidity and mortality.

It is interesting to note that in this busy critical care unit with an average of more than 6 admissions a day only 9.4% of admitted patients received NIV. There was a higher usage of NIV for Level II or III indications - 40.6% vs 59.4%. Failure of NIV was seen in 35.8% patients (i.e. required intubation). Failure was higher in group 2, but 27.9% of patients in group 1 failed as well. Another important observation is that 68.4% of patients who required intubation had delayed intubation with 31.6% patients requiring emergency intubation. Not surprisingly, this group had a higher mortality. The actual reason for higher mortality in groups 2 whether due to delayed intubation or to Level II or III indication is unclear. The authors have also pointed out this important limitation. The overall mortality in the study population (25.5%) is high for a mean APACHE score of 14.75. In contrast, a recent meta-analysis of randomized controlled trials (NIV vs standard medical

care), showed that the overall NIV failure occurred in only 16.3% (360/2198) of patients.^[3]

It seems that the focus in this study was on capturing only the intubation and mortality rates whereas data could have included important information on patient related factors of NIV failure, e.g. claustrophobia, hypotension, barotrauma and leaks.

The authors mention that NIV is generally used for indications beyond Level I in an attempt to minimize cost and complications of endotracheal intubation and mechanical ventilation. However, recent trends have clearly shown increasing NIV use as an initial therapy in acute care settings with the following physiological indications: Dyspnea with respiratory rate >25 breaths/min, Use of accessory muscles, PaCO₂ > 45 mm Hg with pH ≤ 7.35, PaO₂/FiO₂ <200 mm Hg, etc., regardless of the level of indication.^[4] Additionally, there is ample evidence of efficacy of NIV in community-acquired pneumonia, post-extubation failure in chronic obstructive pulmonary disease patients, postoperative respiratory failure (e.g. lung resection, bariatric surgery, coronary artery bypass graft).^[5]

The authors stated that indications outside of Level I recommendations lead to higher rates of NIV failure. NIV failure cannot be solely attributed to the indications of its use as it also depends on the lack of patient cooperation,

Access this article online

Website: www.ijccm.org

DOI: 10.4103/0972-5229.138138

Quick Response Code:



From:
Department of Pulmonology, Critical Care and Sleep Medicine, Saket City Hospital, New Delhi, India

Correspondence:
Dr. R K Mani, Director, Department of Pulmonology, Critical Care and Sleep Medicine, Saket City Hospital, Press Enclave Road, Mandir Marg, Saket, New Delhi - 110 017, India. E-mail: raj.rkmjs@gmail.com

asynchrony, leaks, presence of shock, a lower Glasgow coma score, and a lower PaO₂/FiO₂ ratio. Clinicians should remember that there are other important causes of immediate failure (within minutes to < 1 h) such as a weak cough and excessive secretions that can be prevented by adequate attention to physiotherapy. NIV failure may also result from care-giver factors such as delayed NIV initiation, inappropriate NIV settings, and inexperienced clinical team.^[1,5,6]

Physicians and other staff managing NIV must be aware of these risk factors and the various parameters of NIV failure that should be observed closely during the application of NIV. Bedside presence of experienced staff facilitates close monitoring, counseling and coaching of patients for success; it is also essential to detect early signs of deterioration for early switch to invasive ventilation.^[1,5,6]

Variations in clinical practice will always exist in NIV use as with other treatment modalities, but the importance of process, protocol and individual commitment needs to be emphasized at the organizational level. Ongoing training programs by dedicated staff are a must for NIV success. The indications for NIV is widening in its scope with the emergence of new evidence of its efficacy. The number of patients being initially managed by NIV is showing an exponentially increasing trend.^[1,7,8]

Moreover, NIV is expected to become more common mode of respiratory support in the Indian subcontinent where there is a major limitation of availability of invasive ventilators in the peripheral health care centers. The knowledge, experience and expertise of the physicians who prescribe and manage NIV are, therefore, crucial for NIV success. The importance of familiarity with the interfaces available and choosing the right interface cannot be underestimated. Low-dose analgesics/sedatives can also be judiciously employed in maximizing the comfort by reducing the anxiety and apprehension of patients.^[9] The nurse: patient ratio particularly important for NIV success. There is so much focus on developing expertise in invasive mechanical ventilation, but relatively less on that required for NIV application which is the first line respiratory support. This stems from a notion that NIV is relatively easy to apply, but in reality it is as demanding of expertise and time as invasive ventilation. NIV service in the hospitals should, therefore, incorporate a multidisciplinary team of physicians, nurses and physiotherapists experienced its application. We often encounter a lack of availability

of a range of interfaces in terms of both type and size that is essential for customizing for individual needs. In selected cases, a relatively expensive yet comfortable mask can avoid the greater expense of tracheal intubation.

Regardless of the level of indication an NIV trial must be employed in carefully selected individuals according to available evidence-based guidelines while monitoring carefully for the predictors for NIV failure. It is recommended that health care centers should have a specifically designated area, where patients on NIV are managed and monitored by experienced staff.^[1,5,6,8]

There is a paucity of data that reflect the quality of patient experience and comfort with NIV use. We recommend a pre or postdischarge questionnaire wherein specific aspects of patient experience are captured and audited for improved institutional protocols and patient outcomes. We should remember that the indications of NIV use need not be too rigid, and success depends significantly on a number of intangible factors such as the availability experience and skills of the healthcare personnel.

References

1. British Thoracic Society Standards of Care Committee. Non-invasive ventilation in acute respiratory failure. *Thorax* 2002;57:192-211.
2. Purwar S, Venkataraman R, Senthilkumar R, Ramakrishnan N, Abraham BK. Non-invasive ventilation – Are we overdoing it? *Indian J Crit Care Med* 2014;18:502-6.
3. Carron M, Fieo U, BaHammam AS, Dellweg D, Guarraicino F, Cosentini R, *et al.* Complications of non-invasive ventilation techniques: A comprehensive qualitative review of randomized trials. *Br J Anaesth* 2013;110:896-914.
4. Aboussouan LS, Ricourte B. Noninvasive positive pressure ventilation: Increasing use in acute care. *Cleve Clin J Med* 2010;77:307-16.
5. Nava S, Hill N. Non-invasive ventilation in acute respiratory failure. *Lancet* 2009;374:250-9.
6. Ozyilmaz E, Ugurlu AO, Nava S. Timing of noninvasive ventilation failure: Causes, risk factors, and potential remedies. *BMC Pulm Med* 2014;14:19.
7. Esteban A, Ferguson ND, Meade MO, Frutos-Vivar F, Apezteguia C, Brochard L, *et al.* Evolution of mechanical ventilation in response to clinical research. *Am J Respir Crit Care Med* 2008;177:170-7.
8. Del Sorbo L, Ranieri VM. We do not need mechanical ventilation any more. *Crit Care Med* 2010;38:S555-8.
9. Clouzeau B, Bui HN, Vargas F, Grenouillet-Delaere M, Guilhon E, Gruson D, *et al.* Target-controlled infusion of propofol for sedation in patients with non-invasive ventilation failure due to low tolerance: A preliminary study. *Intensive Care Med* 2010;36:1675-80.

How to cite this article: Saxena P, Mani RK. Noninvasive ventilation success: Combining knowledge and experience. *Indian J Crit Care Med* 2014;18:492-3.
Source of Support: Nil, **Conflict of Interest:** None declared.