THE EUROPEAN SOCIETY OF MEDICINE
Medical Research Archives, Volume 14 Issue 5

REVIEW ARTICLE

High Flow Nasal Cannula and High Velocity Nasal Insufflation as a Goal-Concordant Support Tool for Dyspnoea Relief in Palliative and End-of-Life Care

Megan G. Wooldridge

Department of Medical Affairs, Vapotherm, Exeter NH.

megangwooldridge@icloud.com

OPEN ACCESS

PUBLISHED
31 May 2026

CITATION
Wooldridge, M.G., 2026. High Flow Nasal Cannula and High Velocity Nasal Insufflation as a Goal-Concordant Support Tool for Dyspnoea Relief in Palliative and End-of-Life Care. Medical Research Archives, [online] 14(5).

ISSN
2375-1924

ABSTRACT

Background: Dyspnoea is a prevalent and distressing symptom experienced by patients advanced respiratory and non-respiratory diseases, particularly near the end-of-life. Symptom control with pharmacological and non-pharmacological therapies is frequently incomplete, with some respiratory support compromising comfort, communication, or care-goal concordance. High-flow nasal cannula therapy, including high velocity nasal insufflation, has emerged as an option for relieving breathlessness while preserving patient interaction and dignity.

Aim and scope: This systematic literature review synthesises international evidence on high-flow nasal cannula and high velocity nasal insufflation for dyspnoea relief in palliative and end-of-life care, with a primary focus on chronic respiratory diseases (chronic obstructive pulmonary disease and interstitial lung disease). Evidence from mixed-aetiology cohorts, including cancer and paediatric populations, was included for contextual insight.

Results: Twenty-seven eligible publications were identified following database screening and eligibility assessment. Across study designs, high-flow nasal cannula was associated with lower patient-reported dyspnoea and improved comfort, with better tolerance than conventional oxygen therapy or mask-based non-invasive ventilation. Several studies reported preserved oral intake, communication, and family interaction. A randomised controlled trial in palliative patients with do-not-intubate status found superior dyspnoea relief with high-flow nasal cannula compared to conventional oxygen therapy. Evidence regarding survival impact remains limited; available data suggest that high flow nasal cannula was used primarily for symptom relief rather than life prolongation.

Discussion: High-flow nasal cannula and high velocity nasal insufflation have been implemented as comfort-focused respiratory support, particularly in hypoxaemic cohorts. However, heterogeneity in population, intervention, and outcome measures limited generalisability. Clinician uncertainty regarding initiation, continuation, and withdrawal of high flow nasal cannula at the end-of-life remains.

Conclusion: Available evidence supports high-flow nasal cannula and high velocity nasal insufflation as valuable interventions for dyspnoea relief in palliative and end-of-life care, with particular relevance to chronic respiratory disease progression. Reactive palliative consultations should be given when terminal prognoses are identified. Further prospective research is needed to investigate high velocity nasal insufflation as a goal concordant dyspnoea management strategy, and to create standardised guidance that includes time-limited trials and withdrawal practices in palliative settings.

1. Introduction:

Dyspnoea is a complex, subjective experience often reported as difficulty breathing, increased effort of breathing, and breathlessness by patients with advanced respiratory and non-respiratory diseases.[1] Although patients with chronic respiratory diseases such as chronic obstructive pulmonary disease (COPD) and interstitial lung disease (ILD) commonly experience dyspnoea, it is a near ubiquitous symptom in palliative populations, with prevalence increasing towards the end-of-life.[1–3] Dyspnoea severity often correlates to poorer physiology, increased anxiety and fear, and loss of dignity for the patient, which complicate assessment and treatment decisions once goals of care become comfort and palliation.[1–4]

Multiple tools exist to conceptualise a 'good death' for patients, namely, the modified BORG scale, and Quality of Death and Dying questionnaire (QODD). The modified BORG scale (0-10) is commonly used to quantify a patient's subjective sensation of breathlessness; in palliative care this should be assessed at rest and appropriate support given to decrease score.[5] The QODD evaluates 31 characteristics of the end-of-life experience on a 0-10 scale, with high and medium-priority characteristics including pain, breathing comfort, ability to feed oneself, maintained dignity, avoidance of life support, and the ability to laugh and smile with loved ones.[6]

Clinicians must balance symptom burden and therapy limitations when escalating respiratory support in palliative settings, particularly when goals of care are comfort rather than life prolongation. For example, non-invasive ventilation (NIV) utilises a tight-fitting face mask which enhances ventilation by increasing the inspired volume of air. This pressure-based therapy is associated with high intolerance and facial trauma but works to resolve symptoms of dyspnea.[7] Conversely, conventional oxygen therapy (COT) has been shown to provide some physiological improvement but may not offer full relief, however, it allows the patient to maintain communication, and oral intake.[8,9] High-flow nasal therapy (HFNC) and high velocity nasal insufflation (HVNI) should be explored as an alternative 'middle ground' intervention between COT and NIV, as evidence supports initiation reduces work of breathing while maintaining ability to eat, drink and speak.[10,11]

1.1 BACKGROUND:

Dyspnoea is among the most observed symptom in palliative populations with 88% of patients experiencing breathlessness, which was reported as 'severe' in half of patients studied.[3] Symptom burden also significantly increases in the last months of life, with dyspnoea found to be the fourth most common reason palliative care patients visit the emergency department (ED).[2] Furthermore, in advanced diseases, dyspnoea and distress significantly increase in the last days of life ($p < 0.0001$).[1] Effective symptom management for dyspnoea relief is therefore a central component of palliative care. However, a survey by Marie Curie reported that, in the United Kingdom, only 50% of dying patients received a palliative consultation, despite 90% requiring access to palliative services.[12] Decisions for managing distressing symptoms at the end-of-life should be made through a collaborative palliative consultation when quality of life is severely compromised or when life prolonging interventions are inappropriate or declined.[13] This may present as a patient requesting a do-not-intubate (DNI) status, which prohibits application of invasive mechanical ventilation, but allows for interventions such as NIV, where the line between symptom management and corrective or life-prolonging therapy may be less clear. This becomes particularly difficult when considering the complication and intolerance rate associated with NIV.[3] Within this context, HFNC and HVNI may represent a valuable modality that can be applied as an alternative to NIV, especially for patients with DNI who are on comfort based care.

1.2 AIM & SCOPE:

The aim of this literature review is to synthesise international evidence and practise considerations on HFNC and HVNI as a goal-concordant intervention for dyspnoea relief in palliative and end-of-life care, focusing on the chronic respiratory disease cohorts of COPD and ILD. Upon initial searches, it was clear that a breadth of literature existed reporting on the application of HFNC and HVNI to relieve dyspnoea in mixed-aetiology palliative care populations. These populations similarly experienced persistent breathlessness at the end-of-life and are included to contextualise feasibility, intolerance rates, and ethical practice contention.

1.3 DEFINING PALLIATIVE CARE:

Palliative care is a specialised approach to medical care that aims to optimise quality of life by alleviating

suffering in patients with life-limiting conditions through symptom control, comfort measures, and pain management. It is relevant at all stages of illness, including alongside disease-directed treatment, as well as at the end-of-life. Although palliative care is often associated with malignant disease, most patients with advanced, progressive, and irreversible non-malignant conditions will also require palliative support.[14,15] As illness progresses, patients frequently experience increasing symptom burden, recurrent hospitalisations, and high healthcare utilization.[16] Palliation represents the act of moving away from curative intent toward comfort-focused care that supports both the patient and their family by preserving meaningful interaction and minimising distress, which are high priority objectives in the QODD.[6]

1.4 CURRENT PALLIATIVE DYSPNOEA MANAGEMENT LANDSCAPE:

Whilst research is ongoing, a growing body of evidence supports HFNC and HVNI use in a palliative setting. Current respiratory guidance recommends HFNC for hypoxemic respiratory failure and has been shown to be non-inferior to NIV in this setting.[17] In addition, HVNI has been clinically demonstrated to have comparable outcomes to NIV in treating both hypoxemic and hypercapnic respiratory failure (non-inferior, $p < 0.005$).[10] Both HFNC and HVNI deliver heated, humidified gas through a nasal cannula to improve gas exchange and reduce work of breathing for spontaneously breathing, alert and oriented patients who can protect their airway.

It is well established that HFNC and HVNI are more comfortable than NIV. When compared with COT and NIV, HFNC based therapies are less claustrophobic, better tolerated, and allow patients to eat, drink, speak, and interact with family members, with HVNI having demonstrated superior comfort ratings in multiple randomised controlled trial settings.[10,18] Olsson-Moller et al., surveyed palliative patients' priorities and wishes, and of the 46 listed; 'being able to move around' ranked 3rd, 'not being short of breath' ranked as 4th, and 'being able to eat and drink' ranked 7th, highlighting the value placed on patient wishes for autonomy.[19]

In a subgroup analysis of patients with acute decompensated heart failure, Haywood, et al. investigated physician reported comfort of HVNI vs NIV. Patients experienced significantly higher comfort levels with HVNI technology (excellent vs adequate, $p<0.001$) and reported patients had the ability to eat, drink, take oral medications, wear hearing aids and glasses, as well as talk and cough whilst on HVNI.[20] Furthermore, the Intensive Care Society have stated that all palliative care patients nursed in a critical care environment should have the opportunity for transfer to an outdoor space, which is possible on more recent HVNI and HFNC devices with internal batteries (e.g HVT2.0, Vapotherm, NH), but may be more logistically complex for NIV and COT supported patients.[21]

1.5 SYMPTOM VS TREATMENT BURDEN:

For patients receiving palliative care, clinicians are frequently required to balance symptom relief against delivering care which may not align with patient goals and/or may cause unnecessary suffering. Unlike invasive ventilation, HFNC is often used in awake, communicative patients, making withdrawal of life-sustaining therapy emotionally complex.[22] A recent survey examining HFNC use at end-of-life found that only 58% of respiratory therapists agreed that comfort-focused goals influenced their HFNC management, and nearly half reported moral or emotional distress related to HFNC use in end-of-life care. However, the majority perceived HFNC as beneficial for relieving dyspnoea in conscious and hypoxemic patients, 73% and 70%, respectively.[23]

Current dyspnoea management strategies include opioids, anxiolytics, COT, and NIV. While effective for some patients, these approaches may result in sedation, impaired communication, intolerance, or discomfort.[18] Non-invasive ventilation in particular has been associated with high intolerance and failure rates (18-40%; mostly due to discomfort), and preventable injuries.[24] A reported 70% of patients experience pressure ulcers within the first 48 hours of NIV, and a further 5-50% of patients suffer facial skin breakdown.[25] The 'Clinical Practice Guidelines for Caregivers of Palliative Care Patients' state that avoiding pressure ulcers help a patient to achieve the 'best quality of life', and 'spend the last days of life peacefully and comfortably with dignity'.[26]

These limitations prompt investigation into alternative support strategies for relieving dyspnoea in palliative populations. In addition, the

development of clearer frameworks that clarify end-of-life objectives for individual patients is important to alleviate clinician uncertainty when initiating palliative therapies.

2. Methods:

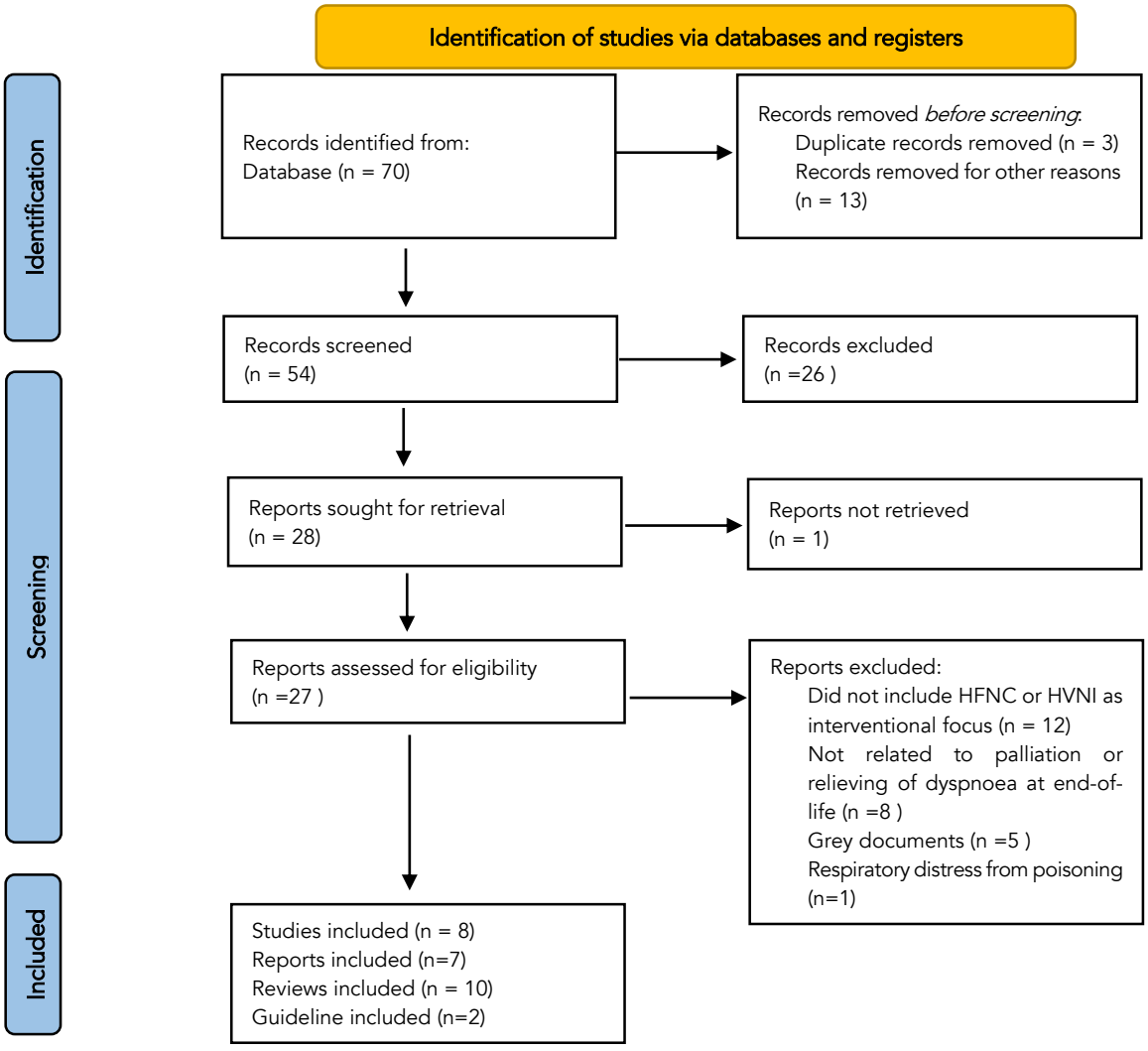
Searches were performed in PubMed and limited to peer-reviewed publications in English. Titles and abstracts were screened, followed by full-text reviews against predefined inclusion/exclusion criteria (Section 2.1). Data were extracted on population, setting, intervention parameters, comparator therapy, dyspnoea, comfort outcomes, and ethical considerations. Given the heterogeneity of study designs and outcomes, findings were synthesised narratively focusing on chronic respiratory disease associated palliative dyspnoea, with attention to patient-centred outcomes and end-of-life decision-making contention. Grey literature such as conference abstracts, letters to the editor or narrative opinion pieces were excluded from this review, as were papers not focused on palliation or dyspnoea relief, or studies without HFNC/HVNI as an intervention. Results from this systematic literature review were captured in Figure 1.

2.1 SEARCH TERMS USED:

("high flow nasal cannula"[Title/Abstract] OR "high-flow nasal cannula"[Title/Abstract] OR HFNC [Title/Abstract] OR "high flow nasal oxygen" [Title/Abstract] OR HFNO[Title/Abstract] OR "high velocity nasal insufflation" OR "HVNI" OR "high velocity therapy" OR "Vapotherm") AND ("palliative care"[MeSH Terms] OR "palliative care"[Title/Abstract] OR "end of life"[Title/Abstract] OR "end-of-life"[Title/Abstract] OR terminal[Title/Abstract] OR hospice[Title/Abstract])

2.2 PRISMA DIAGRAM:

Figure 1: PRISMA diagram for systematic review on application of HFNC and HVNI for dyspnoea relief in palliative care. *HFNC = High flow nasal cannula, HVNI = High Velocity Nasal Insufflation*



3. Discussion:

The most common study types recorded were real-world descriptive evidence papers including case reports (n=5) and retrospective cohort analyses (n=6), followed by literature syntheses made of reviews (n=7) and meta-analyses (n=3) (Table 1). This spread of small heterogenous primary studies allow us to discuss the potential benefits of HFNC and HVNI implementation, but require further feasibility focused trials to conclude superiority, or non-inferiority for dyspnoea relief and QODD metrics in specified palliative care populations.

Most publications reported on palliative care in the hospital environment for mixed-aetiology patients, where HFNC and HVNI equipment is most likely to be situated and set up by staff with continuous monitoring in place. Six publications reported on palliative care with HFNC or HVNI in the home environment, which is important to consider as a place-of-death preference. It is difficult to bracket current literature into discreet categories of home vs hospital, therefore single disease populations with chronic respiratory diseases are described foremost. The evidence presented is largely observational, with variability in outcome measures, and few studies prioritising patient-reported outcomes. Additionally, clinician perspectives reveal ongoing ethical uncertainty, particularly around withdrawal practices.

The consistency of reported symptom relief across heterogeneous study designs suggest HFNC and HVNI can be applicable to undifferentiated respiratory distress despite the limited availability of high-quality randomised data in specified cohorts. These findings suggest that HFNC and HVNI are an additional therapeutic option between COT and NIV, but its role requires clearer conceptualisation as part of an individualised goal concordant palliative care plan.

Table 1: Study Breakdown. *RCT = Randomised Controlled Trial, US = United States, ILD = interstitial Lung Disease, COPD = Chronic Obstructive Pulmonary Disease*

Metric	Count
Study Type	
Review	7
Meta-analysis	3
RCT	1
Case Report	5
Retrospective	6
Prospective	1
Cross-sectional	1
Guideline	2
Survey	1
Country	
US	7
Japan	5
Italy	4
Australia	2
Other Europe	4
Asia (excl. Japan)	3
India	1
Canada	1
Population	
Adult	21
Elderly	4
Paediatric	2
Condition	
Cancer	6
ILD	6
COPD	2
Multiple	11
Other	2
Care Location	
Hospital	20
Home	6
Hospice	1
Total Papers	**27**

3.1 HIGH FLOW NASAL CANNULA AND HIGH VELOCITY NASAL INSUFFLATION:

Both HFNC and HVNI have increasing data to suggest utility in reducing escalation of ventilatory therapy in DNI patients in end stage respiratory failure.[13] Generally, HFNC and HVNI share similar physiological advantages over COT including 1) capability to administer precise fraction of inspired oxygen (FiO_2) values ranging from 21 to 100% (0.21-1.0); 2) delivery of heated and humidified gases; 3) matching inspiratory flow demand of patient; 4) enable patients to eat, drink, and speak freely while still receiving therapy; 5) minimal stenting effect on upper airways and alveolar recruitment from flow-dependant positive end expiratory pressure (PEEP) generation.[27,28]

Interestingly, HVNI may extend the utility of HFNC at the end-of-life, as the design utilises symmetrical small bore nasal cannula to enhance flush mechanism by generating higher gas velocity and kinetic energy. This increased speed of gas delivery, results in greater nasopharyngeal dead space flush at equivalent HFNC flow rates.[28] High velocity nasal insufflation was associated with lower end-exhalation carbon dioxide (CO_2) remaining in upper airway than HFNC (27% less in healthy airway, and 54% less in inflamed models), and significantly reduced purging time of extra-thoracic CO_2 (HVNI vs HFNC, 2.2s vs 3.6s; 64% longer in HFNC).[27,28] This difference can be meaningful when considering that end-of-life breathing may be tachypnoeic.[29]

No direct comparative studies on patients treated with HVNI vs HFNC are present in the literature. However, as HVNI may be considered a specialised form of HFNC, the wider HFNC literature presented supports HVNI use, while mechanistic differences in cannula design and gas delivery suggest potential benefits that extend beyond those described in generic HFNC studies.

3.2 HOME PALLIATIVE RESPIRATORY SUPPORT FOR CHRONIC OBSTRUCTION PULMONARY DISEASE PATIENTS:

Use of HFNC and HVNI in COPD populations, for both acute hypoxic and hypercapnic respiratory failure are very well evidenced, particularly in acute exacerbations of COPD. Multiple studies defined HVNI specifically as non-inferior to NIV in hypercapnic cohorts, due to its enhanced nasopharynx CO_2 wash out and ventilatory mechanism of action.[10,11,30] Home-based retrospective comparisons and case reports of long-term HFNC and NIV in end-stage COPD disease are presented here.

In advanced COPD, HFNC was reported to be better tolerated than NIV, particularly in the final months of life. Weinreich et al. demonstrated that while both long-term HFNC (LT-HFNC) and long-term NIV (LT-NIV) reduced hospitalisations earlier in the disease course, patients overwhelmingly transitioned to HFNC alone near the end-of-life due to intolerance of mask-based ventilation. When both modalities were offered to patients, 25% of LT-NIV patients stopped treatment after HFNC was available. In the last three months of life, 59% patients stopped using LT-NIV, whereas 91% continued to use LT-HFNC.[31]

In a home-based case report, a 76-year-old patient with severe COPD and associated pulmonary hypertension illustrated HFNC had potential to enable discharge, maintain comfort, and allow patients to remain in their preferred environment. The patient was successfully discharged from hospital and managed at home using HFNC (40l/min, FiO_2 36%) for approximately one month up until his death. Symptom relief was closely linked to preserved alertness and the ability to eat, drink, and converse, which were criteria emphasised as markers of benefit.[32]

Although data are sparse, available evidence suggests HFNC may serve as a terminal-phase alternative to NIV in COPD, particularly when tolerance and comfort are primary goals.

3.3 HOSPITAL PALLIATIVE RESPIRATORY SUPPORT FOR INTERSTITIAL LUNG DISEASE PATIENTS:

Interstitial Lung Disease represents a distinct palliative cohort characterised by progressive hypoxemia, high symptom burden, and limited reversibility. Multiple retrospective comparisons reported that patients receiving HFNC were more likely to maintain oral intake, communicate until death, and avoid intensive care unit (ICU) death compared with NIV or invasive ventilation.[33–35] Across ILD studies, HFNC demonstrated equivalent survival to NIV, with superior tolerability and lower discontinuation rates. In addition, HFNC has been associated with less use of analgesics and sedatives when compared to invasive ventilation.[36]

When comfort is the primary goal for DNI patients, HFNC was not associated with survival (hazard

ratio: 0.79, p = 0.600). Compared to an oxygen reservoir mask, patients on HFNC were able to drink for a significantly longer period (7.5 vs 0.3 days), HFNC was well tolerated, with 33% of patients on masked therapy switching to the HFNC arm, thereafter the continuation rate was 100% until death.[35] Similarly, Koyauchi et al. found patients using HFNC had significantly fewer adverse events, and significantly lower interruption and discontinuation rates when compared to NIV. HFNC also enabled significantly better oral intake and ability to converse until just before death.[34]

In a multicentre study, Koyauchi found that QODD metrics, particularly the Good Death Inventory (GDI), favoured HFNC over COT and invasive modalities. Patients treated with HFNC had the highest GDI score for QODD and highest 'physical and psychological comfort' domain, which were both significantly higher than all other indications (NIV, COT, Invasive ventilation). Family-reported outcomes also indicated higher scores for physical and psychological comfort among HFNC-treated patients, reinforcing value beyond physiological endpoints.[33]

Taken together, HFNC offers end-of-life ILD patients symptom relief and preserved interaction without the burdens associated with NIV or invasive ventilation. Importantly, these benefits were achieved without increased adverse events, even in patients with DNI orders.[33–35] The consistency of findings across settings suggests HFNC is a reasonable palliative standard for hypoxemic ILD patients when goals prioritise comfort and quality of death rather than survival extension.

3.3 HOSPITAL PALLIATIVE RESPIRATORY SUPPORT FOR PALLIATIVE CANCER PATIENTS:

Cancer patients represent the most extensively studied palliative population receiving HFNC/ HVNI in this review, spanning retrospective cohorts, prospective studies, meta-analyses, and case reports across hospital and hospice settings. These studies predominantly involve patients with advanced malignancy, hypoxemic respiratory failure, and documented treatment limitations including DNI orders.

Across cancer-specific studies, HFNC was consistently associated with clinically meaningful reductions in subjective dyspnoea, most commonly measured using the modified BORG scale or numeric rating scales.

The prospective study by Takase et al. demonstrated early dyspnoea improvement within two hours of HFNC initiation, with sustained benefit over 24 hours in more than half of participants, despite limited median survival. Within 24 hours, the change of mean modified BORG scale in responders was 2.7, and five patients (24%) showed ≥3.0 points improvement. Benefit was greatest among early responders, suggesting HFNC functions as a time-limited symptomatic intervention rather than a disease-modifying therapy.[49] Regarding tolerability, half of the patients continued HFNC for five days despite median survival of 19 days. It was concluded that even several days of improvement in quality of life would be beneficial.[49]

In a retrospective study on late palliative respiratory failure by Kim et al, it was found most patients were conscious (79.3%),and had resting dyspnoea (76.3%). Sixty-two percent of patients initiated HFNC within 4 days of death (62.6%), with HFNC frequently continued until death (88.8%). This did not meaningfully alter opioid requirements or survival, reinforcing that HFNC has a role as symptom directed support rather than life prolonging treatment. Among the 37 patients in the HFNC-free state at death, 37.8% were weaned, and 62.2% withdrew. Preservation of alertness, oral intake, and communication was repeatedly reported, even in imminently dying patients.[50]

Meta-analyses included support for HFNC as an effective nonpharmacological intervention for dyspnoea relief in cancer populations, particularly in hypoxemic patients. Hentsch et al found HFNC significantly improved dyspnoea compared to COT control (n=272).[51] Similarly, in another meta-analysis including 3,832 patients, HFNC demonstrated the most significant improvement in dyspnoea relief when compared to activity rehabilitation, corticosteroids and integrative medicine.[52] However, heterogeneity in effect size and limited benefit in non-hypoxemic palliative patients, relay the importance of patient selection. There is opportunity to investigate effectiveness of HVNI in non-hypoxemic palliative populations, as current evidence shows non-inferiority to NIV in undifferentiated respiratory distress.[30,53]

3.5 FURTHER PALLIATIVE RESPIRATORY SUPPORT IN THE HOME ENVIRONMENT:

Domiciliary HFNC, commonly referred to as LT-HFNC was associated with maintained comfort, reduced

hospitalisation, and acceptable survival in selected patients with advanced respiratory disease.[37–39]

Described practical benefits of home HFNC implementation included secretion management, stable oxygen delivery, and caregiver acceptability.[40,41] Logistical challenges such as oxygen supply, humidification requirements, and monitoring were recurrent themes.[38,39] The palliative value of HFNC is illustrated by Goda et al., who reported prolonged home-based end-of-life care in a patient with terminal interstitial pneumonia using domiciliary HFNC alongside continuous subcutaneous morphine. The patient achieved sustained relief of dyspnoea, maintenance of oral intake and communication, and avoidance of repeated hospitalization.[39]

While not universally applicable, home HFNC may enable place-of-death preference fulfilment for carefully selected patients, supporting its role as a palliative option rather than a routine intervention. Together, these findings highlight HFNC as a goal-concordant intervention that prioritizes comfort, reduces respiratory suffering, and supports patient-defined end-of-life preferences.

3.5.1 Home Palliative Respiratory Support for Paediatric Populations:

This literature review was not bracketed by age. It is important to discuss paediatric palliation as care goals can be different to adult or elderly populations.

In a 10 year retrospective cohort, D'Arienzo et al. described significantly increasing use of home HFNC in children with multisystem disease, the majority of whom had underlying genetic conditions and complex care needs, including a subset receiving HFNC for palliative indications (n=35, 6 months -14 years). HFNC was initiated after intolerance of mask based continuous positive airway pressure (CPAP) or Bi-level positive airway pressure (BiPAP) in 37% of cases. Complications were rare, with only two children developing epistaxis requiring an ED visit and 4 children requiring escalation to in-home CPAP or BiPAP.[38]

A 2023 case report by Gomes et al., describes a 14-year-old male with severe primary ciliary dyskinesia, possessing a rare genotype associated with mucociliary clearance disturbance, resultant of impaired motile cilia function. Despite being on home-NIV, symptoms progressed to dyspnoea. Daytime HFNC was started at 30L/min at FiO_2 0.32, and NIV maintained at night, alongside opioid therapy. Patient was able to attend school on COT. The patient was considered for lung transplant as FEV1 was less than 40%, with hypoxemia and hypercarbia present. With HFNC initiation, 24-hour oximetry revealed an increase in mean oxygen saturation (SpO_2), up to 97%, and a reduction in mean heart rate. Marked improvements in dyspnoea, work of breathing, exercise tolerance, and overall comfort were seen.[42]

It is important to also consider that delivery of humidified and heated gas can provide symptom relief independently to oxygenation benefits. Heating and humidification of inspired gas to near-isothermal saturation boundary levels (~37° C, 33-44 mg H_2O /L) improves ciliary function and mucus hydration, which assists mucociliary clearance and reduces metabolic work of breathing.[43–45]

3.6 HOSPITAL PALLIATIVE RESPIRATORY SUPPORT FOR MIXED-AETIOLOGY DYSPNOEA RELIEF:

In-hospital use of HFNC and HVNI represented the most studied environment with ratio of hospital vs home studies of n=20 vs 6. One in four patients (27%) with acute respiratory failure receiving NIV or HFNC at the hospital have a DNI order in place.[46] Heterogeneous and mixed aetiology populations with advanced respiratory failure, unified by DNI status or palliative intent, rather than a specific diagnosis, were investigated in this literature review to examine utility of HFNC and HVNI for symptom relief in undifferentiated respiratory distress.

A randomised controlled trial by Ruangsomboon et al. provided the strongest experimental evidence demonstrating superior dyspnoea relief and reduced respiratory rate with HFNC compared with COT within one hour of initiation. Initial HFNC settings were 35 l/min, adjusted to comfort and titrated to achieve SpO_2 > 95% for 60 minutes. Mean modified BORG scale showed significant reduction with HFNC compared to COT, with mean respiratory rate also significantly decreased (mean differences; BORG 1.3 [95% CI 0.7 to 1.9], RR 5.9; 95% CI 3.5 to 8.3). Compared with COT, HFNC significantly increased SpO_2 and decreased heart rate. No serious or life-threatening complications associated with HFNC were reported. Importantly, most participants (78%) preferred to continue HFNC after the study period, continuing to receive it for a median duration of 5.5 hours. The mortality

rate was 17.7% and 65.9% at ED and hospital discharge, respectively.[9]

Patients with comorbidities such as delirium and dementia are prone to intolerance and agitation with NIV.[47] Calvano et al. reported on a 92-year-old patient with multi-lobar pneumonia with severe hypoxia, delirium and dementia. The patient could not tolerate a facial mask or nasal pillow mask. High velocity nasal insufflation was initiated for this patient, who tolerated it well. Although the patient's death was imminent, HVNI reduced agitation and improved dyspnoea, oxygenation, and comfort at the end-of-life.[48]

4. Ethical Considerations:

Ethical uncertainty emerged as a central theme across the literature. Clinician surveys and guideline papers highlight tension surrounding HFNC continuation, withdrawal, and perceived life prolongation. Unlike invasive ventilation, HFNC is often used in awake, communicative patients, making withdrawal emotionally complex. The current evidence landscape consistently positions HFNC and HVNI as an intermediary modality that is less burdensome than NIV, but more effective than COT, particularly for patients who remain awake and decisional.[22]

Explicit palliative frameworks with predefined goals, time-limited trials, and agreed criteria for reassessment or withdrawal should be embedded when palliative respiratory support is initiated. Albert et al describe stepwise HFNC withdrawal by decreasing FIO_2 and flow by 25% at 10-minute intervals, with boluses of opioids and/or benzodiazepines every 10 minutes until symptom control is achieved.[22] Validated pain and stress scores can indicate symptom burden of the patient and should guide palliative support requirements.[22,54] When used in this way, the respiratory support for end-of-life dyspnoea aligns with ethical principles of proportionality, autonomy, and non-maleficence. Importantly, multiple studies demonstrate that HFNC and HVNI do not prolong survival when goal of care is comfort but preserve meaningful interaction at the end-of-life.[9,35,49,55]

5. Limitations and Evidence gaps:

This largely observational evidence base is limited by heterogeneity in populations, interventions, and outcomes, increasing risk of selection bias, particularly when reporting case reports. Evidence reported may conflate physiological endpoints such as improvements in oxygenation and respiratory rate with comfort outcomes, yet patient-reported comfort are of greater value for this cohort. There also remains a notable gap in direct comparison between HVNI and HFNC, limiting ability to understand if mechanistic differentiation provide superior relief in specific palliative populations.

6. Conclusion:

Dyspnoea at the end-of-life represents a profound source of suffering for patients with advanced respiratory and non-respiratory disease. When HFNC and HVNI were used as respiratory support for dyspnoea relief, near ubiquitous improvements in physiological and comfort outcomes were reported. Collaborative palliative consultations with defined goals of care should be exercised. Additionally, explicit frameworks and education are needed to reduce clinician moral distress associated with initiating and withdrawing end-of-life respiratory support. Future research should report comparison between HVNI and HFNC patient-reported comfort outcomes for dyspnoea relief in a palliative setting.

7. Conflict of Interest Statement:

None.

8. Funding Statement:

No external funding was received for the preparation of this systematic literature review.

9. Acknowledgements:

Author would like to thank Jeanne Pettinichi and Jessica Whittle for conceptualisation and review assistance.

10. ORCID ID:

0009-2497-139X

11. References:

1. Campbell ML, Kiernan JM, Strandmark J, Yarandi HN. Trajectory of Dyspnea and Respiratory Distress among Patients in the Last Month of Life. *J Palliat Med*. 2018;21(2):194-199. doi:10.1089/jpm.2017.0265

2. Kamal AH, Maguire JM, Wheeler JL, Currow DC, Abernethy AP. Dyspnea review for the palliative care professional: assessment, burdens, and etiologies. *J Palliat Med*. 2011;14(10):1167-1172. doi:10.1089/jpm.2011.0109

3. Currow DC, Smith J, Davidson PM, Newton PJ, Agar MR, Abernethy AP. Do the trajectories of dyspnea differ in prevalence and intensity by diagnosis at theend-of-life? A consecutive cohort study. *J Pain Symptom Manage*. 2010;39(4):680-690. doi:10.1016/j.jpainsymman.2009.09.017

4. Celli BR, Cote CG, Marin JM, et al. The Body-Mass Index, Airflow Obstruction, Dyspnea, and Exercise Capacity Index in Chronic Obstructive Pulmonary Disease. *New England Journal of Medicine*. 2004;350(10):1005-1012. doi:10.1056/nejmoa021322

5. Ekström M, Lewthwaite H, Jensen D. How to evaluate exertional breathlessness using normative reference equations in research. *Curr Opin Support Palliat Care*. 2024;18(4):191-198. doi:10.1097/SPC.0000000000000721

6. Downey L, Curtis JR, Lafferty WE, Herting JR, Engelberg RA. The Quality of Dying and Death (QODD) Questionnaire: Empirical Domains and Theoretical Perspectives. *J Pain Symptom Manage*. 2009;39(1):9. doi:10.1016/J.JPAINSYMMAN.2009.05.012

7. Carron M, Freo U, Bahammam AS, et al. Complications of non-invasive ventilation techniques: a comprehensive qualitative review of randomized trials. *Br J Anaesth*. 2013;110(6):896-914. doi:10.1093/BJA/AET070

8. Oxygen | Treatment summaries | BNF | NICE. Accessed April 30, 2026. https://bnf.nice.org.uk/treatment-summaries/oxygen/

9. Ruangsomboon O, Dorongthom T, Chakorn T, et al. High-Flow Nasal Cannula Versus Conventional Oxygen Therapy in Relieving Dyspnea in Emergency Palliative Patients With Do-Not-Intubate Status: A Randomized Crossover Study. *Ann Emerg Med*. 2020;75(5):615-626. doi:10.1016/j.annemergmed.2019.09.009

10. Yamane DP, Jones CW, Wilkerson RG, et al. High-velocity nasal insufflation versus noninvasive positive pressure ventilation for moderate acute exacerbation of chronic obstructive pulmonary disease in the emergency department: A randomized clinical trial. *Academic Emergency Medicine*. 2025;32(4):403-413. doi:10.1111/ACEM.15038

11. Plotnikow GA, Accoce M, Fredes S, et al. High-Flow Oxygen Therapy Application in Chronic Obstructive Pulmonary Disease Patients With Acute Hypercapnic Respiratory Failure: A Multicenter Study. *Crit Care Explor*. 2021;3(2):E0337. doi:10.1097/CCE.0000000000000337,

12. Marie Curie, Association for Palliative Medicine. Association for Palliative Medicine and Marie Curie survey of palliative care practitioners 2021.

13. Scala R. Challenges on non-invasive ventilation to treat acute respiratory failure in the elderly. *BMC Pulm Med*. 2016;16(1):150. doi:10.1186/s12890-016-0310-5

14. Tan Jia Hui H. Palliative Care 101: All you need to know about End-of-life Care. https://www.homage.sg/health/palliative-care/2024

15. World Health Organisation. Palliative Care. https://www.who.int/news-room/fact-sheets/detail/palliative-care. August 2020.

16. Milazzo S, Hansen E, Carozza D, Case AA. How Effective Is Palliative Care in Improving Patient Outcomes? *Curr Treat Options Oncol*. 2020;21(2):12. doi:10.1007/s11864-020-0702-x

17. Tan D, Wang B, Cao P, et al. High flow nasal cannula oxygen therapy versus non-invasive ventilation for acute exacerbations of chronic obstructive pulmonary disease with acute-moderate hypercapnic respiratory failure: a randomized controlled non-inferiority trial. *Crit Care*. 2024;28(1). doi:10.1186/S13054-024-05040-9,

18. Tan D, Walline JH, Ling B, et al. High-flow nasal cannula oxygen therapy versus non-invasive ventilation for chronic obstructive pulmonary disease patients after extubation: a multicenter, randomized controlled trial. *Crit Care*. 2020;24(1):489. doi:10.1186/s13054-020-03214-9

19. Olsson Möller U, Beck I, Fürst CJ, H. Rasmussen B. A Reduced Deck of Conversation Cards of Wishes and Priorities of Patients in Palliative Care. *Journal of Hospice & Palliative Nursing*. 2022;24(3):175-180. doi:10.1097/NJH.0000000000000846

20. Haywood ST, Whittle JS, Volakis LI, et al. HVNI vs NIPPV in the treatment of acute decompensated heart failure: Subgroup analysis of a multi-center trial in the ED. *Am J Emerg Med*. 2019;37(11): 2084-2090. doi:10.1016/j.ajem.2019.03.002

21. Intensive Care Society | Transfer to the outdoors. Accessed April 10, 2026. https://ics.ac.uk/resource/transfer-outdoors.html

22. Albert E, Fuller T, Low C, Murphy C. High Flow Nasal Cannula Oxygen Withdrawal at theend-of-life #503. *J Palliat Med*. 2025;28(6):849-850. doi:10 .1089/jpm.2025.0085

23. Kim MJ, Sachdev G, Mejia-Garcia D, et al. Respiratory Therapists' Attitudes and Beliefs Regarding High Flow Nasal Cannula Use at End-of-Life. *J Pain Symptom Manage*. 2025;71(4). doi:10. 1016/j.jpainsymman.2025.12.019

24. Cammarota G, Simonte R, De Robertis E. Comfort During Non-invasive Ventilation. *Front Med (Lausanne)*. 2022;9:874250. doi:10.3389/ fmed.2022.874250

25. Alqahtani JS, AlAhmari MD. Evidence based synthesis for prevention of noninvasive ventilation related facial pressure ulcers. *Saudi Med J*. 2018;39 (5):443-452. doi:10.15537/smj.2018.5.22058

26. Antony L, Thelly AS, Mathew JM. Evidence-based Clinical Practice Guidelines for Caregivers of Palliative Care Patients on the Prevention of Pressure Ulcer. *Indian J Palliat Care*. 2023;29(1):75-81. doi:10.25259/IJPC_99_2022

27. Kacinski R, Strasser W, Leonard S. Characteristics of Flow in the Upper Airway during High Flow Nasal Cannula Oxygen Therapy. *Proceedings of the Thermal and Fluids Engineering Summer Conference*. 2023;2023-March:193-201. doi:10.16 15/tfec2023.cnm.046138

28. Miller TL, Saberi B, Saberi S. Computational Fluid Dynamics Modeling of Extrathoracic Airway Flush: Evaluation of High Flow Nasal Cannula Design Elements. *J Pulm Respir Med*. 2016;6:376. doi:10.4172/2161-105X.1000376

29. Hui D, Dos Santos R, Chisholm G, Bansal S, Crovador CS, Bruera E. Bedside clinical signs associated with impending death in patients with advanced cancer: Preliminary findings of a prospective longitudinal cohort study. *Cancer*. 2015;121(6):960. doi:10.1002/CNCR.29048

30. Doshi PB, Whittle JS, Dungan G, et al. The ventilatory effect of high velocity nasal insufflation compared to non-invasive positive-pressure ventilation in the treatment of hypercapneic respiratory failure: A subgroup analysis. *Heart and Lung*. 2020;49(5) :610-615. doi:10.1016/j.hrtlng.2020.03.008

31. Weinreich UM, Storgaard LH. A Real-Life Study of Combined Treatment with Long-Term Non-Invasive Ventilation and High Flow Nasal Cannula in Patients with End-Stage Chronic Obstructive Lung Disease. *J Clin Med*. 2023;12(13):4485. doi: 10.3390/jcm12134485

32. Bode S, Grove G. Use of Humidified High Flow Nasal Oxygen in Community Palliative Care: A Case Report. *Palliat Med Rep*. 2020;1(1):179. doi: 10.1089/pmr.2020.0026

33. Koyauchi T, Suzuki Y, Sato K, et al. Impact of end-of-life respiratory modalities on quality of dying and death and symptom relief in patients with interstitial lung disease: a multicenter descriptive cross-sectional study. *Respir Res*. 2022; 23(1). doi:10.1186/s12931-022-02004-x

34. Koyauchi T, Hasegawa H, Kanata K, et al. Efficacy and Tolerability of High-Flow Nasal Cannula Oxygen Therapy for Hypoxemic Respiratory Failure in Patients with Interstitial Lung Disease with Do-Not-Intubate Orders: A Retrospective Single-Center Study. *Respiration*. 2018;96(4):323-329. doi:10.1159/000489890

35. Shibata H, Takeda N, Suzuki Y, et al. ＜Editors' Choice＞: Effects of high-flow nasal cannula oxygen therapy on oral intake of do-not-intubate patients with respiratory diseases. *Nagoya J Med Sci*. 2021;83(3):509. doi:10.18999/nagjms.83.3.509

36. Pagliaro R, Aronne L, Fomez R, et al. High-Flow Nasal Cannula System in Respiratory Failure Associated with Interstitial Lung Diseases: A Systematic Review and Narrative Synthesis. *J Clin Med*. 2024;13(10):2956. doi:10.3390/jcm13102956

37. Pierucci P, Crimi C, Carlucci A, et al. REINVENT: ERS International survey on REstrictive thoracic diseases IN long term home noninvasive VENTilation. *ERJ Open Res*. 2021;7(2). doi:10.1183 /23120541.00911-2020

38. D'Arienzo D, Sanvido L, Amin R, Diskin C, Cohen E. Indications and outcomes of pediatric high flow nasal cannula use in the home setting. *J Hosp Med*. 2025;20(7):669-676. doi:10.1002/jhm.13571

39. Goda K, Kenzaka T, Kuriyama K, Hoshijima M, Akita H. End-of-life home care of an interstitial pneumonia patient supported by high-flow nasal

cannula therapy: A case report. *World J Clin Cases*. 2020;8(20):4853-4857. doi:10.12998/wjcc.v8.i20.4853

40. Nagata K, Kikuchi T, Horie T, et al. Domiciliary high-flow nasal cannula oxygen therapy for patients with stable hypercapnic chronic obstructive pulmonary disease a multicenter randomized crossover trial. *Ann Am Thorac Soc*. 2018;15(4):432-439. doi:10.1513/ANNALSATS.201706-425OC,

41. Martinez Alejos R, Lebret M, Plotnikow GA, Fresnel E, Patout M. Performance of Home-based High Flow Therapy Devices in Mucus Clearance and Hygrometry. *Arch Bronconeumol*. 2025;61(4). doi:10.1016/J.ARBRES.2024.12.009

42. Gomes R, Queirós J, Borges J, Cardoso AL, Barbosa T. Domiciliary High-Flow Nasal Therapy in Primary Ciliary Dyskinesia. *Cureus*. 2023;15(1):e34177. doi:10.7759/cureus.34177

43. Deokar K, Plotnikow GA, Singhal S, et al. Humidification insights in mechanical ventilation and respiratory support. A narrative review. *Expert Rev Respir Med*. *Taylor and Francis Ltd.* Preprint posted online 2025. doi:10.1080/17476348.2025.2581342

44. Kelly SJ, Brodecky V, Skuza EM, Berger PJ, Tatkov S. Variability in tracheal mucociliary transport is not controlled by beating cilia in lambs in vivo during ventilation with humidified and nonhumidified air. *Am J Physiol Lung Cell Mol Physiol*. 2021;320(4):L473-L485. doi:10.1152/AJPLUNG.00485.2020,

45. Lellouche F, Maggiore SM, Deye N, et al. Effect of the humidification device on the work of breathing during noninvasive ventilation. *Intensive Care Med*. 2002;28(11):1582-1589. doi:10.1007/S00134-002-1518-9

46. Wilson ME, Mittal A, Karki B, et al. Do-not-intubate orders in patients with acute respiratory failure: a systematic review and meta-analysis. *Intensive Care Med*. 2020;46(1):36-45. doi:10.1007/s00134-019-05828-2

47. Carrarini C, Russo M, Dono F, et al. Agitation and Dementia: Prevention and Treatment Strategies in Acute and Chronic Conditions. *Front Neurol*. 2021;12:644317. doi:10.3389/FNEUR.2021.644317

48. Tatjana P Calvano 1, Joshua M Sill, Kenneth R Kemp, Kevin K Chung. Use of a high-flow oxygen delivery system in a critically ill patient with dementia - PubMed. Respiratory Care. 2008. Accessed March 20, 2026. https://pubmed.ncbi.nlm.nih.gov/19025711/

49. Takase E, Akamatsu H, Teraoka S, et al. A Phase II Study of High-Flow Nasal Cannula for Relieving Dyspnea in Advanced Cancer Patients. *J Pain Symptom Manage*. 2024;67(3):204-211.e1. doi:10.1016/j.jpainsymman.2023.11.009

50. Kim JS, Shin J, Kim NH, et al. Use of high-flow nasal cannula oxygen therapy for patients with terminal cancer at theend-of-life. *Cancer Med*. 2023;12(13):14612-14622. doi:10.1002/cam4.6060

51. Hentsch L, Guerreiro I, Gonzalez Jaramillo V, et al. High-flow nasal oxygen for the relief of persistent dyspnea in adult patients with cancer: A systematic review and meta-analysis. *Palliat Med*. Published online 2026. doi:10.1177/02692163261422559

52. Vo AT, Ta KNT, Chuang KJ. Comparative effectiveness of pharmacological and non-pharmacological interventions for dyspnea management in advanced cancer: A systematic review and network meta-analysis. *Asia Pac J Oncol Nurs*. 2025;12:100671. doi:10.1016/j.apjon.2025.100671

53. Doshi P, Whittle JS, Bublewicz M, et al. High-Velocity Nasal Insufflation in the Treatment of Respiratory Failure: A Randomized Clinical Trial. *Ann Emerg Med*. 2018;72(1):73-83.e5. doi:10.1016/J.ANNEMERGMED.2017.12.006,

54. van der Maaden T, W de Vet HC, Achterberg WP, et al. Improving comfort in people with dementia and pneumonia: a cluster randomized trial. Published online 2016. doi:10.1186/s12916-016-0663-x

55. Bramati PS, Azhar A, Khan R, et al. High Flow Nasal Cannula in Patients With Cancer at theend-of-life. *J Pain Symptom Manage*. 2023;65(4):e369-e373. doi:10.1016/j.jpainsymman.2022.12.141

