FULL TITLE OF THE STUDY

The use of virtual reality for symptom control and wellbeing in palliative care and oncology patients

SHORT STUDY TITLE / ACRONYM

VR for symptom control and wellbeing

RESEARCH REFERENCE NUMBERS

IRAS Number: 296914

SPONSORS Number: 2021.RCHT.07

FUNDERS Number: N/A

This protocol has regard for the HRA guidance and order of content

Moon NO, *et al. BMJ Oncology* 2023; 2:e000160. doi: 10.1136/bmjonc-2023-000160

SIGNATURE PAGE

The undersigned confirm that the following protocol has been agreed and accepted and that the Chief Investigator agrees to conduct the study in compliance with the approved protocol and will adhere to the principles outlined in the Declaration of Helsinki, the Sponsor's SOPs, and other regulatory requirement.

I agree to ensure that the confidential information contained in this document will not be used for any other purpose other than the evaluation or conduct of the investigation without the prior written consent of the Sponsor

I also confirm that I will make the findings of the study publically available through publication or other dissemination tools without any unnecessary delay and that an honest accurate and transparent account of the study will be given; and that any discrepancies from the study as planned in this protocol will be explained.

For and on behalf of the Study Sponsor:

Signature: Date:

..../...../.....

Name (please print):

.....

Position:

.....

Chief Investigator:

Signature: Date:

..../...../.....

Name: (please print):

.....

TABLE OF CONTENTS

KEY STUDY CONTACTS

Chief Investigator	Dr John McGrane Consultant Oncologist Royal Cornwall Hospital Truro Cornwall TR1 3LJ Email: john.mcgrane@nhs.net
Principle Investigator	Dr Niall O Moon Royal Cornwall Hospital Truro Cornwall TR1 3LJ Email: niall.moon@nhs.net
Sponsor	Mr Mike Visick Research and Development Department Knowledge Spa Royal Cornwall Hospital Trust Truro CornwallTR1 3LJ Email: Rcht.sponsor@nhs.net Tel: 01872 256430
Funder(s)	Royal Cornwall Hospital Charity - £5230 for equipment, VR video camera and technical support

Moon NO, *et al. BMJ Oncology* 2023; 2:e000160. doi: 10.1136/bmjonc-2023-000160

STUDY SUMMARY

Study Title	The use of virtual reality for symptom control and wellbeing in palliative care and oncology patients
Internal ref. no. (or short title)	VR for symptom control and wellbeing
Study Design	A single site, interrupted time series, cohort study
Study Participants	Hospital inpatients who are managed by the oncology and palliative care teams
Planned Size of Sample (if applicable)	Minimum 60
Follow up duration (if applicable)	Participants will be asked to complete a quality of life (QoL) questionnaire prior to using the VR system and again afterwards to measure impact. No Long term follow up is planned
Planned Study Period	12 Months
Research Question/Aim(s)	The aim of the study is to investigate the utility and effectiveness of virtual reality for improving symptoms and wellbeing, as measured by the QoL questionnaire, for palliative care patients

Moon NO, *et al. BMJ Oncology* 2023; 2:e000160. doi: 10.1136/bmjonc-2023-000160

FUNDING AND SUPPORT IN KIND

FUNDER(S) (Names and contact details of ALL organisations providing funding and/or support in kind for this study)	**FINANCIAL AND NON FINANCIALSUPPORT GIVEN**
RCHT Hospital Charity - Funding	**£5230 for VR equipment, VR camera and memory cards plus technical support as required**

Moon NO, *et al. BMJ Oncology* 2023; 2:e000160. doi: 10.1136/bmjonc-2023-000160

LIST OF ABBREVIATIONS

COVID-19	Coronavirus
ESAS-r	Edmonton Symptom Assessment System – revised version (1)
QoL	Quality of Life
REC	Research Ethics Committee
VR	Virtual Reality

Moon NO, *et al. BMJ Oncology* 2023; 2:e000160. doi: 10.1136/bmjonc-2023-000160

STUDY PROTOCOL

The use of virtual reality for symptom control and wellbeing in palliative care and oncology patients

1 BACKGROUND AND RATIONALE

Symptom control and patient wellbeing are of paramount importance in both palliative care and oncology. The current COVID-19 pandemic has had a significant negative effect on oncology and palliative care patients [(2)]. These patients especially have become increasingly isolated from their support networks whilst in-patients due to visiting restrictions, shielding and the physical effects of COVID-19 infections all adversely affecting this group.

Virtual reality (VR) has previously been used in multiple palliative care and oncology settings specifically for pain, anxiety and distraction therapy [(3) (4) (5) (6)]. The technology has advanced exponentially over recent years to the point where photorealistic virtual reality experiences now exist. We hope to utilise existing VR technology to aid in holistic symptom control and wellbeing improvements via distraction therapy during cancer patients in-patient hospital admission.

Multiple techniques exist for holistic symptom management but we believe that VR is under-utilised for this purpose with evidence suggesting its effectiveness but little use so far in clinical practice. We believe that the power of VR to fully immerse a patient into an experience is superior to those offered by other multimedia methods and a potential useful adjuvant to conventional therapy. It is cost effective and commercially available technology with a growing array of equipment and devices.

This study hopes to provide evidence for the utility of virtual reality to improve wellbeing and symptom control in palliative care and oncology inpatients. Cornwall is home to multiple areas of outstanding natural beauty which we hope to utilise to create bespoke VR experiences for our patients to 'visit' virtually. The study will offer either a pre-prepared experience or a custom Cornwall location relaxation session.

2 RESEARCH QUESTION/AIM(S)

To investigate the effect that a VR experience can have on patient symptoms and wellbeing for palliative care and oncology inpatients at RCHT.

2.1 PRIMARY OBJECTIVES

- To quantify the effect a VR experience can have on ESAS-r QoL Scores

2.2 SECONDARY OBJECTIVES

- Investigate quantitative clinician and patient experience of VR intervention on patients
- Investigate qualitative patient experience of VR interventions of patients

Moon NO, *et al. BMJ Oncology* 2023; 2:e000160. doi: 10.1136/bmjonc-2023-000160

3 STUDY DESIGN AND METHODS OF DATA COLLECTION AND DATA ANALYIS

3.1 STUDY DESIGN

The study will be conducted as a cohort interrupted time series study at a single site.

3.2 MATERIALS

ESAS-r QoL Questionnaire has previously been used to study VR use in hospice settings. It is validated for assessment of symptoms in a palliative care setting and comprises 9 questions with scores from 0 to 10.

3.3 PROCEDURE

Once consented and screened, participants will be asked to complete a baseline ESAS-r Quality of Life Questionnaire. Participants will then be able to select an immersive experience to complete. After completing the VR experience a second ESAS-r questionnaire will be completed by the participant.

The study design is not intended to be time measured with both patient and clinician discretion to be used during the experiences. We anticipate between a 15 and 45 minute Virtual Reality experience to be completed.

Participants will also be asked to answer two short qualitative and quantitative questions after completing the VR experience to assess overall VR experience plus any side effects (Appendix 1&2).

Clinicians supporting the VR experience will also be asked to provide a subjective quantitative score of participants VR experience from 0 to 10.

3.4 DATA COLLECTION AND MANAGEMENT

Participants will be allocated a random number which will be associated with Age, Gender, Cancer Type, Cancer Treatment, Line of Treatment, Treatment intent and Chosen VR experience.

Data collection will either be via Electronic ESAS-r questionnaire using the associated VR tablet or paper form completed by clinician or patient. The clinician will be present during the entire process of data collection and the VR experience to provide assistance as required. A unique 5-digit number will be allocated to each participant. The VR tablet scores will be compiled into a single database along with participants age, gender, cancer type, cancer treatment, line of treatment, treatment intent and chosen VR Experience.

If a patient wishes to continue to use the equipment after the initial session we will continue to collect the aforementioned data using the same participant identifier. This data will not be included in the primary analysis but may be considered for a subgroup analysis of continued effect.

Physical data will be kept securely at RCHT on encrypted databases or in locked filing cabinets. Any electronic data will be kept password protected and only handled and opened by those involved with the study as required

Data will be archived after completion of the study and may be included for further analysis as required.

Moon NO, *et al. BMJ Oncology* 2023; 2:e000160. doi: 10.1136/bmjonc-2023-000160

3.5 DATA ANALYSIS

Data analysis will be conducted via paired t-testing using Microsoft Excel. Power calculated for primary outcome via Alpha 0.05%; Beta 0.2%; SD 2.7 [1] and a medium effect size 0.5 based on the size of effects found in previous studies of the impact of VR on patient QoL [7]. Standard deviation for the change in the outcome is not known for this apriori calculation therefore this was estimated using typical values of r within of 0.875 and standard deviation of 2.7.

4 STUDY SETTING

This single-centre study will be based at the RCHT where patients for the project will be identified and approached for participation. The specific patient population will be in-patients on the haematology/oncology inpatient ward (Lowen) plus those under the care of the palliative care inpatient team plus patients known to the Oncology team. These will be identified by junior ward doctors, oncology team and the palliative care nursing team. A patient information sheet will be issued to all patients that fulfil the inclusion criteria.

5 SAMPLE AND RECRUITMENT

5.1 ELIGIBILITY CRITERIA

The study population will include patients of any gender, ethnicity or socioeconomic grouping who are inpatients at the RCHT receiving palliative care or oncology inpatient services

Inclusion criteria

- ≥ 18 years of age
- Inpatient at RCHT known to the palliative care or oncology teams
- Able to consent
- Able to speak and understand the English language
- Able to use the virtual reality system
- Able to complete ESAS-r Questionnaire

Exclusion criteria

- ≤18 years of age
- Patient unable to consent
- Patient unable to speak English
- Unable to use the virtual reality system (e.g. visually impaired)
- Known Epilepsy or seizures or suspected predisposition to seizures (e.g. Brain metastasis)

5.2 RECRUITMENT

Moon NO, *et al. BMJ Oncology* 2023; 2:e000160. doi: 10.1136/bmjonc-2023-000160

The study will be conducted as an interrupted time series study with the aim will be to recruit at least 60 patients. This will allow sufficient power for the student to detect a statistically significant medium effect size. Recruitment will be conducted via the inpatient palliative care CNS, Oncology and Lowen ward teams.

5.3 CONSENT

Before any patient is consented to the study, they will be provided with a Patient Information Sheet whilst an inpatient at RCHT. They will be advised of their rights to either accept the invitation to accept or decline the invitation to participate and assured that their rights to care will not be affected regardless of the decision made.

An explanation of the study and what it will involve will be given to the patient by the clinician present.

The patient will be given time to read, digest and discuss the study with their family. They will be given the opportunity to ask any questions around the study and will be given a demonstration of the Virtual Reality system. Patients will be given at least 48 hours to decide whether they wish to be involved with the study having read the patient Information Sheet and Consent Form.

Unfortunately, due to the nature of the study and the requirements to participate, patients who lack capacity to consent will not be included in the project on this occasion.

Patients will be advised of their rights to withdraw from the study at any time without prejudice and it will be explained that whilst they no longer will be participating in the project and that no further data collection will be made, it will be made clear that any anonymised data collected prior to the withdrawal will be retained and used in the final analysis of the study.

6 ETHICAL AND REGULATORY CONSIDERATIONS

Outside of the patient care team, any patient data will be anonymised using a unique patient identifier. All information pertaining to the patient will be stored in a secure database which will only be accessible by the direct care team. The database will be password protected. We do not predict any significant side effects to using the VR headset with patients able to immediately remove the headset if required.

6.1 ASSESSMENT AND MANAGEMENT OF RISK

Whilst the trial is considered low risk to participants, there may be issues around the use of Virtual Reality equipment that need to be considered. Some patient may experience ‘Sim Sickness’ which is minimised with appropriate technology and VR experiences. Previous studies have also reported some discomfort from prolonged use of VR headsets but given the short duration of our intervention this risk is minimised. The patient will be given the opportunity to continue or decline participation at any point with immediate removal of the VR headset.

6.2 RESEARCH ETHICS COMMITTEE (REC) AND OTHER REGULATORY REVIEW & REPORTS

Before the start of the study, a favourable opinion will be sought from a REC for the study protocol, informed consent forms and patient information sheet. The project will not begin until the relevant approvals are in place and the ‘green light’ is given by the study Sponsor to confirm that recruitment can begin.

Should there be the need for any substantial amendments, we will ensure that they are submitted for the relevant review.

Moon NO, *et al*. *BMJ Oncology* 2023; 2:e000160. doi: 10.1136/bmjonc-2023-000160

All correspondence with the REC will be retained including annual reports and the end of study declaration when the project is completed.

Within one year after the end of the study, the Chief Investigator will submit a final report with the results, including any publications/abstracts, to the REC.

6.3 REGULATORY REVIEW & COMPLIANCE

Before the site enrolls any patients into the study, the Chief Investigator/Principal Investigator or designee will ensure that appropriate approvals from the participating organisations are in place. Study sponsor will undertake audit and monitoring in accordance with the RCHT R&D SOP 10.

6.4 AMENDMENTS

If there is a need for a substantial amendment, the sponsor will submit a valid notice of amendment to the REC for consideration and will await the relevant response regarding the amendment within 35 days of receipt of the notice. It is the sponsor's responsibility to decide whether an amendment is substantial or non-substantial for the purposes of submission to the REC.

A copy of the relevant amended documentation both clean and with tracked changes will be submitted with the amendment application.

Once the amendment has been agreed, the Sponsor will send out a copy of the amendment notice along with the updated documents and a new version control to everyone involved in the study.

7 DATA PROTECTION AND PATIENT CONFIDENTIALITY

7.1 DATA HANDLING

All investigators and staff involved in the study will comply with the requirements of the Data Protection Act (2018) with reference to the collection, storage, processing and disclosure of personal information and they will uphold the Act's core principles. All study personnel are aware of the importance of maintaining confidentiality and adhering to the GDPR regulations

Archiving will be authorised by the Sponsor following submission of the end of study report and in accordance with the RD&I SOP 07 archiving procedure. The Sponsor will be responsible for archiving any original study data in a secure location for a minimum period of 5 years after the end of the trial.

7.2 INDEMNITY

This is an NHS-sponsored research study and as such, any legal liability arising from the research will be covered by the NHS indemnity insurance.

VR Equipment will be commercially available equipment. The System will be kept securely in the Palliative Care team office. Equipment will be covered via manufacturer and suppliers' warranty. The VR camera will only be use by authorised clinicians or members of the research team.

8 DISSEMINIATION POLICY

8.1 DISSEMINATION POLICY

Once the study has been completed and the report / publication drafted, the author will send a copy to the Sponsor for review and final approval. Once the document has been approved by the Sponsor, it

Moon NO, *et al. BMJ Oncology* 2023; 2:e000160. doi: 10.1136/bmjonc-2023-000160

will then be presented for publication in relevant peer reviewed scientific journals and at appropriate specialty specific conferences.

8.2 AUTHORSHIP ELIGIBILITY GUIDELINES AND ANY INTENDED USE OF PROFESSIONAL WRITERS

Authorship of the final report will be granted to the Chief Investigator and Principle Investigator. Any peer reviewed publication arising from the data collect in the study will be authored in line with individual journal policies. Authors will always include the Chief Investigator, Principle Investigator and may include members of the supervisory and contributing team.

9 REFERENCES

1. *A Multicenter Study Comparing Two Numerical Versions of the Edmonton Symptom Assessment System in Palliative Care Patients.* **Sharon M. Watanabe, Cheryl Nekolaichuk, Crystal Beaumont, Laureen Johnson, Jeff Myers, Florian Strasser.** 2, s.l. : Journal of Pain and Symptom Management, 2011, Vol. 41. 456-468.

2. *The impact of the COVID-19 pandemic on cancer care.* **Richards, M., Anderson, M., Carter, P.** 2020, Nature Cancer, Vol. 1, pp. 565-567.

3. *Virtual Reality Use for Symptom Management in Palliative Care: A Pilot Study to Assess User Perceptions.* **Tracy Johnson, Laura Bauler , Duncan Vos , Alan Hifko , Paras Garg , Mohammad Ahmed , Michael Raphelson.** 9, s.l. : Journal of Palliative Medicine, 2020, Vol. 23. 1233-1238.

4. *The effectiveness of virtual reality distraction for reducing pain: A meta-analysis.* **Kenney, M. P., & Milling, L. S.** 3, s.l. : Psychology of Consciousness: Theory, Research, and Practice, 2016, Vol. 3. 199-210.

5. *Virtual reality for persistent pain: a new direction for behavioral pain management.* **Francis J Keefe, Dane A Huling, Michael J Coggins, Daniel F Keefe, M Zachary Rosenthal, Nathaniel R Herr, Hunter G Hoffman.** 11, s.l. : Pain, 2012, Vol. 152. 2163-6.

6. *Virtual reality as a distraction intervention for women receiving chemotherapy.* **Susan M Schneider, Maryjo Prince-Paul, Mary Jo Allen, Paula Silverman, Deborah Talaba.** 1, s.l. : Oncol Nurs Forum, 2004, Vol. 31. 81-8.

7. **Kohn MA, Senyak J. Sample Size Calculators [website]. UCSF CTSI. 22 November 2020. Available at https://www.sample-size.net/.**

10 APPENDICIES

10.1 APPENDIX 1 – CLINICIAN & PARTICIPANT SUBJECTIVE QUESTIONNAIRE

Clinician - On a Scale of 0 to 10 how do you believe the VR experience was to the patient

Patient - On a scale of 0 to 10 how did you find the VR experience

10.2 APPENDIX 2 – PATIENT SUBJECTIVE QUALITATIVE QUESTIONNAIRE

Were there any negative side effects of the VR session?

10.3 APPENDIX 3 – ESAS-R SCORE

ESAS-r Score

Edmonton Symptom Assessment System:
(revised version) (ESAS-R)

Please circle the number that best describes how you feel NOW:

No Pain	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Pain
No Tiredness *(Tiredness = lack of energy)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Tiredness
No Drowsiness *(Drowsiness = feeling sleepy)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Drowsiness
No Nausea	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Nausea
No Lack of Appetite	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Lack of Appetite
No Shortness of Breath	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Shortness of Breath
No Depression *(Depression = feeling sad)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Depression
No Anxiety *(Anxiety = feeling nervous)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Anxiety
Best Wellbeing *(Wellbeing = how you feel overall)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Wellbeing
No _____ Other Problem *(for example constipation)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible _____

Moon NO, *et al. BMJ Oncology* 2023; 2:e000160. doi: 10.1136/bmjonc-2023-000160