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EDITORIAL

High-flow nasal therapy: a game-changer in anesthesia and perioperative medicine?

High-flow nasal therapy (HFNT) is an advanced technique that involves delivering humidified and heated gas to the respiratory tract through the nostrils using nasal prongs. This method employs significantly higher flow rates than those typically used in conventional oxygen therapy.[1] The primary mechanisms of action and physiological advantages of HFNT, in contrast to conventional oxygen therapy, are rooted in its ability to optimally condition the administered gas. This is achieved by closely simulating natural physiological conditions through effective warming and humidification of nasal air/oxygen mixtures. Consequently, the flow of oxygen is better tolerated, leading to heightened respiratory comfort. HFNT brings about several key benefits when compared to conventional oxygen therapy. It leads to a reduction in both dead space and on the effort required for breathing. Notably, the nasal cannula generates continuous positive pressure within the pharynx, reaching levels of up to 8 cmH_2O. Depending on the flow rate and the degree of mouth opening, this positive pressure facilitates lung expansion, ensuring the recruitment of lung tissue and reducing the degree of ventilation-perfusion mismatch in the pulmonary system. Moreover, the end-expiratory lung volume achieved with HFNT surpasses that achieved with low-flow oxygen therapy. A significant advantage of HFNT is its non-dependence on patient cooperation, making it particularly suitable for patients who may struggle to comply with other therapies. However, beyond its convenience, HFNT is generally better tolerated, simpler to administer, and requires less equipment, thereby alleviating nursing workload.[2]

Numerous studies have highlighted the efficacy of HFNT in providing effective assistance for the management of mild to moderate acute hypoxemic respiratory failure.[3,4] However, there is a paucity of evidence concerning its impact on resource utilization. While the costs associated with materials, setup, and oxygen consumption for high-flow nasal cannula (HFNC) are likely to exceed those of conventional oxygen therapy, the potential cost savings from averting intubation and related ancillary expenses should not be overlooked.[5] While HFNT has undergone extensive examination in intensive care settings, its applicability in the intraoperative context for surgical patients remains relatively understudied. Furthermore, its comparative effectiveness in relation to conventional oxygenation methods is not yet definitively established.[1,6]

Presently, there is an expanding body of evidence regarding the utilization of HFNT in perioperative medicine.[7] Employing HFNC oxygen therapy in the preoperative, intraoperative, and postoperative phases presents a promising novel technique aimed at enhancing lung function and, potentially, patient outcomes.[6] For adults, routine pre-oxygenation prior to anesthesia induction is recommended to manage unexpected challenging tracheal intubation.[8] Studies investigating pre-oxygenation through HFNC have yielded mixed findings. Notably, HFNT has demonstrated its advantages in prolonging apnea duration in patients with difficult airways undergoing general anesthesia.[8] The data indicates that despite an average apnea duration of 17 minutes, none of the patients experienced desaturation below 90%. Additionally, no instances of cardiac arrhythmias or other complications suggestive of carbon dioxide toxicity were observed.[8] When compared to facemask pre-oxygenation, HFNC pre-oxygenation is not only more comfortable for patients but also easier for anesthesiologists to administer. Recent studies have underscored the benefits of HFNC-based pre-oxygenation.[9-11] However, the literature lacks studies assessing cost-effectiveness, along with investigations that establish a reduction in pulmonary complications and improved outcomes. Nevertheless, the prospect of increasing safe apnea duration holds the potential to revolutionize anesthesia practices, particularly in scenarios involving emergency settings, challenging intubations, and high-risk patients.

When compared to conventional oxygen therapy, HFNT has reduced the occurrence of hypoxemia, elevation in the lowest SpO_2 levels, and a reduction in the length of hospital stay among obese patients throughout the perioperative phase.[12] Consequently, it is imperative to undertake additional extensive clinical trials that consider factors such as intervention

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timing, surgical procedures, degrees of obesity, and precise definitions of hypoxemia. These trials are essential to establish the effectiveness of HFNT in the surgical setting.

HFNT for patients submitted to surgery without tracheal intubation or in endoscopic procedures remains a subject of controversy and requires further investigation. A recent meta-analysis[13] provides moderate-quality evidence suggesting that HFNT is an efficacious intervention for lowering the incidence of hypoxemia during procedural sedation. Moreover, there is moderate evidence indicating that HFNT can enhance minimum observed oxygen saturation levels and reduce the need for minor airway maneuvers. Additionally, although with lower quality of evidence, the meta-analysis suggests that HFNT can reduce procedural interruptions. In the context of adult post-cardiothoracic surgery, HFNT shows promise in reducing the need for respiratory support and curtailing pulmonary complications. Importantly, its safe administration has been demonstrated after extubation in cardiovascular surgical patients, with no discernible impact on hemodynamic status. Notably, patients undergoing thoracic surgery often face elevated risks of pulmonary complications and frequently experience compromised gas exchange. In this scenario, HFNT emerges as a potentially viable alternative for postoperative care. In the case of prophylactic HFNT, compared to conventional oxygen administration, it has been associated with decreased hospital length of stay and improved patient satisfaction following lung resection. However, the composite occurrence of postoperative pulmonary complications exhibited no distinction between HFNT and conventional oxygen therapy.[14] Although evidence favoring HFNT over alternative techniques exists,[6] it remains limited, underscoring the necessity for large-scale trials to provide more substantial insights.

There are limited studies on the perioperative use of HFNT in pediatric procedures. It is plausible that HFNT presents an avenue for enhanced oxygenation during elective fibrobronchoscopy, displaying a notable decrease in desaturation incidents. Hence, it can be considered a viable approach for delivering oxygen in the pediatric population.[13] Notably, while its established application in intensive care and for treating bronchiolitis is well acknowledged, studies validate that HFNT surpasses conventional oxygen therapy in aspects such as treatment efficacy, duration of oxygen therapy, and hospital length of stay in these scenarios.[15]

In summary, HFNT has demonstrated its ability to enhance patient outcomes in cases of hypoxemia, although most of the evidence stems from studies conducted in intensive care units. Within perioperative settings, ongoing research is shedding light, yet there remains a demand for supplementary evidence to establish its efficacy. Investigations propose that HFNT could play a pivotal role in enhancing preoxygenation and may also be valuable after extubation. However, it is crucial to acknowledge that conclusive data are restricted, underscoring the requirement for interventions that adhere to standardized HFNT protocols, incorporate relevant clinical comparators, and assess pertinent outcomes. This approach is essential in pinpointing the specific patient population for whom HFNT offers the most substantial benefits. In the trajectory of future research, there are three pivotal questions that need elucidation: first, which patients will derive the greatest advantages; second, the optimal timing for commencing treatment and any necessary escalation; and third, the requisite attention to appropriate settings, training, and vigilant monitoring of the response to therapy. This multifaceted approach will be instrumental in unraveling the full potential of HFNT and its precise role in patient care.

Conflicts of interest

The authors declare no conflicts of interest.

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