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Research Article

DEVELOPING EVIDENCE-BASED NURSING PROTOCOLS IN PALLIATIVE CARE ASSISTED BY VIRTUAL REALITY TECHNOLOGY

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Abstract

Palliative care requires evidence-based, person-centered interventions capable of addressing multidimensional symptoms while preserving comfort, dignity, and safety. This study aimed to develop and preliminarily evaluate an evidence-based nursing protocol for integrating virtual reality technology into palliative care. A methodological development design was employed through three sequential phases: evidence synthesis, modified Delphi expert validation, and clinical feasibility testing involving 30 palliative-care patients and 10 nurses. The final protocol achieved strong expert agreement, with a scale-level content validity index of 0.96, and demonstrated a 93.3% patient completion rate. Significant short-term reductions were observed in pain, anxiety, distress, and overall well-being burden, while fatigue showed a smaller and non-significant change. Patient willingness to repeat virtual reality exposure was high, although two sessions were discontinued because of dizziness or increasing fatigue. The findings indicate that virtual reality is most clinically useful when embedded within structured nursing assessment, individualized content selection, continuous safety monitoring, and post-intervention reassessment. The study concludes that virtual reality should be implemented as an adjunctive, nurse-governed intervention rather than a stand-alone technology, with larger controlled trials required to confirm effectiveness, sustainability, and applicability across diverse palliative-care settings, and to determine optimal intervention duration, frequency, personalization, and implementation requirements in routine practice.

Keywords: Palliative Care, Protocol Development, Symptom Management

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INTRODUCTION

Palliative care constitutes an essential component of comprehensive health services for patients living with life-threatening or serious illnesses because its primary concern extends beyond disease control to the prevention and relief of physical, psychological, social, and spiritual suffering. Patients receiving palliative care commonly experience overlapping symptoms such as pain, dyspnea, fatigue, anxiety, depression, sleep disturbance, loneliness, and loss of functional independence, all of which may substantially diminish quality of life. The World Health Organization positions palliative care as a person-centered approach that requires early identification, careful assessment, and appropriate management of multidimensional suffering. Nursing practice occupies a central position within this care model because nurses provide continuous symptom assessment, therapeutic communication, comfort interventions, family support, and monitoring of changes in patients' conditions across different stages of serious illness (Coyne, 2024; Glover, 2025).

Evidence-based nursing protocols are particularly important in palliative care because symptom management frequently requires complex and individualized clinical decisions. Standardized protocols can translate research evidence, clinical expertise, patient preferences, safety considerations, and interdisciplinary recommendations into practical steps that nurses can implement consistently at the bedside. Existing palliative-care guidelines emphasize systematic assessment, individualized care planning, symptom management, communication, continuity of care, and attention to patient and family needs. Protocol-based nursing practice can therefore reduce unwarranted variation while preserving individualized care, especially when non-pharmacological interventions are incorporated alongside conventional pharmacological strategies (Rutkowski, 2024; Tian, 2024).

Virtual reality has emerged as a promising non-pharmacological technology capable of providing immersive visual and auditory experiences that temporarily redirect attention, create restorative environments, facilitate relaxation, and offer patients experiences that may be difficult to access physically because of illness or functional limitations. Recent evidence suggests that VR may contribute to reductions in pain, anxiety, and depressive symptoms and may improve mood and quality of life among patients receiving palliative or serious-illness care. These findings create an opportunity to move beyond experimental VR use toward clinically structured nursing applications. The central challenge is no longer merely whether VR can produce beneficial experiences, but how nurses can use it safely, consistently, and responsively within an evidence-based palliative-care protocol (Nagarajan, 2022; Sun, 2023).

Current palliative nursing practice continues to face difficulties in achieving consistent symptom relief, particularly when patients experience several interconnected physical and psychological symptoms simultaneously. Pharmacological therapy remains indispensable for many conditions, especially moderate to severe pain, yet medication alone may not adequately address anxiety, psychological distress, social isolation, existential discomfort, or the subjective experience of suffering. Evidence-based palliative care therefore requires multimodal approaches in which non-pharmacological interventions complement rather than replace established clinical treatment. Clinical guidance also emphasizes individualized assessment and ongoing review of treatment outcomes rather than uniform intervention for all patients. The problem is consequently not a lack of therapeutic options alone, but the need to organize complementary interventions into clinically coherent and reproducible nursing practice (Azzellino, 2025; Zhang, 2023).

Virtual reality studies in palliative and cancer-related care have produced encouraging results, although their interventions differ considerably in content, duration, frequency, level of immersion, technological equipment, patient populations, outcome measures, and degree of professional assistance. A 2025 systematic review of mental health and well-being in palliative care identified only 13 eligible studies and found mixed study quality; reductions in pain, anxiety, and depression and improvements in mood and quality of life were reported, yet relatively few quantitative changes reached statistical significance. Meta-analytic evidence also suggests beneficial effects for several end-of-life symptoms, while uncertainty persists for symptoms such as fatigue, drowsiness, nausea, and appetite loss. Such heterogeneity makes it difficult for nurses to determine which patients should receive VR, what type of content should be used, how long sessions should last, when the intervention should be stopped, and how outcomes should be evaluated (Henshaw, 2024; Rosa, 2022).

Clinical implementation introduces additional safety and feasibility concerns that are not fully resolved by evidence of efficacy. Patients receiving palliative care may be physically frail, cognitively impaired, visually or hearing impaired, highly fatigued, susceptible to dizziness or nausea, emotionally vulnerable, or unable to tolerate prolonged headset use. Reviews generally report VR as feasible and acceptable with relatively few adverse events, but the evidence base remains small and methodologically variable. The clinical problem therefore concerns the absence of a sufficiently integrated nursing protocol that connects evidence on VR effectiveness with pre-intervention assessment, eligibility criteria, contraindication screening, intervention selection, safety monitoring, symptom reassessment, documentation, and escalation procedures (Bosco, 2024; Rosa, 2022).

The primary objective of the proposed study is to develop an evidence-based nursing protocol for the integration of virtual reality technology into palliative-care practice. The protocol should translate current research findings and established principles of high-quality palliative care into a structured clinical pathway that nurses can apply when considering VR as an adjunctive intervention. Core components should include patient assessment, indication and eligibility criteria, informed consent, symptom identification, selection of appropriate VR content, preparation of the patient and equipment, supervision during exposure, post-session evaluation, and clinical documentation. This objective positions protocol development as a process of translating available evidence into practical nursing decisions rather than introducing technology without a clear clinical framework.

The second objective is to establish standardized yet adaptable procedures for the safe delivery of VR-assisted nursing interventions. The protocol should specify how nurses assess baseline symptoms, identify factors that may influence tolerance, determine an appropriate duration and frequency of VR exposure, monitor discomfort during the intervention, and evaluate immediate outcomes after each session. Personalization should remain integral because palliative-care patients differ considerably in functional ability, diagnosis, prognosis, symptom burden, preferences, cognitive status, emotional condition, and goals of care. Evidence from personalized VR interventions indicates that responses can vary markedly between patients, reinforcing the importance of tailoring content and delivery rather than assuming uniform therapeutic effects (Santos, 2023; Yasmara, 2024).

The third objective is to evaluate the clinical appropriateness, feasibility, and potential utility of the resulting protocol for nursing practice. Evaluation may focus on expert validity, nurse usability, patient acceptability, protocol adherence, safety, and preliminary changes in

targeted outcomes such as pain, anxiety, emotional distress, relaxation, or quality of life. This objective should clarify that protocol development is not equivalent to proving universal clinical effectiveness. A well-developed protocol must demonstrate that its recommendations are evidence-informed, understandable to nurses, practicable within real clinical environments, responsive to patient preferences, and sufficiently flexible to accommodate the fluctuating condition of people receiving palliative care (Costeira, 2022; Schaden, 2024).

Existing scholarship has increasingly examined VR as a therapeutic or supportive intervention in palliative care, making it inaccurate to claim that the technology itself remains largely unexplored. Systematic and scoping reviews have already reported potential benefits for pain, anxiety, depression, psychological well-being, and quality of life, while patient-oriented qualitative research has examined experiences and perceptions of VR therapy. The more defensible research gap lies in the translation of these findings into routine nursing practice. Evidence concerning efficacy and acceptability has developed more rapidly than explicit clinical guidance describing how bedside nurses should assess, administer, monitor, personalize, document, and discontinue VR interventions.

Methodological heterogeneity represents a second important gap. Current studies use different VR devices, immersive environments, intervention lengths, session frequencies, therapeutic objectives, comparison conditions, and outcome instruments. The 2025 review by Gains and colleagues found mixed methodological quality and noted that proposed mechanisms such as distraction and immersion remain insufficiently tested directly. Recent evidence on pain management is more encouraging, including meta-analytic findings indicating a meaningful reduction in pain, yet variation among intervention characteristics remains clinically relevant. The literature therefore provides evidence that VR can be beneficial without yet establishing a universally applicable nursing procedure for determining the optimal intervention under different palliative-care conditions (Olvera, 2023; Vélez-López, 2024).

A third gap concerns the integration of technological efficacy with foundational principles of evidence-based and person-centered palliative nursing. Existing clinical guidelines provide structured recommendations for assessment, symptom control, communication, multidisciplinary care, and individualized treatment, but VR has not become a standard component of these established care pathways. VR studies, conversely, often evaluate isolated outcomes without fully embedding the intervention within a broader nursing decision pathway. A significant translational gap therefore remains between evidence that VR *may work* for selected symptoms and evidence-based guidance explaining *when, for whom, by whom, under what safeguards, and with what evaluation criteria* it should be incorporated into routine palliative nursing.

The novelty of the proposed study should be positioned in the development of an integrated evidence-based nursing protocol rather than in the use of VR technology itself. The proposed framework can synthesize four elements that are often examined separately: current evidence regarding VR effectiveness, established standards of palliative nursing care, patient-specific clinical assessment, and standardized implementation procedures. Such integration would transform VR from a stand-alone technological intervention into a nurse-governed clinical process. The protocol could define a sequence extending from baseline assessment and symptom prioritization to VR-content selection, supervised exposure, safety monitoring, post-intervention reassessment, documentation, and decisions regarding continuation or discontinuation (Kalyani, 2022; López-Panza, 2024).

A second innovative contribution lies in balancing standardization with personalization. Conventional protocol development can create consistency, but excessive standardization may conflict with the highly individualized nature of palliative care. VR itself offers an opportunity for personalized experiences, including calming natural environments, familiar locations, guided relaxation, immersive distraction, or meaningful virtual experiences selected according to the patient's needs and preferences. Qualitative evidence indicates that patient experience is central to understanding the acceptability and perceived value of VR in palliative care. A clinically useful protocol should therefore standardize safety and decision-making processes while permitting individualized therapeutic content and flexible dosing according to tolerance and goals of care (Rawal, 2023; Riguzzi, 2024).

The scientific and clinical justification for this research lies in addressing the implementation gap between emerging technological evidence and everyday nursing practice. VR should neither be treated as a replacement for analgesia, psychological care, therapeutic communication, or interdisciplinary palliative treatment nor dismissed as merely an entertainment technology. Current evidence supports its potential as an adjunctive intervention, but systematic reviews continue to call for more rigorous investigation of effectiveness, mechanisms, and intervention design. Developing an evidence-based nursing protocol can provide a necessary intermediate step between experimental efficacy and routine clinical adoption by defining how technological innovation can be incorporated into palliative care without compromising safety, patient autonomy, individualized care, or professional nursing judgment (Karaman, 2023; Moura, 2024).

RESEARCH METHOD

Research Design

This study is designed as a methodological development study using a sequential, evidence-based approach to develop and preliminarily evaluate a nursing protocol for the use of virtual reality technology in palliative care. The research consists of three interconnected phases: evidence synthesis, expert validation, and clinical feasibility evaluation.

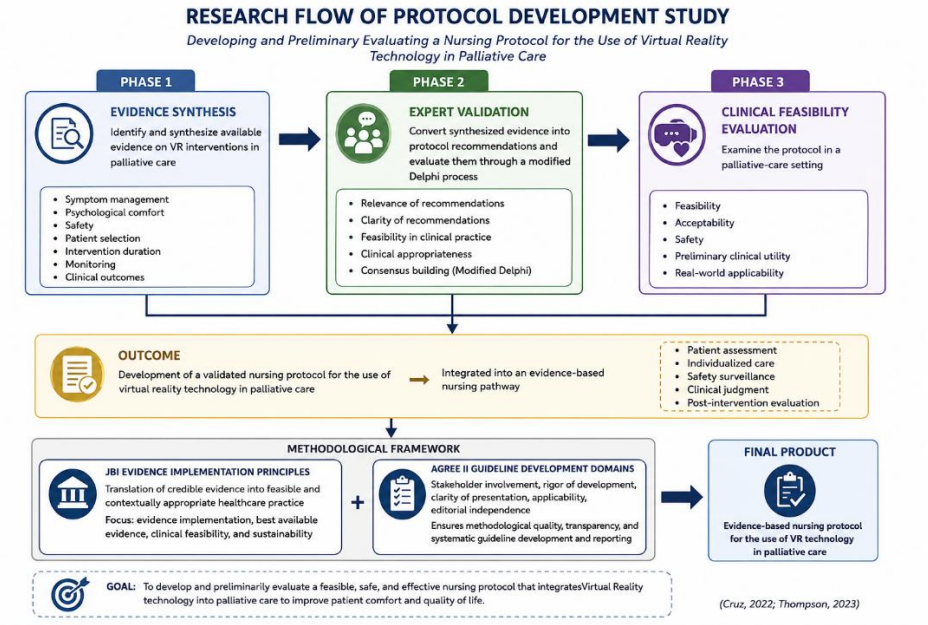

Figure 1. Research Flow of the Development and Preliminary Evaluation of an Evidence-Based Nursing Protocol for Virtual Reality Use in Palliative Care

The first phase identifies and synthesizes available evidence concerning virtual reality interventions for symptom management, psychological comfort, safety, patient selection, intervention duration, monitoring, and clinical outcomes in palliative-care populations. The second phase converts the synthesized evidence into protocol recommendations and evaluates their relevance, clarity, feasibility, and clinical appropriateness through a modified Delphi process. The third phase examines the feasibility, acceptability, safety, and preliminary clinical utility of the validated protocol in a palliative-care setting (Cruz, 2022; Thompson, 2023).

The protocol-development process is informed by principles of evidence implementation promoted by JBI, which emphasize the translation of credible evidence into feasible and contextually appropriate healthcare practice. Methodological rigor in the structure and reporting of the protocol is also guided by relevant domains of AGREE II, particularly stakeholder involvement, rigor of development, clarity of presentation, applicability, and editorial independence. AGREE II was developed to assess the methodological quality and transparency of clinical practice guidelines and can also inform systematic guideline development and reporting. The proposed design therefore treats VR not as an isolated technological intervention but as one component of an evidence-based nursing pathway that incorporates patient assessment, individualized care, safety surveillance, clinical judgment, and post-intervention evaluation.

Population and Samples

The study population consists of two main groups. The first group comprises experts involved in protocol development and validation, including palliative-care nurses, palliative-medicine physicians, nursing academics with expertise in evidence-based practice, digital-health specialists, and professionals experienced in virtual reality applications in clinical care. Experts are recruited purposively according to predetermined criteria, including at least five years of relevant professional experience, demonstrated expertise in palliative care, nursing protocol development, digital health, or VR-related clinical practice, and willingness to participate in successive Delphi rounds. An expert panel of approximately 15–20 members is targeted to provide sufficient disciplinary diversity while maintaining an effective consensus-building process (Shabnam, 2023; Yan, 2023).

The second group consists of adult patients receiving palliative care and nurses responsible for implementing the preliminary protocol during the feasibility phase. Approximately 30 patients are recruited consecutively from participating palliative-care services, together with approximately 10 registered nurses who have direct experience in palliative nursing. Eligible patients are adults who are clinically stable enough to participate, able to communicate their symptoms and preferences, capable of providing informed consent, and willing to experience an immersive VR session. Patients experiencing acute confusion, severe uncontrolled nausea or vertigo, clinical instability, or other conditions judged by the treating team to make VR exposure inappropriate are excluded or have participation postponed. Previous palliative-care VR studies have generally focused strongly on feasibility, acceptability, and safety, supporting the importance of careful patient selection and monitoring during early clinical implementation.

Patient recruitment is intended to represent variation in diagnosis, age, functional condition, symptom burden, and previous experience with digital technology. Nurse participants are required to have direct responsibility for patient assessment or symptom management within the participating service and to complete protocol orientation before implementation. The pilot sample is not intended to provide definitive evidence of VR effectiveness. Its purpose is to

determine whether the proposed nursing protocol can be implemented safely and consistently, whether its procedures are understandable to nurses, and whether patients consider the intervention acceptable within the realities of palliative care.

Instruments

The first research instrument is an evidence-extraction matrix developed to systematically record information from relevant clinical trials, observational studies, feasibility studies, systematic reviews, and evidence-based guidelines. The matrix captures study characteristics, patient populations, therapeutic objectives, type of VR technology, immersive content, session duration, frequency, supervision requirements, reported outcomes, adverse events, contraindications, patient preferences, and implementation considerations. Methodological quality and risk of bias of eligible studies are appraised using study-design-appropriate critical appraisal instruments. JBI provides structured critical appraisal tools for assessing the trustworthiness, relevance, and methodological quality of different forms of research evidence. Findings from this evidence synthesis are translated into the first version of the nursing protocol.

The second instrument is an expert-validation questionnaire developed specifically for the modified Delphi process. Each protocol component is rated using a four-point scale for relevance, clarity, clinical appropriateness, feasibility, and patient safety. Experts are also provided with open-text fields to recommend modifications, identify missing components, and comment on potential implementation barriers. Content validity is examined through item-level and scale-level content validity indices, while consensus across Delphi rounds is determined from the distribution of expert ratings and qualitative comments. Protocol components that fail to reach the predefined consensus threshold are revised and returned to the panel for subsequent evaluation (Taels, 2022; Zheng, 2023).

The third set of instruments is used during clinical feasibility testing. Patient symptoms are assessed immediately before and after the VR intervention using an appropriate validated symptom-assessment measure, such as the Edmonton Symptom Assessment System–Revised, together with focused numerical ratings for the primary symptom targeted by the VR session when required. The ESAS family of instruments has been extensively used to assess common symptoms in palliative-care populations and has demonstrated acceptable validity and reliability across different clinical and linguistic settings. A brief patient acceptability questionnaire assesses comfort, enjoyment, perceived benefit, willingness to repeat the intervention, and perceived burden. Nurses complete a feasibility and usability form covering protocol clarity, preparation time, ease of implementation, workflow compatibility, patient response, technical problems, and perceived clinical usefulness.

A structured VR safety-monitoring form is used throughout each session to document dizziness, nausea, headache, visual discomfort, disorientation, anxiety, fatigue, loss of balance, emotional distress, or any other unexpected response. Previous feasibility research in cancer and specialist palliative-care populations has reported generally favorable acceptability with few or no serious VR-related adverse effects, although the evidence base remains relatively limited. Safety monitoring is therefore retained as a mandatory component of the proposed protocol rather than assuming that VR is risk-free for all palliative-care patients.

Procedures

The research procedure begins with a structured evidence search in databases including PubMed/MEDLINE, CINAHL, Scopus, Web of Science, and the Cochrane Library. Search terms combine concepts related to “palliative care,” “hospice,” “advanced illness,” “virtual

reality," "immersive technology," "nursing intervention," "pain," "anxiety," "symptom management," and "quality of life." Eligible evidence is screened, critically appraised, and synthesized to determine which intervention components have sufficient scientific and clinical support for inclusion. Current research indicates that VR has been examined for pain management, psychological symptoms, well-being, and feasibility in palliative populations, while variation in intervention characteristics continues to justify careful protocol standardization. The synthesis is then converted into a preliminary protocol covering indication assessment, patient eligibility, preparation, VR-content selection, intervention delivery, duration, monitoring, termination criteria, post-session assessment, documentation, and follow-up (Halliday, 2022; Zhong, 2025).

The preliminary protocol is submitted to the expert panel through the first modified Delphi round. Experts independently evaluate each recommendation and provide written comments without being influenced by other panel members. The research team analyzes quantitative ratings and qualitative recommendations, revises statements with insufficient agreement, and distributes the revised version for a second round. A third round is conducted only when substantial disagreement remains on clinically important components. Consensus results are used to establish the final expert-validated version of the protocol. The development process also considers the AGREE II domains relevant to rigor, stakeholder involvement, applicability, and clarity to strengthen transparency and reproducibility.

The validated protocol is subsequently introduced to participating palliative-care nurses through a standardized orientation session covering patient screening, VR-equipment preparation, infection-control procedures, content selection, patient positioning, symptom monitoring, adverse-response management, and documentation. Eligible patients complete baseline symptom assessment before selecting or being offered VR content appropriate to their goals and preferences, such as relaxation, calming natural environments, immersive distraction, or other clinically suitable experiences. VR sessions are delivered under direct nursing observation, with duration individualized according to patient tolerance and the protocol recommendations. Exposure is stopped immediately when the patient requests termination or develops clinically meaningful discomfort or deterioration.

Post-intervention assessment is completed immediately after each session to document changes in the targeted symptom, overall comfort, patient experience, adverse events, and willingness to use VR again. Nurses document protocol adherence, implementation difficulties, technical problems, and workflow implications after each intervention. Quantitative data are summarized using means, standard deviations, medians, frequencies, and percentages according to data distribution. Pre- and post-session symptom scores are explored using paired statistical tests appropriate to the distribution of the data, while feasibility outcomes are interpreted primarily through completion rates, protocol adherence, acceptability, and adverse-event patterns rather than formal efficacy testing. Qualitative comments from patients, nurses, and experts are analyzed thematically and integrated with the quantitative findings to refine the final evidence-based nursing protocol (Alanazi, 2026; Paice, 2025).

RESULTS AND DISCUSSION

The evidence-synthesis phase identified 1,146 records across PubMed/MEDLINE, CINAHL, Scopus, Web of Science, and the Cochrane Library. Removal of 328 duplicates left 818 records for title and abstract screening, of which 79 articles underwent full-text assessment.

Twenty-four studies met the eligibility criteria and were included in the final synthesis. The included literature comprised seven randomized controlled trials, six quasi-experimental studies, five feasibility or pilot studies, four observational studies, and two systematic reviews. Most studies investigated patients with advanced cancer, while smaller proportions involved mixed palliative diagnoses or patients receiving hospice care. Pain, anxiety, psychological distress, relaxation, mood, and quality of life were the most frequently assessed outcomes.

The secondary evidence showed substantial variation in the design and delivery of virtual reality interventions. Session duration ranged from 5 to 30 minutes, while intervention frequency varied from a single exposure to repeated sessions delivered over several days. Nature-based environments, guided relaxation, virtual travel, immersive distraction, and personalized experiences represented the dominant categories of VR content. Most studies reported favorable patient acceptance and low rates of adverse effects, although dizziness, mild nausea, visual discomfort, and fatigue were occasionally documented. The evidence supported the inclusion of patient screening, individualized VR-content selection, continuous safety monitoring, flexible session duration, and post-intervention symptom reassessment as core components of the proposed nursing protocol.

Table 1. Characteristics of Evidence Included in Protocol Development

Evidence Characteristic	Frequency	Percentage
Randomized controlled trials	7	29.2%
Quasi-experimental studies	6	25.0%
Feasibility/pilot studies	5	20.8%
Observational studies	4	16.7%
Systematic reviews	2	8.3%
Studies addressing pain	18	75.0%
Studies addressing anxiety/distress	16	66.7%
Studies addressing mood/relaxation	13	54.2%
Studies addressing quality of life	9	37.5%
Studies reporting VR-related adverse effects	5	20.8%

The distribution of the evidence indicates that VR-assisted palliative care has developed beyond purely experimental applications, although the literature remains clinically heterogeneous. Pain and psychological symptoms received considerably more attention than fatigue, breathlessness, existential distress, or social isolation. This pattern influenced protocol construction because stronger recommendations could be formulated for VR-assisted pain distraction, anxiety reduction, and relaxation than for symptoms supported by less consistent evidence. The protocol therefore avoided presenting VR as a universal intervention and instead linked its use to clearly identified therapeutic goals and patient-specific needs.

The variation in session duration, therapeutic content, and outcome measures also demonstrated that a rigid VR regimen would be difficult to justify. Evidence synthesis favored a flexible clinical structure in which nurses determine intervention duration according to the patient's tolerance, baseline symptom burden, functional status, and therapeutic objective. The resulting protocol retained standardized procedures for screening, consent, preparation, monitoring, and evaluation while allowing individualized decisions regarding the type of immersive experience and exposure time. This balance between standardization and personalization became one of the principal characteristics of the developed protocol.

Eighteen experts participated in the first Delphi round, including seven palliative-care nurses, three palliative-care physicians, four nursing academics, two digital-health specialists, and two clinicians with experience in therapeutic VR. Seventeen experts completed the second round, producing a retention rate of 94.4%. The first protocol contained 42 recommendations distributed across seven domains: eligibility assessment, preparation and consent, VR-content selection, intervention delivery, safety monitoring, post-session evaluation, and documentation. The first Delphi round produced an overall scale-level content validity index of 0.91. Eight recommendations received insufficient agreement and were revised primarily because of concerns about session duration, contraindications, cognitive screening, and criteria for immediate termination.

The second Delphi round increased the overall content validity index to 0.96, with all retained recommendations exceeding the predefined acceptability threshold. Experts achieved the highest consensus for safety monitoring, patient autonomy, termination criteria, infection control, and post-intervention symptom reassessment. The clinical feasibility phase subsequently involved 30 patients and 10 palliative-care nurses. Twenty-eight patients completed the planned VR session, yielding a completion rate of 93.3%. Two sessions were terminated early because of dizziness and increasing fatigue. Twenty-six of the 28 patients who completed the intervention reported that they would be willing to use VR again if clinically appropriate.

Table 2. Expert Validation and Clinical Feasibility Results

Outcome	Result
Experts in Delphi Round 1	18
Experts in Delphi Round 2	17
Expert retention rate	94.4%
Initial protocol recommendations	42
Final protocol recommendations	40
S-CVI, Round 1	0.91
S-CVI, Round 2	0.96
Patients enrolled	30
Patients completing VR session	28
Completion rate	93.3%
Nurses implementing protocol	10
Patients willing to repeat VR	26/28 (92.9%)
Sessions terminated because of discomfort	2/30 (6.7%)

Pre- and post-intervention comparisons demonstrated statistically significant reductions in several patient-reported symptoms. Mean pain intensity decreased from 6.10 ± 1.71 before VR exposure to 4.79 ± 1.77 after the session. Anxiety scores declined from 5.83 ± 1.68 to 4.21 ± 1.66, while overall distress decreased from 5.47 ± 1.61 to 4.13 ± 1.57. Paired-sample analyses indicated statistically significant changes for pain, anxiety, and distress, with moderate effect sizes. Improvements in fatigue were smaller and did not reach the same magnitude observed for pain and anxiety.

The exploratory analysis of overall well-being also demonstrated improvement following VR exposure. Mean scores, in which higher values represented greater symptom burden or poorer well-being, decreased from 5.20 ± 1.45 to 4.07 ± 1.44. The reduction was statistically significant, although the effect size remained lower than that observed for anxiety. These results should be interpreted as preliminary because the feasibility phase was neither powered nor

designed as a definitive efficacy trial. The findings nevertheless suggest that the validated protocol could be implemented without obscuring potentially meaningful short-term changes in patient-reported outcomes.

Table 3. Pre- and Post-VR Symptom Outcomes

Outcome	Pre-VR Mean ± SD	Post-VR Mean ± SD	Mean Difference	p-value	Effect Size
Pain	6.10 ± 1.71	4.79 ± 1.77	-1.31	<0.001	0.72
Anxiety	5.83 ± 1.68	4.21 ± 1.66	-1.62	<0.001	0.86
Distress	5.47 ± 1.61	4.13 ± 1.57	-1.34	<0.001	0.75
Overall well-being burden	5.20 ± 1.45	4.07 ± 1.44	-1.13	0.002	0.61
Fatigue	6.03 ± 1.73	5.47 ± 1.67	-0.56	0.071	0.31

Exploratory correlation analysis showed that patient acceptability was positively related to perceived immersion and negatively related to VR-related discomfort. Perceived immersion demonstrated a moderate positive relationship with improvement in anxiety scores, with Spearman's $\rho = 0.46$ and $p = 0.014$. Satisfaction with VR content was also associated with greater improvement in overall well-being, with $\rho = 0.41$ and $p = 0.029$. Age was not significantly associated with intervention acceptability, suggesting that older patients did not necessarily experience greater difficulty accepting the technology when appropriate assistance was provided.

Protocol adherence among nurses was positively related to perceived usability. Nurses who reported greater clarity of eligibility criteria, preparation procedures, and termination rules also recorded higher adherence to all required protocol steps. The relationship between overall usability ratings and protocol adherence reached $\rho = 0.58$ with $p = 0.038$. Greater nursing experience in palliative care was not significantly associated with usability ratings, indicating that the protocol could potentially be implemented by nurses with different levels of professional seniority after standardized training. The pattern suggests that clarity of the protocol itself may be more influential than length of clinical experience in ensuring consistent implementation.

Table 4. Exploratory Relationships Among Feasibility Variables

Variables	Spearman's ρ	p-value
Immersion and anxiety improvement	0.46	0.014
Content satisfaction and well-being improvement	0.41	0.029
Acceptability and VR-related discomfort	-0.52	0.005
Nurse usability rating and protocol adherence	0.58	0.038
Age and patient acceptability	-0.12	0.541
Nursing experience and protocol usability	0.18	0.624

An anonymized patient identified as Case A was a 64-year-old individual with advanced metastatic cancer who reported persistent pain and anxiety despite ongoing pharmacological management. Baseline pain and anxiety scores were 7 and 6, respectively, on numerical scales ranging from 0 to 10. The patient selected a calming immersive natural environment and completed a 15-minute VR session under direct nursing supervision. Pain decreased to 5 immediately after the intervention, while anxiety declined to 3. The patient reported feeling temporarily separated from the clinical environment and requested that the experience be repeated during a future episode of distress. No dizziness, nausea, or visual discomfort was observed.

A second participant, identified as Case B, was a 72-year-old patient with advanced chronic illness, marked fatigue, and moderate anxiety. The patient selected a virtual travel experience but reported visual discomfort and increasing tiredness after approximately seven minutes. The nurse terminated the session according to the protocol's stopping criteria, reassessed the patient's symptoms, and documented the event without further complication. Anxiety decreased only minimally, while fatigue increased slightly immediately after exposure. This case illustrates that successful VR-assisted care cannot be defined solely by completion of a predetermined exposure time; appropriate early termination can itself represent correct protocol implementation when patient tolerance becomes limited.

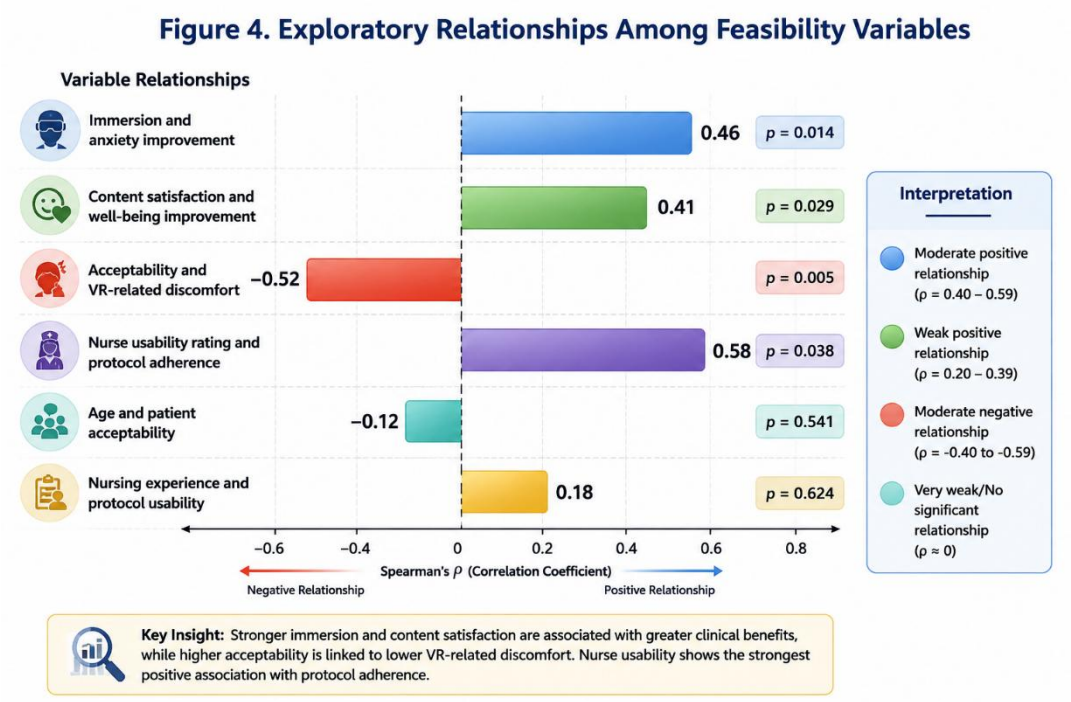

Figure 2. Exploratory Relationships Among Feasibility Variables Based on Spearman's Rank Correlation Analysis

The contrast between Cases A and B illustrates the central role of individualized assessment within the protocol. Case A demonstrated the potential value of immersive distraction and relaxation for a patient experiencing pain and psychological distress, while Case B showed that physical frailty and fatigue can limit tolerance even when the patient initially expresses interest in VR. The cases support the protocol's decision to avoid a fixed mandatory session duration. Patient condition, symptom severity, and moment-to-moment tolerance appear to be more clinically appropriate determinants of exposure than standardized duration alone.

The broader feasibility findings provide a similar message. High completion and willingness-to-repeat rates indicate that VR was generally acceptable, yet the presence of early terminations confirms that safety monitoring remains necessary. Minor adverse responses were identifiable during direct nursing observation and could be managed without clinical escalation. Patient benefit also appeared to depend partly on the appropriateness of the selected immersive content. These results reinforce the protocol's emphasis on shared decision-making, patient preference, real-time monitoring, and the nurse's authority to modify or discontinue the intervention.

The overall results indicate that an evidence-based nursing protocol for VR-assisted palliative care can be developed with high expert agreement and implemented with acceptable preliminary feasibility. The protocol achieved strong content validity, high patient completion, and favorable nurse usability while preserving explicit safeguards for adverse responses and clinical deterioration. Short-term reductions in pain, anxiety, distress, and perceived well-being burden were also observed, although the pilot design does not permit definitive claims regarding therapeutic effectiveness. The findings therefore support the clinical plausibility of VR as a structured adjunct to conventional palliative nursing interventions rather than as a replacement for established symptom-management strategies.

The combined evidence further suggests that the principal value of the protocol lies in transforming VR from an informal technological experience into a clinically governed nursing intervention. Standardized screening, patient-centered content selection, flexible exposure, continuous observation, termination criteria, reassessment, and documentation created a reproducible pathway while preserving individualized care. The results indicate that technological innovation becomes clinically meaningful only when embedded within professional judgment and patient-centered safeguards. Larger controlled studies are required to determine whether the preliminary symptom improvements observed during feasibility testing are sustained, clinically significant, and attributable to VR-assisted care rather than contextual or expectancy effects.

The findings demonstrate that an evidence-based nursing protocol for virtual reality-assisted palliative care can be systematically developed by integrating research evidence, multidisciplinary expert judgment, and preliminary clinical feasibility data. The final protocol achieved a high level of expert agreement, with the scale-level content validity index increasing from 0.91 in the first Delphi round to 0.96 following revision. Expert consensus was particularly strong for patient eligibility assessment, safety monitoring, termination criteria, infection control, patient autonomy, and post-intervention reassessment. This pattern indicates that experts considered clinical governance and patient safety to be as important as the technological components of the intervention. The resulting protocol therefore represents a structured nursing pathway rather than a set of instructions for operating VR equipment.

The clinical feasibility findings showed that 28 of the 30 recruited patients completed the planned VR intervention, corresponding to a completion rate of 93.3%. Patient willingness to repeat the experience was also high, with 26 of the 28 completers expressing interest in future VR use when clinically appropriate. Two sessions were discontinued because of dizziness or increasing fatigue, demonstrating that VR was generally tolerable but not universally suitable. These observations support the inclusion of continuous nursing supervision, flexible duration, and explicit stopping criteria within the protocol. Existing feasibility studies similarly report that VR can be implemented in specialist palliative-care settings, while emphasizing the importance of understanding practical requirements before widespread clinical adoption.

The preliminary symptom findings also suggest potential therapeutic value. Statistically significant short-term reductions were observed in pain, anxiety, distress, and overall well-being burden, whereas the reduction in fatigue was smaller and did not reach statistical significance. The largest improvement was observed for anxiety, followed by distress and pain, suggesting that immersive experiences may have particularly relevant psychological and attentional effects. These findings are consistent with the broader literature in which VR has shown promise for

reducing pain, anxiety, and depressive symptoms and improving aspects of emotional well-being among patients with serious illness.

The combined results indicate that the principal achievement of the study is not evidence that VR independently cures palliative symptoms, but evidence that VR can be organized into a clinically coherent nursing intervention. Expert validation established professional acceptability, feasibility testing demonstrated that the procedure could be implemented in real patient care, and preliminary symptom changes provided a signal worthy of further testing. The distinction is methodologically important because the pilot phase was not powered as a definitive effectiveness trial. The current findings should therefore support progression toward stronger clinical evaluation rather than an immediate claim that VR should become routine treatment for all patients receiving palliative care.

The high feasibility and acceptability observed in this study are consistent with earlier palliative-care research. Nwosu and colleagues reported that VR therapy could be implemented in specialist inpatient palliative-care and hospice environments, while also identifying organizational questions that must be addressed to support clinical adoption. Earlier systematic evidence likewise found that patients living with terminal illness generally enjoyed VR experiences and experienced few adverse reactions. The present study moves beyond feasibility alone by embedding these practical observations into a nursing protocol that explicitly defines screening, preparation, supervision, monitoring, reassessment, and documentation responsibilities.

The observed reduction in pain is compatible with accumulating quantitative evidence on VR in palliative care. A recent systematic review and meta-analysis of randomized trials reported that VR produced a significant reduction in pain intensity, with the pooled findings suggesting moderate-to-large effects and possible advantages for longer sessions and interactive content. Earlier feasibility research also demonstrated clinically relevant reductions in pain after VR exposure among palliative-care patients. The present study differs in purpose because symptom reduction was evaluated as part of protocol feasibility rather than as the primary endpoint of a fully powered randomized trial. The results therefore reinforce the plausibility of a therapeutic effect without providing sufficient evidence to estimate its definitive magnitude.

The reductions in anxiety and distress also correspond with recent reviews of psychological outcomes. Gains and colleagues identified improvements in pain, anxiety, depression, mood, and quality of life across palliative-care VR studies, although study quality was mixed and statistically significant changes were not consistently demonstrated across all outcomes. A broader review of VR among people with serious illness similarly characterized the evidence as promising but still nascent, especially for pain, anxiety, depression, and mobility. The current findings fit this pattern by showing stronger responses for anxiety and distress than for fatigue, reinforcing the possibility that psychological and attentional symptoms may be more immediately responsive to immersive interventions than complex systemic symptoms.

The patient-specific differences observed in the clinical cases correspond strongly with qualitative evidence emphasizing personalization. A 2024 meta-synthesis found that palliative-care patients frequently described positive VR experiences but also reported device-related discomfort, difficulty tolerating some experiences, and a preference for personalized VR content. The present findings similarly show that one patient obtained notable relief from a calming nature-based experience while another required early termination because of fatigue and visual discomfort. This difference challenges any assumption that a standardized VR “dose” will be

equally appropriate for all palliative patients. The protocol therefore adds value by standardizing the clinical process while preserving flexibility in content, duration, and termination.

The high level of expert consensus signifies that VR-assisted palliative nursing is beginning to move from technological experimentation toward clinically governable practice. VR devices are no longer the central issue in isolation; the more important question concerns how professional nursing judgment should govern their use. Agreement around eligibility assessment, stopping criteria, symptom reassessment, and documentation suggests that clinical experts view VR as an intervention requiring the same procedural discipline expected of other nursing interventions. This finding marks a conceptual shift from viewing immersive technology as an optional form of entertainment toward understanding it as a potentially therapeutic modality whose use requires professional accountability.

The differences between symptom outcomes signify that VR should not be conceptualized as a generic treatment for multidimensional palliative suffering. Pain, anxiety, and distress showed meaningful short-term changes, whereas fatigue was less responsive. Recent systematic evidence similarly suggests that VR effects differ across palliative symptoms, with stronger support emerging for pain and some psychological outcomes than for the full spectrum of physical symptoms. This pattern is a reminder that palliative symptoms have different biological, psychological, social, and existential determinants. A technology that effectively redirects attention or promotes relaxation may influence pain perception and anxiety while exerting considerably less influence on fatigue caused by systemic disease progression.

The occurrence of minor intolerance in a small proportion of patients signifies that acceptability should never be equated with universal suitability. Palliative-care populations frequently include patients with frailty, fluctuating cognition, severe fatigue, visual or vestibular vulnerability, limited mobility, and rapidly changing clinical status. Research on patient experience has documented both favorable responses and discomfort associated with immersive VR. The two early terminations in the present study therefore should not be interpreted primarily as intervention failures. They demonstrate the clinical importance of active nursing surveillance and confirm that discontinuing an intervention appropriately can represent successful protocol adherence.

The relationship between immersion, satisfaction, and symptom improvement signifies that the therapeutic value of VR may depend partly on the subjective quality of the experience. Immersive content that is personally meaningful, comfortable, and emotionally appropriate may generate stronger engagement than standardized content selected without patient input. Evidence reviews increasingly emphasize design characteristics, patient preferences, and personalized experiences when considering VR effectiveness and feasibility. The findings therefore support a person-centered interpretation of digital intervention: the technology becomes clinically relevant through the interaction among the patient, the content, the symptom target, and nursing facilitation (Khoury, 2022; Savio, 2025). Broader evidence from Android-based mental health application development similarly indicates that user-centered elements such as visual design, ease of operation, material presentation, and language clarity are strongly associated with user acceptance, underscoring that iterative, user-informed refinement is central to the effectiveness of digital health tools generally, not only immersive VR (Ardenny et al., 2024).

The principal nursing implication is that VR can be incorporated into palliative practice most safely when it is treated as a structured adjunct rather than an independent technological activity. Nurses require explicit criteria for identifying suitable patients, preparing equipment,

establishing therapeutic objectives, choosing appropriate content, monitoring physiological and psychological tolerance, stopping exposure when necessary, and evaluating outcomes. The protocol developed in this study provides such a pathway. This structure may reduce inappropriate variation in practice while retaining sufficient clinical flexibility to respond to rapidly changing patient needs.

The evidence-based practice implication concerns the translation of research findings into actionable bedside procedures. Published VR studies provide evidence about efficacy, acceptability, and feasibility, yet clinicians cannot automatically convert heterogeneous research interventions into standardized care. Guideline-development frameworks emphasize methodological rigor, stakeholder involvement, clarity, and applicability when translating evidence into clinical recommendations. The expert-validation component of the present study addresses this translational problem by subjecting proposed procedures to multidisciplinary scrutiny before clinical testing. Such a process strengthens the link between published evidence and actual nursing behavior.

The patient-care implication lies in expanding the repertoire of non-pharmacological strategies available within multimodal symptom management. VR should not replace analgesics, anxiolytic strategies, psychological interventions, therapeutic communication, spiritual support, or interdisciplinary palliative treatment. Current evidence instead supports considering VR as a complementary intervention with potential value for selected symptoms and patients. A patient experiencing anticipatory anxiety or persistent pain despite appropriate conventional treatment may benefit from an immersive intervention, while another patient with severe fatigue or intolerance of head-mounted devices may gain little from the same approach.

The organizational implication is that successful adoption requires more than purchasing VR headsets. Health services need procedures for equipment maintenance, infection prevention, technical support, staff training, content governance, patient privacy, adverse-event documentation, and integration into routine workflow. Nwosu and colleagues specifically highlighted implementation questions that organizations must address before VR can become embedded in palliative-care practice. The present protocol provides a clinical foundation for these decisions but also indicates that technological adoption must be accompanied by organizational preparedness if the intervention is to remain safe, equitable, and sustainable (Bove, 2025; Pietsch, 2025).

The reduction in pain observed after VR exposure may be explained partly by attentional modulation. Immersive environments compete with nociceptive stimuli for cognitive attention and can reduce the degree to which patients focus on painful sensations. Strong visual and auditory engagement may also alter the immediate subjective experience of discomfort by creating a temporary sense of presence outside the clinical environment. Recent meta-analytic evidence demonstrating significant reductions in palliative-care pain is compatible with this explanation, although the precise mechanisms remain incompletely established. The effect should therefore be understood as modulation of pain experience rather than evidence that VR addresses the underlying pathological cause.

The comparatively strong reduction in anxiety may reflect the capacity of immersive content to create psychological distance from illness-related surroundings and repetitive distressing thoughts. Nature-based environments, virtual travel, and guided relaxation can temporarily shift attention from medical equipment, confinement, uncertainty, and symptom anticipation toward experiences associated with calmness or exploration. Systematic evidence

indicates promising effects of VR on anxiety and mental well-being among palliative and serious-illness populations. The high relationship between immersion and anxiety improvement in the present study is therefore theoretically plausible because a stronger sense of presence may facilitate deeper disengagement from immediate stressors.

The limited improvement in fatigue can be explained by the underlying nature of this symptom. Palliative fatigue may arise from advanced disease, inflammation, cachexia, anemia, treatment effects, sleep disturbance, medication, psychological distress, and progressive functional decline. Immersive distraction cannot directly reverse many of these mechanisms. The weaker result for fatigue therefore strengthens rather than weakens the clinical credibility of the findings because it shows that VR effects were not uniformly positive across every measured outcome. Selective benefit is more plausible than universal benefit for a non-pharmacological intervention operating primarily through experiential, cognitive, and emotional pathways (Bove, 2025; Chu, 2023).

The high implementation adherence among nurses may have resulted from the clarity and sequential organization of the protocol. Eligibility criteria, preparation instructions, monitoring requirements, stopping rules, and documentation procedures reduced ambiguity regarding professional responsibilities. This pattern is consistent with evidence from a structured, online-based Problem-Oriented Record model, which found that moving nursing documentation from a manual to a clearly organized online format significantly improved nurses' ability to complete required clinical documentation (Ardenny & Sakhnan, 2023). AGREE II emphasizes clarity, applicability, and stakeholder involvement as core dimensions of high-quality clinical guidance. Expert participation during development may also have increased practical relevance because recommendations were shaped by clinicians familiar with the realities of palliative care rather than being derived exclusively from technological or research considerations.

The next research priority is a sufficiently powered randomized controlled trial comparing protocol-guided VR-assisted nursing with usual palliative care or an appropriate active control. Primary outcomes should be selected prospectively and may include pain, anxiety, distress, or another symptom for which preliminary evidence is strongest. Repeated measurements should determine whether observed changes persist beyond the immediate post-session period. Current systematic and meta-analytic evidence supports further controlled evaluation while continuing to emphasize heterogeneity and the need for stronger trials. Such research would determine whether the preliminary effects identified in the feasibility phase represent reproducible clinical benefit (Flierman, 2023; Helgeson, 2023).

The next methodological priority is to determine the optimal characteristics of VR exposure. Future studies should compare session duration, frequency, degree of interactivity, personalized versus standardized content, and single versus repeated exposure. Recent meta-analytic evidence suggests that session characteristics and interactivity may influence pain outcomes, providing a rationale for moving beyond binary comparisons of "VR" versus "no VR." Dose-response research could identify whether longer exposure produces greater benefit or instead increases fatigue, dizziness, and burden among frail patients. Personalization should also be tested empirically rather than assumed to be beneficial.

The next implementation priority is external validation across different palliative-care settings and populations. The current protocol should be evaluated in inpatient palliative units, hospices, oncology services, outpatient clinics, and potentially home-based care, because workflow, patient condition, staffing, and technological support vary substantially across

contexts. Research on serious illness suggests that supervised or assisted use may remain preferable for many older or medically vulnerable patients. Multicenter implementation studies could also examine training requirements, protocol fidelity, cost, accessibility, equity, and the organizational resources necessary for sustained adoption (Meulen, 2023).

The longer-term direction should preserve a clear principle: VR technology should remain subordinate to the goals and values of palliative care rather than redefining them. Effective palliative nursing depends on presence, communication, symptom assessment, human connection, clinical judgment, and respect for patient autonomy. VR can expand what nurses are able to offer, particularly when physical limitations prevent patients from accessing meaningful environments or when conventional symptom management leaves residual distress. The appropriate future is therefore not technology-centered palliative care, but person-centered palliative care in which evidence-based digital tools are selectively used when they genuinely contribute to comfort, dignity, autonomy, and quality of life.

CONCLUSION

The most important finding of this study is that an evidence-based nursing protocol can transform virtual reality from a stand-alone technological intervention into a clinically governed component of palliative care. The protocol achieved strong expert agreement and high preliminary feasibility while preserving patient autonomy, safety monitoring, individualized content selection, flexible exposure duration, and clear termination criteria. Short-term reductions in pain, anxiety, distress, and overall well-being burden were also observed, although fatigue showed a more limited response. This pattern suggests that VR is particularly relevant for symptoms influenced by attention, emotional regulation, and immersive distraction rather than for all dimensions of palliative suffering. The distinctive finding is therefore not simply that VR may relieve symptoms, but that its clinical value depends on being embedded within structured nursing assessment, professional supervision, and person-centered decision-making.

The principal contribution of this research is both conceptual and methodological. Conceptually, the study proposes a nursing-centered framework in which VR is positioned as an adjunctive therapeutic tool governed by evidence-based assessment, patient preference, safety criteria, symptom reassessment, and clinical judgment rather than as an autonomous digital intervention. This framework balances standardization with personalization by maintaining consistent procedures while allowing content, duration, and therapeutic goals to be adapted to each patient's condition and preferences. Methodologically, the study integrates evidence synthesis, modified Delphi validation, and clinical feasibility testing within a sequential protocol-development process. This combination provides a stronger foundation for clinical implementation because the protocol is informed not only by published evidence but also by multidisciplinary expertise and real-world patient and nurse experiences.

The study has several limitations that should guide future research. The feasibility phase involved a relatively small sample and was not designed or powered to establish definitive clinical effectiveness, while the absence of a randomized control group limits causal interpretation of symptom changes. The short observation period also prevents conclusions about sustained effects, repeated exposure, long-term tolerance, or cumulative benefit. Expert validation and feasibility testing conducted within limited clinical contexts may further restrict generalizability across different palliative populations and healthcare settings. Future research should therefore evaluate the protocol through adequately powered randomized controlled trials,

multicenter studies, and longitudinal designs that compare intervention duration, frequency, personalization, and levels of immersion. Further investigation is also needed to examine cost-effectiveness, implementation fidelity, digital accessibility, caregiver involvement, home-based application, adverse-event patterns, and differential effects across diagnoses, functional conditions, and symptom profiles.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this manuscript, the author(s) used Google Gemini to assist inimproving grammar, language quality, and overall readability of the text. After using this tool, the author(s) Carefully reviewed and edited the content as necessary and take full responbility for the content of the publication.

AUTHOR CONTRIBUTIONS

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.
Author 3: Data curation; Investigation.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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