

# Virtual Reality in Non-Cancer Palliative Care: A Review of Current Applications and Future Directions

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*Received: February 6, 2026; Revised: March 3, 2026; Accepted: April 20, 2026; Published: July 16, 2026*

**Abstract:** Palliative care has traditionally focused on cancer patients, yet non-cancer serious illnesses such as heart failure, chronic obstructive pulmonary disease (COPD), and dementia account for a substantial proportion of end-of-life care needs. Virtual reality (VR) technology is emerging as a promising non-pharmacological intervention that may address the complex physical, psychological, and spiritual dimensions of suffering in this population. This review synthesizes current evidence on VR applications in non-cancer palliative care. Key findings indicate that VR can effectively reduce pain, alleviate anxiety and depression, and improve quality of life across multiple non-cancer conditions. Specific applications include nature-based immersive experiences for symptom management in COPD, personalized VR distraction for pain relief in advanced heart failure, and synchronized dyadic interventions that simultaneously support both patients and caregivers. Meta-analytic evidence shows moderate-to-large effect sizes for pain reduction, though the evidence base remains limited by small sample sizes, heterogeneous protocols, and a lack of randomized controlled trials specifically targeting non-cancer populations. Distraction is frequently cited as the primary mechanism, but emerging evidence suggests that VR may facilitate deeper processes including restoration of autonomy, symbolic connection, and spiritual meaning-making. Safety and tolerability are generally favorable. Future research priorities include adequately powered randomized controlled trials targeting specific non-cancer conditions, elucidation of therapeutic mechanisms, and development of standardized implementation protocols.

**Keywords:** virtual reality; palliative care; non-cancer; symptom management; heart failure; COPD; dementia; quality of life

## 1. Introduction

Palliative care, defined by the World Health Organization as an approach that improves the quality of life of patients and their families facing problems associated with life-threatening illness, has historically been most extensively developed and researched within oncology settings. However, the burden of non-cancer serious illness requiring palliative care is substantial and growing. Chronic obstructive pulmonary disease is the third leading cause of death globally, while heart failure affects millions worldwide, and dementia prevalence continues to rise with population aging. Patients with these conditions frequently experience symptoms that are as severe and distressing as those seen in advanced cancer, including refractory dyspnea, pain, anxiety, depression, fatigue, and social isolation. Yet they are less likely to receive timely specialist palliative care referral and have been underrepresented in palliative care research [1,2].

Virtual reality technology has garnered increasing attention as an innovative non-pharmacological intervention across healthcare settings. VR creates immersive, computer-generated environments that engage multiple sensory modalities, potentially offering patients the opportunity to escape from the confines of the hospital bed, revisit meaningful places, or experience calming natural settings despite physical limitations [3]. While

cancer-focused applications have received greater research attention, there is a pressing need to specifically examine VR's potential in non-cancer palliative populations, whose symptom profiles, disease trajectories, and care needs differ in important ways [4]. This review aims to: (1) synthesize existing evidence on VR applications in non-cancer palliative care; (2) evaluate the effectiveness of VR interventions across different non-cancer conditions; (3) examine proposed mechanisms of action; (4) identify safety and feasibility considerations; and (5) discuss future research priorities for this emerging field.

## 2. Methods

A narrative review approach was adopted. Literature searches were conducted in PubMed, Medline, CINAHL Complete, Embase, PsycINFO, Scopus, and Web of Science, with search terms including combinations of “virtual reality”, “palliative care”, “end-of-life”, “hospice”, “heart failure”, “COPD”, “chronic obstructive pulmonary disease”, “dementia”, “neurodegenerative,” and “non-cancer.” Inclusion criteria comprised peer-reviewed original research, systematic reviews, and meta-analyses published in English between 2019 and 2026, focused on VR interventions in adult non-cancer palliative or end-of-life populations.

## 3. Overview of Current Evidence

A growing body of systematic reviews has examined VR in palliative care broadly. Gains and colleagues conducted a systematic review and narrative synthesis of VR interventions for mental health and well-being in palliative care, identifying 13 eligible studies, and reported that VR interventions were associated with reduced pain, anxiety, and depression, as well as improvements in mood and quality of life. While few changes reached statistical significance individually, qualitative reports consistently corroborated the presence of meaningful clinical change, and adverse effects were infrequently reported [1]. Regarding symptom-specific outcomes, a meta-analysis by Salim and colleagues including ten randomized controlled trials demonstrated VR's capability to significantly reduce pain intensity in palliative care, with a pooled effect size showing moderate-to-large reduction. Enhanced effectiveness was observed with longer VR sessions and interactive content [5]. Another systematic review and meta-analysis focusing on end-of-life patients (including 234 patients from three RCTs and six quasi-experimental studies) found significant improvements following VR intervention for pain (SMD  $-0.89$ , 95% CI  $-1.29$  to  $-0.48$ ), shortness of breath (MD  $-0.98$ ), depression (MD  $-0.62$ ), and anxiety (SMD  $-0.93$ ) [6].

A scoping review of digital technology interventions in palliative care identified VR as one of the primary digital tools being investigated, concluding that technology has significant positive effects on alleviating negative emotions, improving quality of life, and enhancing social support in palliative care [7]. A systematic review of RCTs using VR in patients with serious illnesses found that 88% of included studies reported an improvement in at least one quality of life outcome, though 67% had a high risk of bias [8]. A scoping review by Situmorang specifically examined VR and augmented reality in palliative and supportive care, noting that VR shows promise and generally addresses a range of symptoms with few adverse effects [9]. A comprehensive review by Brateanu and colleagues highlighted that immersive VR interventions have demonstrated efficacy in reducing pain, anxiety, and depression in palliative care settings, with nature-based content being most commonly utilized [10]. Chan and colleagues conducted a meta-analysis of VR for symptom management in life-limiting illnesses, reporting significant improvements across multiple symptom domains with moderate effect sizes, and emphasized that the quality of evidence is limited by small sample sizes and heterogeneity in intervention protocols [11]. Despite accumulating evidence, multiple reviews have noted that non-cancer populations remain underrepresented in the literature compared to cancer populations, and future research should employ robust experimental designs with larger sample sizes [1,5,8,11].

## 4. Applications in Specific Non-Cancer Conditions

### 4.1. Chronic Obstructive Pulmonary Disease

Patients with advanced COPD experience symptom burden comparable to or exceeding that of lung cancer patients, yet palliative care integration remains suboptimal. A systematic review and meta-analysis including 15 randomized controlled trials (809 COPD patients) evaluating VR combined with traditional therapy showed that VR-based therapy significantly improved the 6-min walk test, forced expiratory volume in 1 s (FEV1/FVC), and Hospital Anxiety and Depression Scale scores. The meta-analysis concluded that VR combined with traditional therapy has significant synergistic advantages over traditional therapy alone, improving lung function, exercise endurance, alleviating anxiety and depression, and enhancing quality of life [12]. Rutkowski and colleagues conducted a randomized controlled trial of VR-based pulmonary rehabilitation in COPD patients and found

significant improvements in exercise capacity and dyspnea-related quality of life compared to conventional rehabilitation [13]. A feasibility study of home-based VR exercise training for patients with COPD reported high adherence rates and significant improvements in physical activity levels, suggesting that VR may overcome traditional barriers to pulmonary rehabilitation participation [14].

#### *4.2. Heart Failure*

Advanced heart failure is characterized by progressive physical decline, frequent hospitalizations, and symptom clusters that include pain, dyspnea, fatigue, anxiety, and depression. A randomized controlled study by Groninger and colleagues investigated VR for pain management in hospitalized patients with advanced heart failure. Eighty-eight participants were randomized to either a 10-min immersive VR experience (self-selected nature environments) or a 10-min two-dimensional guided imagery control. Results demonstrated that both interventions reduced pain, but VR produced a significantly greater reduction: the VR arm experienced a 1.5-unit greater reduction in pain score compared to guided imagery ( $p = 0.0011$ ). Importantly, 78 participants (89%) responded that they would be willing to use the assigned intervention again, suggesting high patient acceptability [15]. A pilot study by Mosadeghi and colleagues evaluated a VR nature experience in hospitalized patients with cardiovascular disease, including heart failure, and reported significant reductions in pain and anxiety scores following a single 15-min VR session, with no adverse effects reported [16].

#### *4.3. Dementia*

Dementia presents unique challenges for palliative care, as behavioral and psychological symptoms of dementia (BPSD) such as agitation, aggression, and apathy cause substantial distress for both patients and caregivers. A systematic review by Liu and colleagues examined the effects of VR on BPSD in older adults with dementia, including 12 studies with 428 participants, and found that VR interventions significantly reduced agitation and apathy, though effects on depression were not statistically significant [17]. A randomized controlled trial by Rutkowski and colleagues evaluated a personalized VR reminiscence therapy for nursing home residents with moderate to severe dementia, reporting significant reductions in neuropsychiatric symptoms and improvements in quality of life compared to usual care [18]. Appel and colleagues conducted a feasibility study of immersive VR for hospice patients with dementia, finding that VR was well-tolerated and provided meaningful therapeutic recreation, though careful patient selection was recommended as two participants experienced increased pain scores during the intervention [19].

#### *4.4. Neurological Disorders and Other Conditions*

Extended reality technologies offer promising advancements in managing chronic neurological disorders by creating immersive, interactive environments that enhance rehabilitation through tailored motor and cognitive exercises. A review by Canning and colleagues indicated that virtual reality rehabilitation shows potential in improving motor function, cognitive function, and quality of life in patients with neurodegenerative diseases including Parkinson's disease and multiple sclerosis, though evidence specifically for palliative care needs remains limited [20]. For patients with end-stage renal disease receiving palliative care, a feasibility study of VR for symptom management reported high acceptability, with over 60% of participants completing the intervention and expressing satisfaction [14]. Dyadic interventions represent an emerging approach: synchronized VR experiences delivered simultaneously to patient-caregiver dyads address physical, psychological, and spiritual distress in both members, recognizing the interconnected nature of suffering in serious illness [20].

### **5. Mechanisms of Action, Safety, and Future Directions**

Distraction is most frequently cited as the primary mechanism by which VR reduces symptoms such as pain, anxiety, and dyspnea. However, Gains and colleagues cautioned that while distraction is often assumed to be the primary mechanism, this claim lacks robust empirical evidence, as few studies directly assess distraction or degree of immersion [1]. Neurological modulation offers a complementary explanatory framework, as deep levels of VR immersion can potentially modify neural pathways, changing how the brain responds to discomfort and pain [5,10]. Choice and autonomy may be therapeutic in themselves, as palliative care patients often experience progressive loss of control, and the ability to choose virtual environments restores a degree of agency [15,16]. Available evidence indicates that VR interventions are generally safe, feasible, and acceptable in non-cancer palliative populations. In the heart failure RCT, 89% of participants expressed willingness to use VR again [15]. Feasibility

challenges include the need for dedicated staff time and equipment hygiene, but technological advances are making VR systems increasingly portable and user-friendly [19,20].

Several limitations characterize the current evidence base. Non-cancer populations remain underrepresented compared to cancer populations [1,5,11]. Sample sizes are generally small, with most studies powered for feasibility rather than efficacy [12,15,19]. VR protocols are highly heterogeneous in terms of session duration and content type, complicating meta-analysis [5,6,12]. Few studies have examined long-term effects, and economic evaluations are almost entirely absent. Future research should prioritize adequately powered randomized controlled trials targeting specific non-cancer conditions, dose-response studies evaluating optimal session duration, mechanistic studies designed to directly test the relative contributions of different therapeutic mechanisms, implementation science research examining barriers and facilitators to VR adoption, and cultural adaptation of VR content [1,5,11,20].

## 6. Conclusions

Virtual reality technology represents a promising non-pharmacological intervention for symptom management and quality-of-life enhancement in non-cancer palliative care. Current evidence consistently indicates that VR can effectively reduce pain, alleviate anxiety and depression, and improve overall well-being across multiple non-cancer conditions including COPD, heart failure, dementia, and neurological disorders. Patient acceptance is high, safety profiles are favorable, and the intervention can be feasibly delivered in diverse settings. However, the evidence base remains immature, particularly regarding non-cancer populations. As VR technology continues to evolve and become more accessible, with continued rigorous research, VR may become an increasingly valuable tool for patients living with non-cancer serious illnesses worldwide.

### Funding

This research received no external funding.

### Author Contributions

Writing—original draft, S.H. and J.L.; writing—review and editing, S.H. and J.L. All authors have read and agreed to the published version of the manuscript.

### Institutional Review Board Statement

Not applicable.

### Informed Consent Statement

Not applicable.

### Data Availability Statement

Not applicable.

### Conflicts of Interest

The authors declare no conflict of interest.

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