Expert consensus on clinical standardized application of high-flow nasal cannula oxygen therapy in adults

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High-flow nasal cannula oxygen therapy (HFNC) is a novel respiratory support technology and has been extensively applied in clinics in recent years. This therapeutic equipment mainly includes an air-oxygen blender, an active humidifier, a high-flow nasal cannula, and a connecting inspiratory circuit. It provides patients a humidified high-flow gas (8–80 L/min) with relatively stable oxygen concentration (21–100%), temperature (31–37°C) and performs oxygen therapy via a nasal cannula, which is very comfortable.^[1] Through inspiration of high-flow gases, HFNC can produce a certain level of positive end-expiratory pressure^[2] and wash the biological dead space of the upper respiratory tract.^[3] Gases with constant temperature and humidity provided through a high-flow nasal cannula can maintain the function of the mucociliary clearance system^[4] and reduce upper airway resistance and breathing effort of patients to improve gas exchange and partial ventilation functions.

The Pulmonary & Critical Care Medicine Group of Chinese Thoracic Society, Pulmonary & Critical Care Medicine Committee of Chinese Association of Chest Physicians, took the lead in writing an Expert Consensus on Clinical Standardized Application of HFNC Oxygen Therapy in Adults, with the goal of standardizing the clinical application of HFNC in China [Supplementary Digital content, <http://links.lww.com/CM9/A207>]. The standard of evidence levels were as follows: level I: high-quality randomized controlled trials (RCT), authoritative guidelines, and high-quality systemic reviews and meta-analyses; level II: RCTs with a certain study limitation (such as unconcealed grouping, no blind method, and failure to report loss to follow-up), cohort studies, case-series studies and case-controlled studies; and level III: case report and expert opinions.^[5] We have extracted the following aspects to present our viewpoints.

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1. The application timing, indications, and contraindications for HFNC are shown in Table 1.
2. For clinical application, this consensus has resulted in a flowchart for the clinical application timing of HFNC [Figures 1 and 2].

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Table 1: Indications and contraindications for the clinical application of HFNC.

Items	Descriptions
Indications	Mild-to-moderate type I respiratory failure ($100 \text{ mmHg} \leq \text{PaO}_2/\text{FiO}_2 < 300 \text{ mmHg}$) Mild respiratory distress (respiratory rate >24 times/min) Mild ventilatory dysfunction ($\text{pH} \geq 7.30$) People who have intolerance or contradictions to conventional oxygen therapy or NPPV
Relative contraindications	Severe type I respiratory failure ($\text{PaO}_2/\text{FiO}_2 < 100 \text{ mmHg}$) Ventilatory dysfunction ($\text{pH} < 7.30$) Paradoxical respiration Poor airway protection and high risk of aspiration People who have hemodynamic instability and require the use of vasoactive drugs People who cannot wear a high-flow nasal cannula because of facial or upper respiratory surgery Severe nasal obstruction HFNC intolerance
Absolute contraindications	People who have cardiac and respiratory arrest and require emergency tracheal intubation with invasive mechanic ventilation Weak spontaneous breathing and coma Very severe type I respiratory failure ($\text{PaO}_2/\text{FiO}_2 < 60 \text{ mmHg}$) Ventilatory dysfunction ($\text{pH} < 7.25$)

PaO_2 : Partial pressure of oxygen; FiO_2 : Fraction of inspired oxygen; NPPV: Non-invasive positive pressure ventilation; HFNC: High-flow nasal cannula oxygen therapy.

Figure 1: Application timing of HFNC for acute respiratory failure. PaO_2 : Partial pressure of oxygen; FiO_2 : Fraction of inspired oxygen; IPPV: Intermittent positive pressure ventilation; HFNC: High-flow nasal cannula oxygen therapy; NPPV: Non-invasive positive pressure ventilation.

Figure 2: Application timing of HFNC after extubation. Criteria for low risk of reintubation in the intensive care unit (ICU) (meet all following criteria): age <65 years; acute physiology and chronic health evaluation score II (APACHE II) < 12 points; body mass index (BMI) <30 kg/m²; patent airway; full expectoration; successfully weaning; number of complication ≤1; without heart failure, moderate-severe chronic obstructive pulmonary disease (COPD) and long-term mechanic ventilation.^[6] Criteria for high risk of reintubation in the ICU (meet at least 1 of the following criteria): age ≥65 years; heart failure; APACHE II ≥ 12 points; BMI ≥30 kg/m²; expectoration weakness or substantial discharge; at least one spontaneous breathing trial failure; number of complication >1; and invasive mechanic ventilation >7 days.^[7,8] HFNC: High-flow nasal cannula oxygen therapy; ICU: Intensive care unit; IPPV: Intermittent positive pressure ventilation; NPPV: Non-invasive positive pressure ventilation.

Conflicts of interest

None.

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