

The Importance of Non-Invasive Mechanical Ventilation: Current Status in Iran

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Over the past two decades, the use of non-invasive positive pressure ventilation (NIPPV) has increased in many ICUs around the world (1). According to a study conducted in French, the use of non-invasive ventilation during 1994 to 2001 increased from 20 to 90% (2). The result of serial survey from more than 40 countries indicated that the overall use of NIPPV increased from 4.4% in 1998 to 14% in 2010 (3, 4).

NIPPV is used in wide variety conditions. It is a well-recognized approach in the management of acute respiratory failure, acute exacerbations of chronic obstructive pulmonary disease (COPD), hypoxemic respiratory failure, community-acquired pneumonia, cardiogenic pulmonary edema, and after solid organ transplants (5). It is also considered as the most effective treatment available for motor neuron disease when respiratory symptoms appear (6).

Non-invasive ventilation is a well-known strategy to avoid endotracheal intubation and its complications (7).

Endotracheal intubation in critically ill patients is accompanied by high risk and life threatening complications such as severe hypoxemia and hypotension, even in intensive care units (8). NIPPV reduces endotracheal intubation rate, mortality, and length of stay in the intensive care unit and it is a life-saving intervention (9-11).

NIPPV is also a cost-effective intervention (9). Results of a prospective observational study in India indicated that NIPPV can be a cost-effective intervention in countries with limited resources due to the decreased need for invasive mechanical ventilation (12). Use of NIPPV is not limited to intensive care unit. It is applicable in alternative settings with necessary recourses consisted of appropriate ventilator and mask, expert physicians, and other professional caregivers (13). The use of NIPPV outside the intensive care unit is an opportunity for reduction of the cost of care. Given the benefits of NIV, applying this approach to eligible patients who did not receive it is another opportunity which can reduce the cost of care and complications of invasive mechanical ventilation (14-16).

There is a lot of attention paid to NIPPV in interna-

tional database. An electronic search without any limitation in time was conducted in PubMed and ScienceDirect databases. The search terms employed were “NIPPV” OR “non-invasive positive pressure ventilation” OR “non-invasive ventilation”. Also, an evidence-based medicine database, the Cochrane library, was searched with keywords mentioned above. The number of retrieved articles is shown in Table 1. Persian databases such as “SID”, “Magiran” and “Barekat knowledge network system” were also searched using related keywords, and a few research papers about NIPPV were found in Iran (Table 1).

Using NIPPV requires a professional teamwork. As the same as anesthesiologists and intensivists, literature review of published articles indicates that nurses play an important role in the management of patients undergoing NIPPV (17-19). Also, in the research area, faculty nurses are interested to investigate NIPPV as an author (18, 20).

In recent years, an academic education course in critical care nursing master's degree has established in Iran. This course will provide expert nurses with the specific knowledge and skills to provide better nursing care for patients requiring NIPPV.

In spite of the importance of using NIPPV in the management of respiratory failure, there are some barriers which limit applying this method of treatment. Systematic use of NIPPV is limited to some educational centers and it has not been established in non-specialized hospitals. Lack of national guideline about the use of NIPPV could contribute to lack of use. Also, there is not any systematic knowledge about NIPPV indication, selection of appropriate patients, and necessary equipment and ventilator for appropriate utilization of this approach. Most specialists and other professional members also need to pass more educational courses about non-invasive mechanical ventilation. Another limitation in applying NIPPV is poor compliance. Enhancing patient compliance and comfort are key factors for successful use of NIV.

Choice of suitable interface, levels of pressure applied, position of the patient, synchrony of ventilation, pharma-

Table 1. The Number of Articles Retrieved from International Databases Based on Keywords

Keywords	Search Strategy	International Databases			Iranian Databases
		PubMed	ScienceDirect	Cochrane Library	SID Magiran Barekat knowledge network system
		Number of articles retrieved ^a			
“Non-invasive positive pressure ventilation”	OR	1453	1294	903 trials	Less than 30
“Non-invasive ventilation”				14 Systematic	
“NIPPV”				Reviews	

^aSearch without any limitation in time.

cotherapy for dyspnea, treatment of anxiety and pain, humidification of air flow, and palliation of symptoms are some factors that can enhance patient compliance and comfort (21).

Given the importance of systematic use of NIV for eligible patients, paying attention to this well-known approach by health policy-makers and intensivists is necessary. Designing a national and context based guideline by forming an expert panel of intensivists, anesthesiologists, pulmonologists, and other related health care providers is crucial. Successful implementation of such guideline is just possible with collaboration and support of health care policy makers.

References

- Hill NS. The worldwide spread of noninvasive ventilation; too much, too little or just right? *Tanaffos*. 2013;**12**(2):6-8. [PubMed: 25191455].
- Girou E, Brun-Buisson C, Taille S, Lemaire F, Brochard L. Secular trends in nosocomial infections and mortality associated with noninvasive ventilation in patients with exacerbation of COPD and pulmonary edema. *JAMA*. 2003;**290**(22):2985-91. doi: 10.1001/jama.290.22.2985. [PubMed: 14665660].
- 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**(2):170-7. doi: 10.1164/rccm.200706-893OC. [PubMed: 17962636].
- Esteban A, Frutos-Vivar F, Muriel A, Ferguson ND, Penuelas O, Abaira V, et al. Evolution of mortality over time in patients receiving mechanical ventilation. *Am J Respir Crit Care Med*. 2013;**188**(2):220-30. doi: 10.1164/rccm.201212-2169OC. [PubMed: 23631814].
- Elliott MW. Non-invasive ventilation for acute respiratory disease. *Br Med Bull*. 2004;**72**:83-97. doi: 10.1093/bmb/ldh042. [PubMed: 15802610].
- Cousins R, Ando H, Thornton E, Chakrabarti B, Angus R, Young C. Determinants of accepting non-invasive ventilation treatment in motor neurone disease: a quantitative analysis at point of need. *Health Psychol Behav Med*. 2013;**1**(1):47-58. doi: 10.1080/21642850.2013.848169. [PubMed: 25264500].
- Crimi C, Noto A, Princi P, Esquinas A, Nava S. A European survey of noninvasive ventilation practices. *Eur Respir J*. 2010;**36**(2):362-9. doi: 10.1183/09031936.00123509. [PubMed: 20075052].
- Griesdale DE, Bosma TL, Kurth T, Isac G, Chittock DR. Complications of endotracheal intubation in the critically ill. *Intensive Care Med*. 2008;**34**(10):1835-42. doi: 10.1007/s00134-008-1205-6. [PubMed: 18604519].
- Kaul S, Pearson M, Coutts I, Lowe D, Roberts M. Non-invasive ventilation (NIV) in the clinical management of acute COPD in 233 UK hospitals: results from the RCP/BTS 2003 National COPD Audit. *COPD*. 2009;**6**(3):171-6. [PubMed: 19811372].
- Kumar A, Kumar A, Rai K, Ghazal S, Rizvi N, Kumar S, et al. Factors leading to poor outcome of noninvasive positive pressure ventilation in acute exacerbation of chronic obstructive pulmonary disease. *J Acute Dis*. 2015;**4**(1):44-7. doi: 10.1016/s2221-6189(14)60081-0.
- Patel SP, Pena ME, Babcock CI. Cost-effectiveness of noninvasive ventilation for chronic obstructive pulmonary disease-related respiratory failure in Indian hospitals without ICU facilities. *Lung India*. 2015;**32**(6):549-56. doi: 10.4103/0970-2113.168137. [PubMed: 26664158].
- George I, John G, John P, Peter JV, Christopher S. An evaluation of the role of noninvasive positive pressure ventilation in the management of acute respiratory failure in a developing country. *Indian J Med Sci*. 2007;**61**(9):495. doi: 10.4103/0019-5359.34518.
- Cabrini L, Antonelli M, Savoia G, Landriscina M. Non-invasive ventilation outside of the Intensive Care Unit: an Italian survey. *Minerva Anesthesiol*. 2011;**77**(3):313-22. [PubMed: 21441886].
- Gay PC. Complications of noninvasive ventilation in acute care. *Respir Care*. 2009;**54**(2):246-57. [PubMed: 19173756] discussion 257-8.
- Fakharian A, Rabiei E, Nasiri A, Masjedi M. Non invasive positive pressure ventilation experience in Iran. *Eur Respirat J*. 2013;**42**(Suppl 57):P2493.
- Chiumello D, Conti G, Foti G, Giacomini MM, Braschi A, Iapichino G. Non-invasive ventilation outside the Intensive Care Unit for acute respiratory failure. *Minerva anesthesiologica*. 2009;**75**(7-8):459-66.
- Bambi S. Noninvasive positive pressure ventilation: an ABC approach for advanced nursing in emergency departments and acute care settings. *Dimens Crit Care Nurs*. 2009;**28**(6):253-63. doi: 10.1097/DCC.0b013e3181b3ffdc. [PubMed: 19855200].
- Stoltzfus S. The role of noninvasive ventilation: CPAP and BiPAP in the treatment of congestive heart failure. *Dimens Crit Care Nurs*. 2006;**25**(2):66-70. [PubMed: 16552275].

19. Ambrosino N, Vaghegini G. Noninvasive positive pressure ventilation in the acute care setting: where are we? *Eur Respir J.* 2008;**31**(4):874-86. doi: [10.1183/09031936.00143507](https://doi.org/10.1183/09031936.00143507). [PubMed: [18378782](https://pubmed.ncbi.nlm.nih.gov/18378782/)].
20. McEvoy RD, Pierce RJ, Hillman D, Esterman A, Ellis EE, Catcheside PG, et al. Nocturnal non-invasive nasal ventilation in stable hypercapnic COPD: a randomised controlled trial. *Thorax.* 2009;**64**(7):561-6. doi: [10.1136/thx.2008.108274](https://doi.org/10.1136/thx.2008.108274). [PubMed: [19213769](https://pubmed.ncbi.nlm.nih.gov/19213769/)].
21. Sanchez D, Smith G, Piper A, Rolls K. Non-invasive ventilation guidelines for adult patients with acute respiratory failure: a clinical practice guideline. Agency for Clinical Innovation NSW government version; 2014.