Title: VIRTUAL REALITY REDUCES ANXIETY AND PAIN IN ACUTE HOSPITAL PALLIATIVE CARE: SERVICE EVALUATION

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Abstract:
Objectives: Virtual Reality (VR) might improve symptom management, but there is limited evidence regarding VR in palliative care. We evaluated the feasibility of VR and impact on anxiety and pain for patients in a hospital palliative care consultation service.

Methods: Patients referred to a hospital specialist palliative care team, with anxiety or pain were offered a VR intervention (a short audio-visual experience.) Participants rated anxiety and pain on a 0-10 Likert severity scale pre/post intervention and completed an evaluation form. Change in symptom scores was analysed by parametric statistics.

Results: 28 participants used VR a total of 42 times with no adverse events. Mean pain score reduced by 28% from 4.10 (SD = 2.71) pre intervention, to 2.93 (SD=2.45) post intervention ($t(27)=5.150$, $p<0.001$). Mean anxiety scores reduced by 40% from 4.43 (SD=2.56) to 2.65 (SD=2.24); ($t(27)=5.058$, $p<0.001$). Patients rated the experience on average 4.75/5 and all would recommend use to a friend. VR was described as absorbing and relaxing.

Conclusion: VR may improve anxiety and pain and was acceptable in this setting. Larger scale evaluation will generate important data on feasibility and implementation.

Introduction:

The focus of hospital palliative care is to improve quality of life for those living with life limiting illness, through holistic support and expert symptom management. Symptoms can be distressing and are often exacerbated by anxiety related to care in the hospital environment (1). Pain is not just a physiological experience, often includes emotional distress and can co-occur with depression and anxiety. All these domains should be addressed in treatment for optimal results (2).

Virtual Reality (VR) provides an immersive computer generated 3-dimensional experience allowing the brain to perceive an entirely different environment, thus creating distraction. This non-pharmacological approach has positive effects in management of anxiety and pain in various populations (3-8).

Early studies highlighted potential benefits and feasibility of VR in palliative care in hospice and hospital and with few reported risks or side effects (3, 9-12). However, evidence is limited and patient cohorts small. Guenther et al (3) identified reductions in pain but suggests further information to individualize VR technology. Nwosu et al (11) concluded that VR in palliative care is feasible and safe but further evidence and understanding of efficacy and practicality is needed.

The use of Virtual Reality in palliative care is in its infancy but may be a helpful adjunct to non-pharmacological symptom management. More information and greater understanding of how this can be practically applied to support and enhance existing clinical practice is needed. We evaluated the feasibility of using VR and impact on anxiety and pain scores for patients being seen by a hospital palliative care consultation service.

Methods:

Study Design: This was a Service evaluation of the impact and acceptability of VR intervention for anxiety and pain in hospitalised palliative care patients. VR was offered as an additional treatment option, alongside standard pharmacological and non-pharmacological symptom management techniques for anxiety and pain for patients referred to the specialist palliative care team. VR equipment was funded by Addenbrooke's Charitable Trust.

Participants: Patients under the care of Cambridge University Hospital (CUH) palliative care team, with anxiety and pain, with capacity to verbally consent and agree to trial the VR were potentially eligible.

Evidence to date suggests VR is low risk with few reported adverse side effects, but dizziness headaches, and nausea have been reported (3,7,8). To ensure safety and comfort we excluded patients with poorly controlled nausea, claustrophobia, epileptic symptoms, motion sickness or open facial wounds. Conditions that would impede equipment such as binocular vision abnormalities or severely impaired vision were excluded. To minimise risk of infection, VR was not offered to patients nursed in isolation.

VR intervention: The VR equipment (DR.VR immersive Therapeutic System, provided by Rescape Innovation LTD) comprised a VR headset, headphones, a computer tablet for patients to rate anxiety and pain and select audio-visual experiences (referred to as Immersive Therapeutic Treatments) a router and carry case.

Clinical practitioners within the CUH palliative care team (including specialist nurses and psychologists), had initial VR training and then trained other clinical team members.

VR was verbally explained, and written information provided to suitable patients. They were advised participation was voluntary and personal details and data capture would remain anonymous.

Patients wishing to use the VR chose from a selection of short audio-visual experiences, meditative spaces, or games, lasting an average of 7.5 minutes. These included themes such as "Secret Beaches", "Under Water", "A short meditation".

Patients were supported in fitting the VR head set to ensure it was comfortable and the image was focused. The clinician remained with the patient for the duration of the experience.

A cleaning process was followed between equipment uses as per clinical reports (13-14).

Data collection: Pre-intervention, patients rated anxiety and pain scores on a 10-point Likert severity scale, via the computer tablet, illustrated with images of different facial expressions. These measures were repeated at the end of the intervention. Gender, age-range, and choice of audio-visual experience were also reported via the tablet. Data was stored securely according to General Data Protection Regulation (GDPR).

To assess VR acceptability, a short-written evaluation form was devised and completed after initial use. This asked patients to “like” their experience using a numerical 0 -5 Likert scale and respond, yes or no to, “would you recommend it to a friend?” The evaluation included space for patient and clinician comments.

Analysis: All recorded data was included in the analysis. Given the sample size, 10-point Likert scale, and normal distribution of data, we treated results as interval data and used parametric analysis (15). We used a within-subjects t-test to compare mean anxiety score before and after VR intervention and to compare the mean pain scores. For those using VR more than once, we averaged pre/post symptom scores across all episodes to give a single score for each measure.

Ethics: Approval was provided by the University of West England ethics committee and Cambridge University Hospitals clinical audit team.

Results:

28 patients, 19 female (aged 25 – 84) and 9 males (aged 25-78) used VR a total of 42 times between June 2021 and July 2022. There were no adverse events. On two occasions data was not recorded due to loss of internet connection. Six patients used the VR 2-6 times. One patient used VR to undergo a painful procedure.

There was statistically significant reduction in both anxiety and pain after the intervention. Mean anxiety scores reduced by 40.3% from 4.43 (SD=2.56) to 2.65 (SD=2.24); ($t(27)=5.058$, $p<0.001$) (figure 1). Mean pain score reduced by 28.6% from 4.10 (SD = 2.71) pre intervention, to 2.93 (SD=2.45) immediately post intervention ($t(27)=5.150$, $p<0.001$).

<Insert figure 1 here>

Most patients offered VR were happy to participate. 23 completed an evaluation form. The mean score response to, “did you like the VR experience?” was 4.75 on a 5-point verbal rating scale, where 1 was “not at all” and 5 was “a lot”. All indicated yes to “would you recommend it to a friend?” Ten referred to the experience as relaxing or an escape, e.g. “drift off into my own world”, “allowed me to escape”, “so relaxed I could have gone to sleep”. Ten patients commented on their enjoyment, “Fantastic”, “Brilliant”, “too short”. Two reported visual problems, “slightly blurred”.

Staff observed four patients looking visibly relaxed. They also noted patients’ expressions of joy, such as “how lovely” and one patient appear, “very moved and tearful”. Main staff constraints were lack of confidence in VR, bulky equipment and limited time. Reasons for declining VR use were inconsistently recorded, but some patients reported feeling too tired or prioritised other clinical care. One patient was unable to tolerate the headset.

Discussion:

This service evaluation suggests VR improved anxiety and pain in palliative care patients in an acute hospital setting, and provided a sense of wellbeing. The statistically significant reduction in both anxiety and pain is important and consistent with other findings. VR can potentially be a helpful adjunctive treatment for symptom management in palliative care (3, 9-12).

The acceptability of VR was high for patients. The fact that we were able to visit patients in a variety of clinical areas, suggests VR can be used flexibly and is feasible in practice as shown in previous studies (3, 11, 12). The demographic profile of participants suggests age was not a barrier to use.

Our findings raise several questions about future use and applications of VR in palliative care. Firstly, some patients used VR more than once. Further investigation of the effects of repeated VR use would help better understand future service models (3,8,12). Secondly, prior studies to date have used VR experiences of varying duration (3,5,8). A shorter intervention is potentially more practical for routine clinical care, but it is worth investigating the optimal duration of VR for maximum clinical impact (3). Thirdly, one patient used VR to enable them to undergo a painful procedure, indicating other potential uses as highlighted in existing literature (4,8). Finally, patient comments included expressions of joy or sadness, and the possibility of VR as an adjunct to traditional psychological therapies (3). This evaluation involved a small cohort, and data collection was limited in scope, but the findings nevertheless support existing literature.

Future studies with more extensive data collection to investigate cost implications, impact on length of consultation time, duration of action of VR, and the effect on use of analgesics would be helpful.

Conclusion:

A brief VR intervention was acceptable and resulted in clinically important reductions in anxiety and pain scores for hospitalised patients referred for specialist palliative care. The implications of this finding for palliative care services deserve further exploration.

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Conflicts of interest:

None declared.

Contributions statement:

Nancy Burridge, Alison Sillence and Lynda Teape were responsible for conceptual ideas and study design.
Nancy Burridge, Alison Sillence, Lynda Teape, Ben Clark, Emma Bruce, Julie Armoogum and Daniella Leloch were responsible for planning, organising and conduct.
Nancy Burridge, Alison Sillence, Lynda Teape, Ben Clark and Emma Bruce were responsible for data collection and reporting.
Alison Sillence, was responsible for statistical analysis of data.
Simon Etkind and Anna Spathis were responsible for critical review and editing of report.
All authors read and approved the final version of this short report.
Nancy Burridge is the guarantor

References:

1. Alzahrani N. The effect of hospitalization on patients' emotional and psychological well-being among adult patients: An integrative review. Appl Nurs Res. 2021 Oct;61:151488. doi: 10.1016/j.apnr.2021.151488. Epub 2021 Aug 12.

2. Brant J. Holistic total pain management in palliative care: Cultural and global considerations. Palliative Medicine and Hospice Care Open J. 2017; SE(1): S32-S38. Doi: 10.17140/PMHCOJ-SE-1-108.

3. Guenther M, Görlich D, Bernhardt, F et al. Virtual reality reduces pain in palliative care–A feasibility trial. BMC Palliative Care. 2022. 21, 169 doi:https://doi.org/10.1186/s12904-022-01058-4

4. Hoffman H, Doctor J, Patterson D, et al. Virtual reality as an adjunctive pain control during burn wound care in adolescent patients. Pain. 2000 Mar;85(1-2):305-9. doi: 10.1016/s0304-3959(99)00275-4.

5. Jones T, Moore T, Choo J. The Impact of Virtual Reality on Chronic Pain. PLoS One. 2016 Dec 20;11(12):e0167523. doi: 10.1371/journal.pone.0167523.

6. Niki K, Okamoto Y, Maeda I, Mori I. et al. A Novel Palliative Care Approach Using Virtual Reality for Improving Various Symptoms of Terminal Cancer Patients: A Preliminary Prospective, Multicenter Study. Journal of Palliative Medicine. 2019 Jun;22(6):702-707. doi: 10.1089/jpm.2018.0527. Epub 2019 Jan 24.

7. Spiegel B, Fuller G, Lopez M, Dupuy T. et al. Virtual reality for management of pain in hospitalized patients: A randomized comparative effectiveness trial. PloS one. 2019. 14(8), p.e0219115. doi: 10.1371/journal.pone.0219115.

8. Tashjian V, Mosadeghi S, Howard A. et al. Virtual Reality for Management of Pain in Hospitalized Patients: Results of a Controlled Trial. JMIR Mental Health. 2017 Mar 29;4(1): e9. doi: 10.2196/mental.7387.

9. Johnson T, Bauler L, Vos D, Hifko A. Virtual Reality Use for Symptom Management in Palliative Care: A Pilot Study to Assess User Perceptions. J Palliat Med. 2020 Sep;23(9):1233-1238. doi: 10.1089/jpm.2019.0411. Epub 2020 Jan 2.

10. Lloyd A, Haraldsdottir E. Virtual reality in hospice: improved patient well-being. BMJ Support Palliat Care. 2021 Sep;11(3):344-350. doi: 10.1136/bmjspcare-2021-003173. Epub 2021 Jul 2.

11. Nwosu A, Mills M, Roughneen, S. et al. Virtual Reality in specialist palliative care: a feasibility study to enable clinical practice adoption. BMJ Supportive & Palliative care. Published Online First: 17 February 2021. doi: 10.1136/bmjspcare-2020-002327.

12. Perna L, Lund S, White N. et al. The Potential of Personalized Virtual Reality in Palliative Care: A Feasibility Trial. American Journal of Hospice and Palliative Medicine. 2021; 38(12):1488-1494. doi:10.1177/1049909121994299.

13. Pascoe & Maillard (2020) Rescape: Dr VR disinfection (Part II – virucidal activity of disinfectant wipe products). Available via: https://hubs.ly/Q01Cg-Hz0 . Accessed on 14.02.23.

14. Pascoe & Maillard (2020) Rescape: DR.VR disinfection (Part I – bactericidal activity of disinfectant wipe). Available via: https://hubs.ly/Q01Cg_s10 . Accessed on 14.02.23

15. Sullivan G, Artino A. Analyzing and interpreting data from likert-type scales. J Grad Med Educ. 2013 Dec;5(4):541-2. doi: 10.4300/JGME-5-4-18.

Figure 1 legend: Mean pain and anxiety scores pre and post VR use