Virtual reality in specialist palliative care: a feasibility study to enable clinical practice adoption

Corresponding author

Dr Amara Callistus Nwosu

Lancaster University Faculty of Health and Medicine
International Observatory on End of Life Care
Lancaster University
Lancaster
LA1 4YG
Email: a.nwosu@lancaster.ac.uk

Mark Mills

Marie Curie Hospice Liverpool

Simon Roughneen

Academic Palliative & End of Life Care Centre, Liverpool University Hospitals
NHS Foundation Trust

Sarah Stanley

Marie Curie Hospice Liverpool

Laura Chapman

Marie Curie Hospice Liverpool

Stephen Mason

Palliative Care Unit, University of Liverpool, Liverpool, Merseyside, UK.

WORD COUNT

1576

KEY WORDS

Terminal care; supportive care; quality of life; symptoms and symptom management

ABSTRACT

Background

The use of Virtual Reality (VR) is increasing in palliative care. However, despite increasing interest in VR there is little evidence of how this technology can be implemented into practice.

Aims

This paper aims to: (1) explore the feasibility of implementing VR therapy, for patients and caregivers, in a hospital specialist inpatient palliative care unit and a hospice, and (2) to identify questions for organisations, to support VR adoption in palliative care.

Methods

The Samsung Gear VR system was used in a hospital specialist palliative inpatient unit and a hospice. Patients and caregivers received VR distraction therapy and provided feedback of their experience. Staff completed a feedback questionnaire to explore their opinion of the usefulness of VR in palliative care. A public engagement event was conducted, to identify questions to support implementation of VR in palliative care settings.

Results

Fifteen individuals (12 (80%) patients and 3 (20%) caregivers) participated. All had a positive experience. No adverse effects were reported. Ten items were identified for organisations to consider ahead of adoption of VR in palliative care. These were questions about: the purpose of VR; intended population; supporting evidence; session duration; equipment choice; infection control issues; content choice; setting of VR; person(s) responsible for delivery and the maintenance plan.

Conclusions

It is feasible to use VR therapy in palliative care; however further evidence about its efficacy and effectiveness is needed. Palliative care practitioners considering VR use should carefully consider several factors, to ensure it can be used safely and effectively.

BACKGROUND

Virtual reality (VR) is a computerised technology that uses visual graphics, sounds and other sensory input to create an interactive computer world.[1] VR is increasingly used in healthcare for symptom management of several conditions.[1-5] The use of VR in palliative care is growing for variety of purposes, such as education delivery[6][7], and symptom management in hospital[8] and hospices.[9-12] Currently, there is little guidance of how VR should be used in clinical care,[13] and no information about the organisational requirements (e.g. internet connectivity) and system processes (e.g. infection control), necessary to ensure VR can be used safely, effectively and sustainably.

AIM

This paper aims to: (1) explore the feasibility of implementing VR therapy, for patients and caregivers, in a hospital specialist inpatient palliative care unit and a hospice, and (2) to identify questions for organisations for consideration, to support VR adoption in palliative care.

METHODS

This quality improvement project was conducted according to the Plan, Do, Study and Act (PDSA) quality improvement cycle.[14] The PDSA cycle was chosen as it is an accepted mechanism of implementing change. The project was done through the Liverpool Global Digital Exemplar Programme (GDE).[15] The GDE programme is a knowledge sharing platform developed by the English National Health Service, which enables digitally advanced hospitals to innovate and share knowledge globally.[16]

Planning/Organisation

The project was conducted over three months (August – October 2018) in two UK specialist palliative care inpatient units. This included a hospital-based 12-bedded (Academic Palliative Care Unit, Liverpool University Hospitals NHS Foundation Trust - LUHFT) and a 20-bedded hospice (Marie Curie Hospice Liverpool - MCHL). Both units provide specialist palliative care services (cancer and non-cancer) to a similar geographical population.

Choice of equipment

The Samsung Gear VR system was chosen due to its portability and ease of use (Supplementary file 1: Virtual reality equipment requirements). This involved a Samsung Galaxy S8 phone positioned in a head mounted display (https://www.samsung.com/global/galaxy/gear-vr/#gear-vr). The foam face cushion was replaced with a polyurethane cushion (Cusfull ®) to enable decontamination between participants (via 70% Isopropyl alcohol wipe). Bluetooth headphones (Sony WH-CH500) were connected to the phone to provide audio.

Partipant evaulation

Inpatient admissions (both sites), outpatients (hospice only) and caregivers (both sites) were were identified by clinical staff (MM – MCHL; SR – LUHFT) and were offered the opportunity to use the VR system. Participants providing written consent were asked to choose one of three VR experiences and complete a evaluation. The VR experiences were downloaded from the Oculus Gear VR store;[17] these included: (i) a 5-minute guided relaxation video of a beach (Relax VR[18]); (ii) a 10-minute guided meditation through a computer-generated forest (Forest of serenity – St Giles Hospice[19]), or (iii) a 5-minute video rollercoaster ride.[20] A modified version of the 'Evaluation of VR Intervention questionnaire' (Supplementary file 2: Modified virtual reality intervention questionnaire) was used to record feedback.[4] Participants were verbally asked the following (by MM and SR): *What did you think of the VR? What did you like? Was there anything you did not like? Would you want to use this again?*

Staff evaluation

Staff involved in the project were asked to complete an electronic feedback survey (Supplementary file 3: Healthcare professional feedback questionnaire) to gather their feedback of using VR. The survey was a combination of closed and free text responses. Staff were asked for feedback on the following issues in VR: helpfulness of VR in clinical practice, what went well, problems, barriers and opportunities for future use.

Public evaluation

Public opinion to VR in palliative care was identified from a public engagement event at end of the project (in MCHL, September 2019). The project results were presented and a modified world café method[21] was used to ask: *"what questions can organisations use to support VR adoption in palliative care?"* A facilitator (ACN) promoted discussion through open questions, and a scribe (SS) collected written feedback.

RESULTS

Fifteen people participated in the evaluation (Table 1). This consisted of 12 patients (80%) and 3 (20%) caregivers. Median age of participants was 63 years (SD ± 16.50). The majority were male (n=9, 60%). Cancer was the most common diagnosis for patient participants (n=10; 83.3%). Most people were from the hospice inpatient setting (n= 7, 46.7%) followed by hospital (n=6, 40%) and outpatients respectively (n=2, 13.3%).

Relaxation was the most common reason for using VR (n=11, 73.3%). The beach (n=7, 46.7%) and forest experiences (n=7, 46.7%) were most popular. Most participants had a positive experience of the VR (n=13, 93.3%). All participants indicated that they would like to use of the VR again. No major complications were noted; although, two participants (13.3%) reported minor problems (heaviness of the headset, difficultly in adjusting the head-straps and problems focusing the image).

Six people (lay representatives) participated in the public engagement event. Ten questions to support adoption of VR in palliative care settings were identified, comprising of the following: the purpose of VR; intended population; supporting evidence; session duration; equipment choice; infection control issues; content choice; setting of VR; person(s) responsible for delivery and the maintenance plan (Supplementary file 4: Public engagement event discussion - questions for organisations).

Seven staff members completed the feedback survey (Supplementary file 5: Staff perspectives on virtual reality). Most were based in MCHL (n=6, 85.7%) and the majority were doctors (n=4, 57.1%). All respondents rated VR as helpful, with high Likert scores of 4 (n=4, 57.1%) and 5 (n=3, 42.9%) for the responses. Following the end of the project, VR was used again by 5 (71.4%) respondents. All staff were willing to use VR in the future. Free-text responses provided further feedback (Supplementary file 6: Free text questionnaire responses from health professionals detailing their views about the use of virtual reality in palliative care); in summary, the reported benefits of VR were its ease of use, the improvements in psychological wellbeing and the observed positive short-term effects in participants. Problems with the VR included the discomfort of the headset, disorientation noted by some participants, and technical issues relating to setting up and charging the device. Barriers to VR use were identified as infection control issues, issues with staff unfamiliar of how to use the equipment and technical issues of ensuring the equipment was updated, charged and ready for use. Future possible opportunities to use VR in palliative care were identified included 'distraction therapy' for patients undergoing during clinical procedures (e.g. ascitic drain insertion), virtual hospice visits, family meetings and therapy sessions.

Table 1: Participant demographics and virtual reality characteristics

Participant demographic	N (%)	Virtual reality characteristic	N (%)	Virtual reality characteristic	N (%)
Median age, years [± SD]	63.0 [± SD 16.50]	*Setting*		*Experience of using VR*	
Male	9 (60)	Hospice inpatient	7 (46.7)	Good	14 (93.3)
Female	6 (40)	Hospice outpatient	2 (13.3)	Indifferent	1 (6.7)
		Hospital	6 (40)	Poor experience	0 (0)
Participants					
Patients	12 (80)	*Reason for VR*		*Adverse events*	
Caregivers	3 (20)	Relaxation	11 (73.3)	Yes	0 (0)
		Pain	2 (13.3)	No	15 (100)
Patient diagnosis, n =12		Boredom	1 (6.7)		
Cancer	10 (83.3)	Anxiety	1 (6.7)	*Problems with VR use?*	
Amyloidosis	1 (8.3)			Yes	2 (13.3)
Neurological	1 (8.3)	*Choice of VR experience*		No	13 (86.7)
		Beach	7 (46.7)		
		Forest	7 (46.7)	*Would they use VR again?*	
		Rollercoaster	1 (6.7)	Yes	15 (100)
				No	0 (0)
		Time VR used			
		5 minutes	3 (20)	*Was VR requested to be used again*	
		10 minutes	5 (33.3)	Yes	2 (13.3)
		15 minutes	6 (40)	No	13 (86.7)
		30 minutes	1 (6.7)		

DISCUSSION

Our data suggests that it is feasible to use VR in hospital and hospice settings. VR was well received by patients, caregivers and staff. All participants described a positive experience with no major adverse effects. Ten questions were identified for organisations to consider, to support VR adoption in palliative care.

Contribution and strengths of this paper

This is the first paper in the literature to begin to develop a framework to consider how VR can be implemented in palliative care. This paper is consistent with previous studies which demonstrate the feasibility of using VR in palliative care settings.

Relation to previous work
The findings of this paper suggest feasibility of VR in hospital palliative care settings. This is consistent with previous work by Niki et al,[8] who identified symptomatic improvement for 20 hospital inpatients with advanced cancer. Similarly, our work suggests feasibility of VR in hospice settings, which supports the outcomes of previous studies that demonstrate positive outcomes of VR in hospice populations.[9-12]

For palliative care VR, it is important to consider the purpose of the activity, to identify how content is developed, and to define how (and by whom) it is delivered. Our study used software developed specifically for palliative care [19] and generic resources.[18, 20] To date, no VR resources have been validated for the specific purpose of providing symptom relief in palliative care. Consistent with previous work, our findings report that palliative care VR should be evidence based.[13] Knowledge transfer considerations to support implementation of VR in palliative care have not been previously reported in the literature. Our study reports on important practical issues, such as choice of VR system, infection control issues and technical device issues such as, storage, charging and maintenance.[22]

Limitations

Limitations to this project are its small scope and feasibility focus, meaning that no conclusions about the effectiveness and efficacy of VR can be made. A completely immersive experience was not possible from the device; meaning that participants may had a better experience with other systems.[10] Some participants struggled to independently operate aspects of the VR device and required assistance, demonstrating that technology should be optimised for user requirements. Remote operation and second screen viewing was not possible from this VR device, which meant that the operator needed to stay with the participant for the entirety of the session.

Technical challenges were observed. Firstly, software updates were frequently required, which necessitated planning to ensure the device was updated prior to use. Secondly, it was necessary to charge the phone and headphones separately, which was occasionally impractical. Finally, internet connectivity problems were encountered which prevented VR use; cellular mobile internet was used in these occasions which reduced the video quality.

Implications for policy and practice and research

Our paper highlights a number of practical questions to support organisations considering use of VR in palliative care. Although the clinical use of VR in palliative care appears feasible and safe, further evidence of its benefit, effectiveness and practicality are required before recommendations can be made about its usefulness. Further research is needed to examine whether VR can effectively improve symptom management in palliative care and to ensure its use is practical, meaningful and evidence-based.

CONCLUSION

Our data suggests that it is feasible to use VR in palliative care. Practitioners considering using VR should consider a number of factors, concerning the evidence and practical issues, to ensure that this technology can be used safely and effectively in palliative care.

ACKNOWLEDGEMENTS

ETHICS

This project did not constitute research. This project has been adopted as a quality improvement (QI) project by the Liverpool University Hospitals NHS Foundation Trust Global Digital Exemplar (GDE) Programme. The covers both the hospital and hospice sites. Therefore, ethics committee approval was not required.

LIST OF SUPPLEMENTARY FILES

Supplementary file 1: Virtual reality equipment requirements

Supplementary file 2: Modified virtual reality intervention questionnaire

Supplementary file 3: Healthcare professional feedback questionnaire

Supplementary file 4: Public engagement event discussion - questions for organisations

Supplementary file 5: Staff perspectives on virtual reality

Supplementary file 6: Free text questionnaire responses from health professionals detailing their views about the use of virtual reality in palliative care

CONTRIBUTORS

The author's responsibilities were as follows:

Study design: ACN, SR, MM

Data collection: MM, SR

Paper writing: ACN

Critique and review of the final manuscript: ACN, MM, SR, SS, LC, SM

CONFLICT OF INTERESTS STATEMENT

The authors declare that they have no conflict of interest.

FUNDING STATEMENT

LICENSE FOR PUBLICATION

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

REFERENCES

1.   Chirico A, Lucidi F, De Laurentiis M, Milanese C, Napoli A, Giordano A. Virtual Reality in Health System: Beyond Entertainment. A Mini-Review on the Efficacy of VR During Cancer Treatment. Journal of cellular physiology. 2016;231(2):275-87.

2.   Hajesmaeel Gohari S, Gozali E, Niakan Kalhori SR. Virtual reality applications for chronic conditions management: A review. Medical journal of the Islamic Republic of Iran. 2019;33:67.

3.   Oyama H. Virtual reality for the palliative care of cancer. Studies in health technology and informatics. 1997;44:87-94.

4.   Schneider SM, Hood LE. Virtual reality: a distraction intervention for chemotherapy. Oncology nursing forum. 2007;34(1):39-46.

5.   Oyama H, Kaneda M, Katsumata N, Akechi T, Ohsuga M. Using the bedside wellness system during chemotherapy decreases fatigue and emesis in cancer patients. Journal of medical systems. 2000;24(3):173-82.

6.   Evans L, Taubert M. State of the science: the doll is dead: simulation in palliative care education. BMJ Support Palliat Care. 2018.

7.   Lee AL, DeBest M, Koeniger-Donohue R, Strowman SR, Mitchell SE. The feasibility and acceptability of using virtual world technology for interprofessional education in palliative care: a mixed methods study. Journal of interprofessional care. 2019:1-11.

8.   Niki K, Okamoto Y, Maeda I, Mori I, Ishii R, Matsuda Y, et al. A Novel Palliative Care Approach Using Virtual Reality for Improving Various Symptoms of Terminal Cancer Patients: A Preliminary Prospective, Multicenter Study. J Palliat Med. 2019;22(6):702-7.

9.   Johnson T, Bauler L, Vos D, Hifko A, Garg P, Ahmed M, et al. Virtual Reality Use for Symptom Management in Palliative Care: A Pilot Study to Assess User Perceptions. Journal of Palliative Medicine. 2020.

10.   Popert S, Riat H, Hodges E. P-35 Can virtual reality (vr) guided meditation reduce pain? a feasibility and acceptability study. BMJ Supportive & Palliative Care. 2017;7:A22.

11.   Perna-Forrest L. P-34 Unlocking the potential of virtual reality in palliative care. BMJ Supportive & Palliative Care. 2017;7:A22.

12.   Perna-Forrest L, Minton O. 149 The potential for virtual reality therapy in palliative care–preliminary findings. British Medical Journal Publishing Group; 2019.

13.   Austin P, Lovell M, Siddall P. The Efficacy of Virtual Reality for Persistent Cancer Pain: A Call for Research. J Pain Symptom Manage. 2019;58(4):e11-e4.

14.   ACT Academy - NHS Improvement. Plan, Do, Study, Act (PDSA) cycles and the model for improvement. https://improvement.nhs.uk/resources/pdsa-cycles/: NHS Improvement; 2017.

15.   Royal Liverpool Global Digital Exemplar. Digital Liverpool, Our Digital Future. https://www.rlbuht.nhs.uk/media/5572/digital_liverpool_april_2017.pdf: Liverpool Univerity Hospitals NHS Foundation Trust; 2017.

16.   NHS England. Global Digital Exemplars 2018 [Available from: https://www.england.nhs.uk/digitaltechnology/connecteddigitalsystems/exemplars/.

17.   Facebook Technologies. Oculus Gear VR Store https://www.oculus.com/experiences/gear-vr/2019 [Available from: https://www.oculus.com/experiences/gear-vr/.

18.   Relax VR. Relax VR 2019 [Available from: https://www.relaxvr.co/virtualrealityspas.

19.   St. Giles Hospice. Forest of Serenity 2017 [Available from: https://www.stgileshospice.com/forest-of-serenity/.

20.   3D VR 360 VIDEOS. 360 Video VR Roller Coaster Ride 4K 2018 [Available from: https://www.youtube.com/watch?v=kxPZfwAM2bE&feature=youtu.be.

21.   The World Cafe. World Cafe Method Website of the World Cafe2018 [Available from: http://www.theworldcafe.com/key-concepts-resources/world-cafe-method/#.

22.   Glegg SMN, Levac DE. Barriers, Facilitators and Interventions to Support Virtual Reality Implementation in Rehabilitation: A Scoping Review. PM & R : the journal of injury, function, and rehabilitation. 2018;10(11):1237-51.e1.