HRP-591 - Protocol for
Human Subject Research

Protocol Title:

Provide the full title of the study as listed in item 1 on the "Basic Information" page in CATS IRB (http://irb.psu.edu).

Virtual Reality to Reduce Anxiety, Agitation and Delirium in Critically Ill Patients

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Version Date:

Provide a version date for this document. This date must be updated each time this document is submitted to the IRB office with revisions. DO NOT revise the version date in the footer of this document.

May 6, 2026

Clinicaltrials.gov Registration #:

Provide the registration number for this study, if applicable. See "HRP-103- Investigator Manual", under "ClinicalTrials.gov" for more information.

N/A

Important Instructions for Using This Protocol Template:

This template is provided to help investigators prepare a protocol that includes the necessary information needed by the IRB to determine whether a study meets all applicable criteria for approval.

1. **GENERAL INSTRUCTIONS[1]:**
   - Prior to completing this protocol, ensure that you are using the most recent version by verifying the protocol template version date in the footer of this document with the current version provided in the CATS IRB Library.
   - Do not change the protocol template version date located in the footer of this document.
   - Some of the items may not be applicable to all types of research. If an item is not applicable, please indicate as such or skip question(s) if indicated in any of the instructional text.
   - **GRAY INSTRUCTIONAL BOXES:** Type your protocol responses below the gray instructional boxes of guidance language. If the section or item is not applicable, indicate not applicable.
     - **Do NOT delete the instructional boxes from the final version of the protocol.**
   - **CHECKBOXES:** Either check the boxes or indicate an "X" before the checkbox. Do NOT delete checkboxes.
   - The protocol should be written in lay language. Do **NOT** copy and paste grant proposal information into the protocol.
   - Add the completed protocol template to your study in CATS IRB (http://irb.psu.edu) on the "Basic Information" page.

[1] This template satisfies AAHRPP elements 1.7.B, I.8.B, I-9, II.2. A, II.2.I, II.3.A, II.3.B, II.3.C-II.3.C.1, II.3.D-F, II.4.A, III.1.C-F, II.2.D

2. **CATS IRB LIBRARY:**
    - Documents referenced in this protocol template (e.g., SOP's, Worksheets, Checklists, and Templates) can be accessed by clicking the Library link in CATS IRB (http://irb.psu.edu).

3. **PROTOCOL REVISIONS:**
    - When making revisions to this protocol as requested by the IRB, please follow the instructions outlined in the guides available in the Help Center in CATS IRB (http://irb.psu.edu) for using track changes.
    - Update the Version Date on page 1 each time this document is submitted to the IRB office with revisions.

If you need help:
Human Research Protection Program
Phone: 814-865-1775
Fax: 814-863-8699
Email: irb-orp@psu.edu
https://researchsupport.psu.edu/orp/irb/

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1.0 Objectives

1.1 Study Objectives

Describe the purpose, specific aims, or objectives. State the hypotheses to be tested.

If the research will use or test Artificial Intelligence (AI), Generative AI, algorithms, machine learning, or deep learning, describe this. Include a detailed description of the technology(ies) to be used or tested and the intent of the research.

This is a pilot feasibility study examining the use of immersive virtual reality (VR) in adult intensive care unit (ICU) patients. The study evaluates whether brief, non-interactive VR sessions delivered using a commercially available standalone head-mounted display (Meta Quest 2) with calming, nature-based content can be delivered safely and effectively within routine SICU workflow. Exploratory objectives assess whether VR sessions are associated with changes in anxiety, agitation, delirium, pain, and sedative medication requirements. This research is not intended to evaluate the safety or effectiveness of the headset and/or the specific VR software used for the research

1.2 Primary Study Endpoints

State the primary endpoints to be measured in the study.

Research typically has a primary objective or endpoint. Additional objectives and endpoints are secondary. The endpoints (or outcomes), determined for each study subject, are the quantitative measurements required by the objectives. Measuring the selected endpoints is the goal of a trial (examples: response rate and survival).

The primary endpoints are feasibility and acceptability of delivering VR sessions to adult SICU patients. Feasibility will be measured by (1) the proportion of enrolled patients who complete at least three VR sessions in a 24-hour period, (2) the proportion of scheduled sessions delivered within routine nursing workflow, and (3) time required to complete each session. Acceptability will be measured by patient tolerance (comfort rating, willingness to repeat, and reasons for early termination) and session-related safety symptoms (nausea, dizziness, headache, anxiety escalation, agitation, or other distress during or within 30 minutes after VR).

The primary outcomes will be:

- Enrollment rate (% eligible enrolled)
- Session completion rate
- Adverse event rate
- Acceptability (AIM scale)
- Intervention appropriateness (IAM scale)
- Feasibility (FIM scale)

1.3 Secondary Study Endpoints

State the secondary endpoints to be measured in the study.

Secondary endpoints will assess the impact of VR on anxiety, agitation, delirium and pain using standard care assessment methods as well as standard ICU outcomes. This includes:

CLINICAL OUTCOMES	
Primary outcome	**Measurement**
Acceptability (survey)	AIM scale
Feasibility (survey)	FIM scale
Intervention appropriateness (survey)	IAM scale
Enrollment rate (observation)	
Session completion rate (observation)	
Adverse event rate (observation)	
Secondary outcome (EHR)	**Measurement**
Daily opiate requirements	Morphine equivalents
Daily benzodiazepine requirements	
Daily propofol requirements	
Daily dexmedetomidine requirements	
Other sedative requirements	Drug and dosage
Delirium-free days at day 7	Days CAM-ICU negative
Pre-intervention pain	FLACC: Face, Legs, Activity, Cry, Consolability CPOT: Critical Care Pain Observation Tool FACES pain scale
Post-intervention pain	
Pre-intervention agitation	SAS: Riker Sedation-Agitation Score
Post-intervention agitation	
Pre-intervention anxiety	VAS-A: Visual Analog Scale-Anxiety
Post-intervention anxiety	
Pre-intervention sleep	RCSQ: Richards-Campbell Sleep Questionnaire
Post-intervention sleep	
Ventilator days	
ICU length of stay	
Hospital length of stay	

2.0 Background

2.1 Scientific Background and Gaps

Briefly describe the scientific background and gaps in current knowledge in lay language.

For clinical research studies being conducted at Penn State Health/Penn State College of Medicine, and for other non-PSH locations as applicable, describe the treatment/procedure that is considered standard of care (i.e., indicate how patients would be treated in non-investigational setting); and if applicable, indicate if the study procedure is available to patient without taking part in the study.

Adult ICU patients often face pain, anxiety, agitation, delirium, and sleep disruption during critical illness. These symptoms also persist after ICU discharge for many patients and affect recovery and quality of life. The Society of Critical Care Medicine Guidelines for the Prevention and Management of

Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption in Adult Patients in the ICU (SCCM PADIS) notes that most critically ill patients experience these symptoms at some point during the ICU stay, and symptom control links to morbidity and mortality [1].

Standard ICU care addresses these symptoms using structured, guideline-based assessment and management. The 2018 SCCM PADIS guideline issued 37 recommendations (3 strong, 34 conditional) spanning pain, agitation/sedation, delirium, mobilization/rehabilitation, and sleep disruption. The guideline also includes a good practice statement for regular delirium assessment using a validated tool (examples include CAM-ICU and ICDSC) [2].

Even with guideline-based care, delirium remains common. Naef et al. reports delirium prevalence between 35% and 80% in ventilated and non-ventilated ICU patients [5]. Sleep disruption also remains common in ICU care, with subjective sleep disruption reported as high as 57% in some studies, and subsyndromal delirium (ICDSC 1–3 out of 8) reported in about 30% of critically ill adults [2,5].

SCCM guidelines also highlight limitations of drug-only approaches for delirium and anxiety management. The 2025 SCCM focused update issued five statements and still found insufficient evidence to recommend benzodiazepines for anxiety treatment or antipsychotics for delirium treatment in adult ICU patients [1]. This leaves a gap for scalable non-pharmacologic options that fit ICU workflow and patient safety needs.

Virtual reality (VR) is a non-pharmacologic intervention that delivers immersive audiovisual content aimed at reducing anxiety and distress. Early ICU studies suggest feasibility and patient acceptance, but existing evidence is limited by small sample sizes, single-center designs, and heterogeneity in devices, content, and workflows. Key gaps include integration into routine ICU care, patient tolerance in higher-acuity settings, and standardized safety monitoring.

2.2 Previous Data

Describe any relevant preliminary data.

A 2020 feasibility study by Ong and colleagues evaluated VR in ICU patients (59 recruited, 46 completed). Sessions lasted 5–20 minutes and patients received up to 7 sessions. In those who completed VR, 81% reported reduced pain. Sleep scores improved by 4.56 points per ICU day, and opioid dose decreased by 12.90 morphine milligram equivalents per ICU day. These results support acceptability and signal potential symptom benefit, while remaining non-randomized and center-specific. [4]

A 2023 pilot study conducted by Jawad et al. investigated the use of VR in a medical ICU (15 patients and 21 providers). In this study, VR was delivered for 15 minutes using nature-based content. Among participating patients, 86% reported comfort during the session, and 71% reported improved anxiety after VR. Mild side effects occurred in 17%, and 26.7% declined a repeat session, supporting feasibility while also showing the need for structured screening and monitoring [3].

Larger ICU studies are now being designed to test clinically meaningful outcomes. An ongoing randomized clinical trial at the University Hospital of Bern, Switzerland aims to enroll 920 ICU patients and deliver 30-minute VR sessions three times daily, in addition to standard ICU care, using relaxing 360-degree content via a head-mounted display with noise-cancelling headphones. The primary outcome is delirium incidence, assessed three times daily using ICDSC, with follow-up at 6 months [5]. This trial

reflects growing momentum, while highlighting ongoing gaps in practical implementation across diverse ICUs and acuity levels.

2.3 Study Rationale

Provide the scientific rationale for the research.

Patients enrolled in this study will continue to receive standard ICU care per PADIS guidelines regardless of study participation. VR is not part of routine ICU care and is not otherwise available outside a research setting. Given persistent rates of delirium and anxiety despite guideline-based care, and limited evidence supporting additional pharmacologic therapies, evaluation of a low-risk, non-pharmacologic adjunct is warranted. VR offers a structured, scalable approach that avoids sedative exposure and aligns with PADIS emphasis on minimizing medication related harms.
The goal is to evaluate feasibility, tolerance, and safety of VR delivery within a real-world adult ICU environment prior to larger efficacy studies.

3.0 Inclusion and Exclusion Criteria

Create a numbered list below in sections 3.1 and 3.2 of criteria subjects must meet to be eligible for study enrollment (e.g., age, gender, diagnosis, etc.).

Vulnerable Populations:

You MAY NOT include members of these populations as subjects in your research unless you indicate this in your inclusion criteria because specific regulations apply to studies that involve vulnerable populations.
The checklists referenced below outline the determinations to be made by the IRB when reviewing research involving these populations. Review the checklists as these will help to inform your responses throughout the remainder of the protocol.

- **Children –**Review "HRP-416- Checklist - Children"
- **Pregnant Women** – Review "HRP-412- Checklist - Pregnant Women"
- **Adults with Impaired Decision-Making Capacity -** Review "HRP-417- Checklist - Adults with Impaired Decision-Making Capacity"
- **Prisoners-** Review "HRP-415- Checklist - Prisoners"
- **Neonates of uncertain viability or non-viable neonates-** Review "HRP-413- Checklist - Non-Viable Neonates" or "HRP-414- Checklist - Neonates of Uncertain Viability"

[Do not type here]

3.1 Inclusion Criteria

Create a numbered list of the inclusion criteria that define who will be included in your final study sample (e.g., age, gender, condition, etc.)

Patient subjects:

1. Aged ≥ 18 years old with no upper age limit, admitted to the Surgical Intensive Care Unit (SICU) at Penn State Health Milton S. Hershey Medical Center.
2. No significant uncorrectable visual or auditory impairments
3. Estimated ICU length of stay > 48h
4. At the time of each VR session, able to keep eyes open for at least 30 seconds, follow simple commands and able to indicate discomfort or request to stop.
5. English speaking

Provider subjects:
Bedside nurses caring for patient subjects throughout the study period will be considered for study participation as a provider subject. They will not be recruited to participate as a subject until the patient completes the study. All providers who cared for a patient subject will be eligible for the study.

3.1.1 Does this research involve collecting data from individuals residing outside of the US?

☒ No
☐ Yes – identify the countries where data collection will take place
[Type protocol text here]

3.2 Exclusion Criteria

Create a numbered list of the exclusion criteria that define who will be excluded Iin your study.

Patient subjects:
1. Significant hemodynamic instability
2. Known psychotic disorders associated with delusions (e.g. schizophrenia)
3. Severe dementia (e.g. inability to communicate or follow simple commands)
4. History of disequilibrium syndrome or vertigo
5. Acute hyperactive delirium, requiring physical restraints
6. Contact isolation for infectious disease
7. Admitted for/with substance abuse or withdrawal

Provider subjects:
None

3.3 Early Withdrawal of Subjects

3.3.1 Criteria for removal from study

Insert subject withdrawal criteria (e.g., safety reasons, failure of subject to adhere to protocol requirements, subject consent withdrawal, disease progression, etc.).

Patient subject:
1. Changes in health status that result in meeting exclusion criteria
2. Risk of injury to patient or damage to study equipment
3. Patient withdrawal of consent
4. Failure/inability to adhere to protocol requirements

Provider subject:
None. Recruitment of providers into the study will not be completed until the patient completes the study.

3.3.2 Follow-up for withdrawn subjects

Describe when and how to withdraw subjects from the study; the type and timing of the data to be collected for withdrawal of subjects; the follow-up for subjects withdrawn from investigational treatment.

All subjects are withdrawn once they meet criteria for removal from the study or a request is made by the participant to be withdrawn. Once a patient is withdrawn from the study, all data collection will be terminated immediately. All prior data collected will be included in the analysis, unless the patient participant requests otherwise. These participants will not be replaced but additional participants may be enrolled.

4.0 Recruitment Methods

- Upload recruitment materials for your study in CATS IRB (http://irb.psu.edu). **DO NOT** include the actual recruitment wording in this protocol.
- StudyFinder: If StudyFinder (http://studyfinder.psu.edu) is to be used for recruitment purposes, separate recruitment documents do not need to be uploaded in CATS IRB. The necessary information will be captured from the StudyFinder page in your CATS IRB study.
- Any eligibility screening questions (verbal/phone scripts, email, etc.) used when contacting potential participants must be uploaded to your study in CATS IRB (http://irb.psu.edu).

[Do not type here]

4.1 Identification of subjects

Describe the source of subjects and the methods that will be used to identify potential subjects (e.g., organizational listservs, established recruitment databases, subject pools, medical or school records, interactions during a clinic visit, etc.). If not recruiting subjects directly (e.g., database query for eligible records or samples) state what will be queried, how and by whom.

StudyFinder:

- If you intend to use StudyFinder (http://studyfinder.psu.edu) for recruitment purposes, include this method in this section.
- Information provided in this protocol, including the description of study procedures, compensation, and recruitment, needs to be consistent with information provided on the StudyFinder page in your CATS IRB study.

For research utilizing **Penn State Health patient data**, please note the following:

- Submissions using **Enterprise Information Management (EIM)** for recruitment, and for non-Hershey locations as applicable, attach your EIM Design Specification form in CATS IRB (http://irb.psu.edu). See "HRP-103- Investigator Manual, Study Recruitment" for additional information.
- Direct contact with patients for research recruitment that does not occur in person will require review of the contact list to ensure removal of decedents. It is the study team's responsibility to ensure removal of decedents from the provided data.

The study will be conducted in the Surgical Intensive Care Unit (SICU) at Penn State Milton S. Hershey Medical Center. Patients admitted to the SICU will be screened for eligibility by one of the study investigators. Patients meeting eligibility criteria will be offered the opportunity to participate in this research study.

Potential patient participants will be identified by limited pre-screening of the electronic health record (EHR) to determine eligibility (e.g., age, anticipated SICU length of stay, isolation status, delirium/agitation status, and contraindications). Pre-screening will use the minimum necessary PHI and will be performed under a partial waiver of HIPAA authorization for recruitment purposes. After

eligibility is confirmed, a member of the study team will approach the patient in the SICU to discuss the study and obtain written informed consent and HIPAA authorization prior to any study procedures or study data collection.

The primary nurse that is directly caring for one or more patient(s) enrolled in the study will be identified and recruited for participation at the end of the study and offered the opportunity to participate as a provider study subject via implied consent that is sent via email through REDCap with a deidentified survey (APPENDIX 4).

4.2 Recruitment process

Describe how potential subjects first learn about this research opportunity or indicate 'not applicable' if subjects will not be prospectively recruited to participate in the research.
Subject recruitment can involve various methods (e.g., approaching potential subjects in person, contacting potential subjects via email, letters, telephone, ResearchMatch, or advertising to a general public via flyers, websites, StudyFinder, newspaper, television, and radio).

If applicable, state whether the study team will access medical records before or after engaging the potential subject.

DO NOT include the actual recruitment material or wording in this protocol.

[Do not type here]

4.2.1 How potential subjects will be recruited.

Patients will be recruited once they have been identified as eligible for participation. Inclusion/exclusion criteria will then be reviewed to confirm eligibility. Patient subjects will be approached in the SICU by a member of the study team. Detailed information about the study will be reviewed with them thoroughly, and they will be asked to participate.

Provider subjects will be informed about the research opportunity by email (Penn State Health email account)

4.2.2 Where potential subjects will be recruited.

Potential patient subjects will be recruited in the SICU.

Potential provider subjects will be recruited by email (Penn State Health email account)

4.2.3 When potential subjects will be recruited.

Potential patient subjects will be screened immediately upon admission to SICU, with a goal to recruitment within 24 hours of admission.

Potential provider subjects will be recruited after the study ends for the patient subject and they have completed at least one VR session. Eligible subjects will be identified weekly (every Friday), to minimize redundancy in recruitment for providers taking care of multiple patient subjects.

4.2.4 Screening and determining eligibility

Screening involves assessing whether or not a potential subject is eligible for a study based on the inclusion and exclusion criteria. This process only involves assessing eligibility.

Collecting information/data/biospecimens that are not related to eligibility does not meet the definition of screening and requires prior written consent. There are some specific situations in which consent is not required prior to screening activities.

Answer the following items to describe the screening process and determine if prior consent and/or HIPAA authorization is required.

4.2.4.1 For the purpose of screening/determining eligibility, is the potential subject providing information through oral or written communication (e.g. survey or verbally responding to answers)?

☐ Yes [NOTE: HIPAA authorization or a waiver of HIPAA authorization may be necessary – see section 6.0]

[Describe the process here. Indicate if the information will be recorded or stored by the research team]

☒ No

4.2.4.2 Is eligibility being determined by obtaining identifiable private information or biospecimens by accessing records or stored identifiable biospecimens?

☒ Yes [NOTE: HIPAA authorization or a waiver of HIPAA authorization may be necessary – see section 6.0]

Eligibility screening requires limited review of the patient's electronic health record (EHR) to confirm inclusion and exclusion criteria. This review is limited to the minimum necessary PHI and is used only to determine eligibility and identify an appropriate time to approach for consent; screening information is not retained for analysis if the patient is not enrolled. The extent of review will not exceed what is needed to provide necessary medical care, regardless of study participation.

☐ No

4.2.4.3 Is the potential subject being asked to do any activity for screening and eligibility purposes beyond what is described above (e.g. fast, blood test)?

☐ Yes [NOTE: consent process or waiver of consent is required – see section 5.0]

[Describe the activity here]

☒ No

4.2.4.4 Is the screening data to be used for purposes other than eligibility or recruitment (e.g. retained for data analysis or for other purposes)?

☐ Yes [NOTE: consent process or waiver of consent is required – see section 5.0]

[Describe the other purposes here]

☒ No

5.0 Consent Process and Documentation

Refer to the following materials:

- The "HRP-090- SOP - Informed Consent Process for Research" outlines the process for obtaining informed consent.
- The "HRP-091– SOP - Written Documentation of Consent" describes how the consent process will be documented.
- The "HRP-314- Worksheet - Criteria for Approval" section 7 lists the required elements of consent.
- The "HRP-312- Worksheet - Exemption Determination" includes information on requirements for the consent process for exempt research. In addition, the CATS IRB Library contains consent guidance and templates for exempt research.
- The CATS IRB library contains various consent templates for expedited or full review research that are designed to include the required information.
- Add the consent document(s) to your study in CATS IRB (http://irb.psu.edu). Links to Penn State's consent templates are available in the same location where they are uploaded. **DO NOT** include the actual consent wording in this protocol.

[Do not type here]

5.1 Consent Process:

Check all applicable boxes below (at least one of the first four boxes must be checked):

☒ **Written documentation of consent: Informed consent will be sought and documented with a written consent form** [Complete Sections 5.2 and 5.6; If this is the only box checked, mark Sections 5.3, 5.4 and 5.5 as 'Not applicable']

☒ **Waiver of documentation of consent: Informed consent will be sought but subject signature is not required (e.g. implied or verbal consent will be obtained)** [Complete Sections 5.2, 5.3 and 5.6; If this is the only box checked, mark Sections 5.4 and 5.5 as 'Not applicable']

☐ **Alteration of consent process: Informed consent will be sought but some of the elements of informed consent will be omitted or altered (e.g., deception).** [Complete section 5.2, 5.4 and 5.6; If this is the only box checked, mark Section 5.5 as 'Not applicable']

☐ **Waiver of consent: Informed consent will not be obtained** [Complete Section 5.5; If this is the only box checked, mark Sections 5.2, 5.3, 5.4 and 5.6 as 'Not applicable']

If you believe that the research activities outlined meet one or more of the criteria outlined in "HRP-312- Worksheet- Exemption Determination", check the following box in addition to a consent checkbox above.

☐ **Exempt Research - By checking this box, you are verifying that the consent process will disclose the following:**

- **For all research**: Penn State affiliation; name and contact information for the researcher and advisor (if the researcher is a student); the activities involve research; the procedures to be performed; participation is voluntary; that there are adequate provisions to maintain the privacy interests of subjects and the confidentiality of the data; permission for use of data can be withdrawn for research activities involving the collection and use of identifiable data.

- **For research that uses student educational records:** the records that may be used; the purpose of using those records; the party or class of parties to whom the records may be shared; and that if an adult student (or a parent of a student who is not an adult) requests, the school will provide them with a copy of the records shared. Additionally, the parent or adult student will sign and date the consent.

Note: If this box has been checked, mark Sections 5.3, 5.4, 5.5, and 5.6 as "Not applicable." If the investigator's assessment is inaccurate, an IRB Analyst will request revision to the protocol and ask that consent forms and recruitment materials be submitted. Except for exemptions where Limited IRB Review is required (see "HRP-312- Worksheet- Exemption Determination") or where otherwise requested by the IRB, consent forms and recruitment materials are generally not reviewed nor approved by the PSU HRPP for research undergoing exempt review.

5.2 Obtaining Informed Consent

5.2.1 Consent Process

Describe the consent process (when, where, and how), including how subjects are provided the consent language and how subjects indicate consent. Describe the HIPAA authorization process (if applicable), making sure to state if authorization occurs during the consent process or describe a standalone authorization process.

If there are multiple consent processes, describe each process separately.

Potential patient subjects will be approached at the bedside in the SICU, at which time they will be given detailed information about the study and asked to participate. If eligible, based on inclusion and exclusion criteria, written informed consent will be obtained by a member of the study team at the time of screening, and the participant will be enrolled in the study.

Potential provider subjects will be offered the opportunity to participate as a study subject via email sent through REDCap. The email will contain a link to a deidentified survey as well as an explanation of the study objectives and a statement of implied consent to participate in the study by completing the survey.

5.2.2 Coercion or Undue Influence during Consent

Describe the steps that will be taken to minimize the possibility of coercion or undue influence in the consent process.

Study procedures will be fully explained. The voluntary nature of this study will be heavily emphasized as well as the fact that standard critical care will continue to be delivered regardless of study participation. Participants will be given ample time to read and review the consent form on their own. All questions the participant may have will be answered, and written consent will be obtained. A member of the study team will assist in the explanation and

obtaining of the written consent. A copy of the signed consent will be given to the patient participant and another copy sent to Medical Records.

5.3 Waiver of Written Documentation of Consent

Review "HRP – 411 – Checklist – Waiver of Written Documentation of Consent."

5.3.1 Indicate which of the following conditions applies to this research:

☒ The research presents no more that minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context.

OR

☐ The only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from a breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research, and the subject's wishes will govern. (Note: This condition is not applicable for FDA-regulated research. If this category is chosen, include copies of a consent form and /or parental permission form for participants who want written documentation linking them to the research.)

OR

☐ If the subjects or legally authorized representatives are members of a distinct cultural group or community in which signing forms is not the norm, that the research presents no more than minimal risk of harm to subjects and provided there is an appropriate alternative mechanism for documenting that informed consent was obtained. (Note: This condition is not applicable for FDA-regulated research.)

For distinct cultural groups, describe the alternative mechanism for documenting that informed consent was obtained:

N/A

5.3.2 List all material that will be used to consent and inform potential subjects about the research (e.g., a letter accompanying a questionnaire, verbal script, or implied consent form)

Provider subjects will be sent a REDCap link with an implied consent form accompanying a research questionnaire for completion. This one-time survey at the end of study recruitment will complete their participation in the study. Voluntariness will be emphasized.

5.4 Alteration of consent: Informed consent will be sought but some of the elements of informed consent will be omitted or altered (e.g., deception).

Review "HRP-410-Checklist -Waiver or Alteration of Consent Process" to ensure that you have provided sufficient information.

5.4.1 Indicate the elements of informed consent to be omitted or altered

N/A

5.4.2 Indicate why the research could not practicably be carried out without the omission or alteration of consent elements

N/A

5.4.3 Describe why the research involves no more than minimal risk to subjects.

N/A

5.4.4 Describe why the alteration/omission will not adversely affect the rights and welfare of subjects.

N/A

5.4.5 If the research involves using identifiable private information or identifiable biospecimens, describe why the research could not practicably be carried out without using such information or biospecimens in an identifiable format.

N/A

5.4.6 Debriefing: Explain whether and how subjects will be debriefed after participation in the study. If subjects will not be debriefed, provide a justification for not doing so. Add any debriefing materials to the study in CATS IRB.

N/A

5.5 Waiver of consent: Informed consent will not be obtained

Review "HRP-410-Checklist -Waiver or Alteration of Consent Process" to ensure that you have provided sufficient information.

5.5.1 Indicate why the research could not practicably be carried out without the waiver of consent

N/A

5.5.2 Describe why the research involves no more than minimal risk to subjects.

N/A

5.5.3 Describe why the alteration/omission will not adversely affect the rights and welfare of subjects.

N/A

5.5.4 If the research involves using identifiable private information or identifiable biospecimens, describe why the research could not practicably be carried out without using such information or biospecimens in an identifiable format.

N/A

5.5.5 Additional pertinent information after participation

Explain if subjects will be provided with additional pertinent information after participation.

N/A

5.6 Consent – Other Considerations

5.6.1 Non-English-Speaking Subjects

Indicate what language(s) other than English are understood by prospective subjects or representatives.

If subjects who do not speak English will be enrolled, describe the process to ensure that the oral and written information provided to those subjects will be in that language. Indicate the language that will be used by those obtaining consent.

Indicate whether the consent process will be documented in writing with the long form of the consent documentation or with the short form of the consent documentation. Review "HRP-091 –SOP- Written Documentation of Consent" and "HRP-103 -Investigator Manual" to ensure that you have provided sufficient information.

Not applicable. Non-English-speaking patients will be excluded from this study.

5.6.2 Adults with Impaired Decision-Making Capacity

Refer "HRP-417 -CHECKLIST- Adults with Impaired Decision-Making Capacity" for information about research involving adults with impaired decision-making capacity.

5.6.2.1 Capability of Providing Consent

Describe the process to determine whether an individual is capable of consent.

Patients with impaired decision-making capacity will be excluded from this study. The determination of decision-making capacity will be made by the ICU treatment team based upon standard clinical assessment.

5.6.2.2 Adults Unable to Consent

Describe whether and how informed consent will be obtained from the legally authorized representative. Describe who will be allowed to provide informed consent. Describe the process used to determine these individual's authority to consent to research.

For research conducted in the state of Pennsylvania, review "HRP-013 -SOP- Legally Authorized Representatives, Children and Guardians" to be aware of which individuals in the state of Pennsylvania meet the definition of "legally authorized representative."

For research conducted outside of the state of Pennsylvania, provide information that describes which individuals are authorized under applicable law to consent on behalf of a prospective subject to their participation in the procedure(s) involved in this research. One method of obtaining this information is to have a legal counsel or

authority review your protocol along with the definition of “children” in “HRP-013 - SOP- Legally Authorized Representatives, Children, and Guardians.”

Not applicable. Patients who are unable to consent will be excluded from the study.

5.6.2.3 Assent of Adults Unable to Consent

Describe the process for assent of the subjects. Indicate whether assent will be required of all, some, or none of the subjects. If some, indicate which subjects will be required to assent and which will not.

If assent will not be obtained from some or all subjects, provide an explanation of why not.

Describe whether assent of the subjects will be documented and the process to document assent. The IRB allows the person obtaining assent to document assent on the consent document and does not routinely require assent documents and does not routinely require subjects to sign assent documents.

Not applicable. Adult patients who lack capacity or competence to consent will be excluded from the study.

5.6.3 Subjects who are not yet adults (infants, children, teenagers)

Refer to “HRP-416 -CHECKLIST- Children” for information about research involving children as subjects.

5.6.3.1 Parental Permission

Describe whether and how parental permission will be obtained. If permission will be obtained from individuals other than parents, describe who will be allowed to provide permission. Describe the process used to determine these individual’s authority to consent to each child’s general medical care.

For research conducted in the state of Pennsylvania, review “HRP-013-SOP- Legally Authorized Representatives, Children and Guardians” to be aware of which individuals in the state of Pennsylvania meet the definition of “children.”

For research conducted outside of the state of Pennsylvania, provide information that describes which persons have not attained the legal age for consent to treatments or procedures involved in the research, under the applicable law of the jurisdiction in which research will be conducted. One method of obtaining this information is to have a legal counsel or authority review your protocol along with the definition of “children” in “HRP-013-SOP- Legally Authorized Representatives, Children, and Guardians.”

N/A

5.6.3.2 Assent of subjects who are not yet adults

Indicate whether assent will be obtained from all, some, or none of the children. If assent will be obtained from some children, indicate which children will be required

to assent. When assent of children is obtained describe whether and how it will be documented.

N/A

6.0 HIPAA Research Authorization and/or Waiver or Alteration of Authorization

This section is about the access, use or disclosure of Protected Health Information (PHI). PHI is individually identifiable health information (i.e., health information containing one or more 18 identifiers) that is transmitted or maintained in any form or medium by a Covered Entity or its Business Associate. A Covered Entity is a health plan, a health care clearinghouse or health care provider who transmits health information in electronic form. See "HRP-103 -Investigator Manual" for a list of the 18 identifiers.

[Do not type here]

6.1 Authorization and/or Waiver or Alteration of Authorization for the Uses and Disclosures of PHI

Check all that apply:

☐ **Not applicable, no identifiable protected health information (PHI) is accessed, used, or disclosed in this study.** [Mark all parts of sections 6.2 and 6.3 as not applicable]

☒ **Signed authorization will be obtained and documented.** [If this is the only box checked, mark sections 6.2 and 6.3 as not applicable]

☒ **Partial waiver for recruitment purposes only (e.g. if patients' medical records will be accessed to determine eligibility before consent/authorization has been obtained).** [Complete all parts of sections 6.2 and 6.3]

☐ **Full waiver for entire research study (e.g., medical record review studies).** [Complete all parts of sections 6.2 and 6.3]

☐ **Alteration to waive requirement for written documentation of authorization (e.g. verbal or implied authorization).** [Complete all parts of sections 6.2 and 6.3]

6.2 Waiver or Alteration of Authorization for the Uses and Disclosures of PHI

This section is about the disclosure of PHI as it relates to the requested authorization waiver and/or alteration. Complete each item in this section in relation to each requested waiver of authorization and/or alteration (the last three boxes in Item #6.1). For example, if requesting a partial waiver for recruitment, these items need to address the PHI for recruitment rather than addressing the use of PHI for the entire study.

6.2.1 Access, use or disclosure of PHI representing no more than a minimal risk to the privacy of the individual

6.2.1.1 Plan to protect PHI from improper use or disclosure

Include the following statement as written – DO NOT ALTER
If the research does not involve a waiver or alteration of authorization, <u>remove</u> the statement and indicate as <u>not applicable</u>.

Information is included in the "Confidentiality, Privacy and Data Management" section of this protocol.

6.2.1.2 Plan to destroy identifiers or a justification for retaining identifiers

Describe the plan to destroy the identifiers (associated with the waiver and/or alteration of authorization) at the earliest opportunity consistent with the conduct of the research. Include when and how identifiers will be destroyed. If identifiers are to be retained, provide the legal, health or research justification for retaining the identifiers.

Identifiers will be destroyed when the study is completed.

6.2.2 Explanation for why the research could not practicably be conducted without access to and use of PHI

Provide reasons why the research or the portion of the research could not be conducted **without access to and use of PHI** (for which the study team is requesting the waiver and/or related to the alteration of authorization).

Information must be obtained from the participant's electronic medical record during recruitment to determine eligibility and, in some cases, to confirm information discussed with the participant in regards to their medical history.

HIPAA authorization is not applicable for the provider participant group.

6.2.3 Explanation for why the research could not practicably be conducted without the waiver or alteration of authorization

Provide reasons why the research or the portion of the research could not be conducted **without a signed authorization from the subjects**. If more than one waiver and/or alteration of authorization (e.g. waiver for recruitment and alteration for verbal authorization) is requested, make sure to provide reasoning for each request.

The waiver is requested for recruitment to determine participant eligibility to ensure that no medical conditions that fall into the exclusion criteria are present and would thus preclude enrollment. This waiver will minimize the enrollment of participants who may ultimately fail to meet the study inclusion/exclusion criteria.

HIPAA authorization is not applicable for the provider participant group.

6.3 Waiver or alteration of authorization statements of agreement

By submitting this study for review with a waiver of authorization, you agree to the following statement – DO NOT ALTER. **If the research does not involve a waiver or alteration of authorization, <u>remove</u> the statement and indicate as <u>not applicable.</u>**

Protected health information obtained as part of this research will not be reused or disclosed to any other
person or entity, except as required by law, for authorized oversight of the research study, or for other permitted uses and disclosures according to federal regulations.

The research team will collect only information essential to the study and in accord with the 'Minimum Necessary' standard (information reasonably necessary to accomplish the objectives of the research) per federal regulations.

Access to the information will be limited, to the greatest extent possible, within the research team. All disclosures or releases of identifiable information granted under this waiver will be accounted for and documented.

7.0 Study Design and Procedures

Data collection materials that will be seen or used by subjects in your study must be uploaded to CATS IRB (http://irb.psu.edu). **DO NOT** include any actual data collection materials in this protocol (e.g., actual survey or interview questions).

[Do not type here]

7.1 Study Design

Describe and explain the study design.

This is a non-randomized prospective feasibility and acceptability pilot study examining the impact of virtual reality (VR) as an intervention aimed to decrease anxiety, agitation and delirium in adult critically ill patients admitted to the SICU at PSHMC. The data collected for this study will be used to develop future research projects and to help determine how to expand the use of these tools. Basic demographics for enrolled participants will be collected and recorded, including name, age, gender, medical co-morbidities, and prior use of VR technology.

7.2 Study Procedures

Provide a step-by-step description of all research procedures being conducted (broken down by visit, if applicable) including such information as below (where and when applicable); describe the following:

- HOW: (e.g., data collection via interviews, focus groups, forms such as surveys and questionnaires, medical/school records, audio/video/digital recordings, photographs, EKG procedures, MRI, mobile devices such as electronic tablets/cell phones, observations, collection of specimens, experimental drug/device testing, manipulation of behavior/use of deception, computer games, etc.) For surveys, indicate if subjects are able to skip questions that they don't want to answer.

- WHERE: (e.g., classrooms, labs, internet/online, places of business, medical settings, public spaces, etc.)

[Do not type here]

7.2.1 Intervention Day 1

Provide a description of what procedures will be performed on visit 1 or day 1 or pre-test in order of how these will be done. If your study only involves one session or visit, use this section only and delete 7.2.2.

Once enrolled, the participant will undergo three VR sessions per day (morning, midday, night) for 15 minutes each. These sessions will continue for 72 hours from the time of enrollment or until the patient is discharged from SICU. Anxiety, sedation, delirium and pain will be assessed three times per day by the patient's bedside nurse and entered into the patient's EHR per

standard ICU clinical practice. The data will then be collected from the EHR and entered into RedCap. VR sessions will use a Meta Quest 2 headset with non-interactive, calming nature-based content (e.g., ocean/beach scenes, forests, mountains) delivered through a commercially available VR application (Alcove app). Patients will remain in bed or in a semi-reclined position. Patients will not ambulate, will not use controllers, and will not be asked to perform tasks. A bedside nurse or trained study team member will place and remove the headset, monitor the patient throughout the session, and stop the session immediately if the patient requests to stop or develops adverse symptoms. Clinical care needs take priority; sessions will be deferred or stopped for clinical procedures. No data will be collected or recorded by the VR device or software.

INTERVENTION

- The Meta Quest 2 VR headset will be set up by a member of the research study team
- The patient will remain lying in their ICU bed or sitting semi-reclined
- The subject will be shown VR nature scenes using the Alcove app, which allows users to choose between multiple virtual settings: ocean/beach scenes, forests, mountains (representative imagery shown at the end of the document). These scenes will not be interactive and will be selected to correspond to the time of day to preserve circadian rhythms. Sounds of nature and/or soft, relaxing music will play through the headset concurrently.
- The imagery being viewed by the patient will be mirrored to a portable device (tablet, laptop, smartphone) that is being monitored by a member of the study team to ensure appropriate functionality.
- The sessions will be provided 3 times per day (morning, midday, night) for 15 minutes each.

These sessions will continue for 72 hours from the time of enrollment or until the patient is discharged from SICU.

7.2.2 Intervention Day 2

Provide a description of what procedures will be performed on visit 2 or day 2 or post-test in order of how these will be done. If your study involves more than two sessions or visits replicate this section for each additional session or visit (e.g., 7.2.3, 7.2.4, etc.). If your study involves only one session or visit, delete this section.

The participant will continue to undergo three VR sessions per day (morning, midday, night) for 15 minutes each with anxiety, sedation, delirium and pain being assessed three times per day.

7.2.3 Intervention Day 3

The patient will complete their final VR sessions as scheduled with routine assessments as above.

7.24 Post-intervention Procedures

After SICU discharge or within 24 hours after the intervention is completed (whichever occurs first), the patient participant will be asked to complete a brief acceptability and tolerance survey (items focus on comfort, perceived benefit, and willingness to repeat). An email with link to the survey will be sent to the patient through REDCap. The survey is summarized in APPENDIX 2.

Provider participants will be invited via email to complete a one-time deidentified survey in REDCap assessing feasibility, acceptability, and workflow burden after the intervention is completed by the patient. The survey is summarized in APPENDIX 3.

Clinical outcomes data summarized in APPENDIX 1 will be collected from the EHR and entered in REDCap. Survey responses will be entered directly into REDCap by the participant.

MEASURES

- **APPENDIX 1: <u>Participant Demographics and Outcomes</u>**
  After study enrollment, clinically relevant demographic information that will aid in analysis across key variables (e.g. patient gender, age, relevant medical co-morbidities, primary admitting diagnoses, reason for ICU admission) will be collected from the EHR. Upon completion of the intervention, outcomes measuring anxiety, delirium, pain and sedation will be collected from the EHR.

- **APPENDIX 2: <u>Feasibility, Acceptability and Appropriateness of Intervention (Patient Subjects)</u>**
  A survey will be distributed via REDCap to all patient participants after ICU discharge to assess their perceptions of the VR sessions. This will include 4-item assessments of feasibility, acceptability and appropriateness.

- **APPENDIX 3: <u>Feasibility, Acceptability and Appropriateness of Intervention (Provider Subjects)</u>**
  A similar survey will be distributed via REDCap to provider participants to assess their perception of the VR intervention and the ability to successfully implement it in an ICU setting. This will also include 4-item assessments of feasibility, acceptability and appropriateness.

- **APPENDIX 4: <u>Post-intervention Survey Email</u>**
  An invitation to complete survey will be emailed to both patient and provider participants via REDCap. Consent will be implied within the email invitation to complete the survey.

7.3 Duration of Participation

Describe how long subjects will be involved in this research study. Include the number of sessions and the duration of each session - consider the total number of minutes, hours, days, months, years, etc.

Participants will undergo three VR sessions per day (morning, midday, night) for 15 minutes each. These sessions will continue for 72 hours from the time of enrollment or until the patient is discharged from SICU. Completion of the survey will conclude the study for both patient and provider participants. The survey should take approximately 5 minutes to complete for all participants.

8.0 Number of Subjects and Statistical Plan

8.1 Number of Subjects

Indicate the maximum number of subjects to be accrued/enrolled, to include all persons who sign consent for the study. If applicable, distinguish between the number of subjects who are expected to be

enrolled and screened, and the number of subjects needed to complete the research procedures (i.e., numbers of subjects excluding screen failures.)

A maximum of 30 adult ICU patients will be accrued for this pilot feasibility study. This number includes all individuals who provide informed consent.

A maximum of 90 provider participants will be accrued for this study.

8.2 Sample Size Determination

If applicable, provide a justification of the sample size outlined in section 8.1 to include reflections on, or calculations of, the power of the study.

Of the 30 consented subjects, we anticipate that approximately 24–26 participants will complete the full study procedures, including at least one VR session and post-intervention assessments. Participants who consent but are unable to complete a VR session or required outcome measures will be considered enrolled but not completers.

We estimate that no more than 3 nursing providers will be caring for each distinct patient participant throughout the duration of the study. As such, we anticipate no less than 30 and no more than 90 providers will be eligible to participate in the study.

8.3 Statistical or Analytic Methods

Describe the statistical methods (or non-statistical methods of analysis) that will be employed.

This study is designed as a pilot feasibility study rather than a definitive efficacy trial. As such, the sample size is not based on formal power calculations to detect statistically significant differences in clinical outcomes. A target enrollment of 30 participants was selected based on commonly accepted sample sizes for pilot feasibility studies in critical care research.

The primary analyses will focus on feasibility, acceptability, and appropriateness of the VR intervention, which will be measured using the AIM, FIM and IAM scales (5-point Likert scale shown in APPENDIX 2 AND 3). Item responses will be summarized using means, standard deviations and medians with interquartile ranges.

Given the pilot nature of the study, all analyses of clinical outcomes will be considered exploratory. No adjustments for multiple comparisons will be performed, and results will be interpreted cautiously to guide future hypothesis-driven studies rather than to draw definitive conclusions.

9.0 Data and Safety Monitoring Plan

This section is required when research involves more than Minimal Risk to subjects as defined in "HRP-001 SOP- Definitions."

Minimal Risk is defined as the probability and magnitude of harm or discomfort anticipated in the research that are not greater in and of themselves than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests. For research involving prisoners, Minimal Risk is the probability and magnitude of physical or psychological harm that is normally encountered in the daily lives, or in the routine medical, dental, or psychological examination of healthy persons.

Please complete each section below if the research involves more than minimal risk to subjects or indicate not applicable. If reviewed at a convened board, the board may require the completion of this section. Note: For cancer-related trials, PRC will ask for data safety monitoring for low-risk trials outside of the IRB process.

[Do not type here]

9.1 Periodic evaluation of data

Describe the plan to periodically evaluate the data collected regarding both harms and benefits to determine whether subjects remain safe.

N/A

9.2 Data that are reviewed

Describe the data that are reviewed, including safety data, untoward events, and efficacy data.

N/A

9.3 Method of collection of safety information

Describe the method by which the safety information will be collected (e.g., with case report forms, at study visits, by telephone calls and with subjects).

N/A

9.4 Frequency of data collection

Describe the frequency of data collection, including when safety data collection starts.

N/A

9.5 Individuals reviewing the data

Identify the individuals who will review the data. The plan might include establishing a data and safety monitoring committee and a plan for reporting data monitoring committee findings to the IRB and the sponsor.

N/A

9.6 Frequency of review of cumulative data

Describe the frequency or periodicity of review of cumulative data.

N/A

9.7 Statistical tests

Describe the statistical tests for analyzing the safety data to determine whether harms are occurring.

N/A

9.8 Suspension of research

Describe any conditions that trigger an immediate suspension of research.

N/A

10.0 Risks

List the reasonably foreseeable risks, discomforts, hazards, or inconveniences to the subjects related the subjects' participation in the research. Include as may be useful for the IRB's consideration, a description of the probability, magnitude, duration, and reversibility of the risks. Consider all types of risk including physical, psychological, social, legal, and economic risks. **Note: Loss of confidentiality is a potential risk when conducting human subject research and must be listed here.**

- If applicable, indicate which procedures may have risks to the subjects that are currently unforeseeable.
- If applicable, indicate which procedures may have risks to an embryo or fetus should the subject be or become pregnant.
- If applicable, describe risks to others who are not subjects.

The risks associated with participation in this study are expected to be minimal. Virtual reality exposure is non-invasive and similar to routine audiovisual activities. Reported side effects in prior studies are generally mild, transient, and resolve immediately with discontinuation of VR use.

Physical risks: These risks are expected to be mild, short in duration, and reversible with cessation of VR exposure.

- Transient nausea, dizziness, headache, eye strain, or motion sickness related to VR use
- Discomfort from wearing a head-mounted display
- Potential for transient agitation or anxiety

Psychological risks:

- Temporary anxiety, claustrophobia, or emotional discomfort related to immersive content
- Potential for overstimulation or delirium exacerbation, although VR content will be selected to be calming and sessions will be brief and closely monitored

Loss of confidentiality:

- There is a minimal risk of breach of confidentiality related to collection and storage of research data. No risks to non-subjects are anticipated.

Special monitoring considerations:

- Because participants are critically ill, sessions will be closely monitored to ensure comfort and safety. VR content will be calming, sessions, brief, and discontinued immediately if distress occurs.

11.0 Potential Benefits to Subjects and Others

11.1 Potential Benefits to Subjects

Describe the potential benefits that individual subjects may experience from taking part in the research. If there is no direct benefit to subjects, indicate as such. Compensation is not considered a benefit. Compensation should be addressed in section 13.0.

Subjects may experience reduced anxiety, improved comfort, or relaxation during VR sessions. Subjects may also experience reduced need for sedative medications. These benefits are possible but not guaranteed.

11.2 Potential Benefits to Others

Describe the potential benefits to society or others.

This study may benefit future ICU patients by informing the safe and feasible implementation of VR as a non-pharmacologic intervention to reduce anxiety, delirium, and sedation exposure. Results may guide the design of larger trials and broader ICU practice innovations
.

12.0 Sharing Results with Subjects

Describe whether results (study results or individual subject results, such as results of investigational diagnostic tests, genetic tests, or incidental findings) will be shared with subjects or others (e.g., the subject's primary care physicians) and if so, describe how information will be shared.

Individual subject results will not be shared. However, aggregate results may be shared upon request or publication.

13.0 Subject Payment and/or Travel Reimbursements

Describe the amount, type (cash, check, gift card, other), reason/purpose (travel reimbursement or compensation for their time, inconvenience, discomfort), and timing of any subject payment or travel reimbursement. If there is **no** subject payment or travel reimbursement, indicate as not applicable.

Extra or Course Credit: Describe the amount of credit **and** the available alternatives. Alternatives should be equal in time and effort to the amount of course or extra credit offered. It is not acceptable to indicate that the amount of credit is to be determined or at the discretion of the instructor of the course.

Approved Subject Pool: Indicate which approved subject pool will be used; include in response below that course credit will be given and alternatives will be offered as per the approved subject pool procedures.

N/A

14.0 Economic Burden to Subjects

14.1 Costs

Describe any costs that subjects may be responsible for because of participation in the research.

N/A

14.2 Compensation for research-related injury

If the research involves more than Minimal Risk to subjects, describe the available compensation in the event of research related injury.

If there is no sponsor agreement that addresses compensation for medical care for research subjects with a research-related injury, include the following text as written - DO NOT ALTER OR DELETE:
It is the policy of the institution to provide neither financial compensation nor free medical treatment for research-related injury. In the event of injury resulting from this research, medical treatment is available but will be provided at the usual charge. Costs for the treatment of research-related injuries will be charged to subjects or their insurance carriers.

For sponsored research studies with a research agreement with the sponsor that addresses compensation for medical care for research-related injuries, include the following text as written - DO NOT ALTER OR DELETE:
It is the policy of the institution to provide neither financial compensation nor free medical treatment for research-related injury. In the event of injury resulting from this research, medical treatment is available but will be provided at the usual charge. Such charges may be paid by the study sponsor as outlined in the research agreement and explained in the consent form.

N/A - This study involves minimal risk research. No additional compensation for research-related injury is provided beyond standard clinical care.

15.0 Resources Available

15.1 Facilities and locations

Identify and describe the facilities, sites, and locations where recruitment and study procedures will be performed.

If research will be conducted outside the United States, describe site-specific regulations or customs affecting the research, and describe the process for obtaining local ethical review. Also, describe the principal investigator's experience conducting research at these locations and familiarity with local culture.

The study will be conducted in the Surgical Intensive Care Unit (SICU) at Penn State Health Milton S. Hershey Medical Center. Recruitment, consent, and study procedures will occur at the subject's bedside. The PI has extensive experience conducting clinical research in ICU settings.

15.2 Feasibility of recruiting the required number of subjects

Indicate the number of potential subjects to which the study team has access. Indicate the percentage of those potential subjects needed for recruitment.

The study team has access to approximately 1800 adult SICU admissions annually who may meet eligibility criteria. Enrollment of 30 patient subjects represents less than 2% of the available population, supporting feasibility of recruiting the required number of patient participants.

Because our target enrollment is centered on *patient* subjects, the number of *provider* subjects will be dependent on the actual number of patient subjects enrolled. Assuming enrollment of 30 *patient* subjects, a total of 30 to 90 distinct *provider* subjects may be accrued.

Recruitment of both patient and provider participants will continue until the target **patient** subject accrual number is reached. We anticipate approximately 60% accrual rate for provider subjects.

15.3 PI Time devoted to conducting the research

Describe how the PI will ensure that a sufficient amount of time will be devoted to conducting and completing the research. Consider outside responsibilities as well as other on-going research for which the PI is responsible. Please only provide a response for the principal investigator – do **not** include information about any other study team members.

The PI will dedicate sufficient protected research time to oversee all aspects of the study, including subject enrollment, safety monitoring, data review, and regulatory compliance. The PI's clinical and research responsibilities allow adequate time to ensure successful completion of the study.

15.4 Availability of medical or psychological resources

Describe the availability of medical or psychological resources that subjects might need as a result of their participation in the study.

Subjects are hospitalized in an ICU with immediate access to medical and psychological support. Any adverse symptoms related to VR use will be promptly addressed by the ICU care team.

15.5 Process for informing Study Team

Describe the training plans to ensure members of the research team are informed about the protocol and their duties.

All study team members will receive protocol-specific training prior to study initiation, including eligibility criteria, consent procedures, VR device operation, safety monitoring, and adverse event reporting. Training will be documented and reinforced through regular team communication.

16.0 Other Approvals

16.1 Other Approvals from External Entities

Describe any approvals that will be obtained prior to commencing the research (e.g., from engaged cooperating institutions IRBs who are also reviewing the research and other required review committees, community leaders, schools, research locations where research is to be conducted by the Penn State investigator, funding agencies, etc.).

N/A

16.2 Internal PSU Ancillary Reviews

DO NOT ALTER OR DELETE:
Ancillary reviews are reviewed by other compliance groups or individuals within Penn State that inform the IRB's review of a new study or a modification to an existing study.

PSU IRB may set applicable ancillary reviews for your study. Please refer to the "HRP-309 Worksheet – Ancillary Review Matrix" for more information (found in the CATS Library).

[Do not type here]

17.0 Multi-Site Study

If this is a multi-site study (i.e., a study in which two or more institutions coordinate, with each institution completing all research activities outlined in a specific protocol) and **the Penn State PI is the lead investigator**, describe the processes to ensure communication among sites in the sections below.

[Do not type here]

17.1 Other sites

List the name and location of all other participating sites. Provide the name, qualifications and contact information for the principal investigator at each site and indicate which IRB will be reviewing the study at each site.

N/A

17.2 Communication Plans

Describe the plan for regular communication between the overall lead investigator and the other sites to ensure that all sites have the most current version of the protocol, consent document, etc. Describe the process to ensure all modifications have been communicated to sites. Describe the process to ensure that all required approvals have been obtained at each site (including approval by the site's IRB of record). Describe the process for communication of problems with the research, interim results, and closure of the study.

N/A

17.3 Data Submission and Security Plan

Describe the process and schedule for data submission and provide the data security plan for data collected from other sites. Describe the process to ensure all engaged participating sites will safeguard data as required by local information security policies.

N/A

17.4 Subject Enrollment

Describe the procedures for coordination of subject enrollment and randomization for the overall project.

N/A

17.5 Reporting of Adverse Events and New Information

Describe how adverse events and other information will be reported from the clinical sites to the overall study director. Provide the timeframe for this reporting.

N/A

17.6 Audit and Monitoring Plans

Describe the process to ensure all local site investigators conduct the study appropriately. Describe any on-site auditing and monitoring plans for the study.

N/A

18.0 Adverse Event Reporting

18.1 Reporting Adverse Reactions and Unanticipated Problems to the Responsible IRB

By submitting this study for review, you agree to the following statement – DO NOT ALTER OR DELETE:

In accordance with applicable policies of The Pennsylvania State University Institutional Review Board (IRB), the investigator will report, to the IRB, any observed or reported harm (adverse event) experienced by a subject or other individual, which in the opinion of the investigator is determined to be (1) unexpected; and (2) probably related to the research procedures. Harms (adverse events) will be submitted to the IRB in accordance with the IRB policies and procedures.

19.0 Study Monitoring, Auditing, and Inspecting

19.1 Auditing and Inspecting

By submitting this study for review, you agree to the following statement – DO NOT ALTER OR DELETE:

The investigator will permit study-related monitoring, audits, and inspections by the Penn State quality assurance program office(s), IRB, the sponsor, and government regulatory bodies, of all study related documents (e.g., source documents, regulatory documents, data collection instruments, study data etc.). The investigator will ensure the capability for inspections of applicable study-related facilities (e.g., pharmacy, diagnostic laboratory, etc.).

20.0 References

List relevant references in the literature which highlight methods, controversies, and study outcomes.

1. Lewis K, Balas MC, Stollings JL, et al. A focused update to the clinical practice guidelines for the prevention and management of pain, anxiety, agitation/sedation, delirium, immobility, and sleep disruption in adult patients in the ICU. Critical Care Medicine. 2025;53(3):e711–e727.
2. Devlin JW, Skrobik Y, Gélinas C, et al. Clinical practice guidelines for the prevention and management of pain, agitation/sedation, delirium, immobility, and sleep disruption in adult patients in the ICU. Critical Care Medicine. 2018;46(9):e825–e873.
3. Jawed YT, et al. Virtual reality in the intensive care unit: A potential nonpharmacological intervention. Heart & Lung. 2023. PMCID: PMC10266374.
4. Ong TL, Ruppert MM, Akhtar A, et al. Improving the intensive care patient experience with virtual reality: A feasibility study. Critical Care Explorations. 2020. PMCID: PMC7314318.
5. Naef AC, Jeitziner M-M, Gerber SM, et al. Virtual reality stimulation to reduce the incidence of delirium in critically ill patients: Study protocol for a randomized clinical trial. Trials. 2021;22:174. PMCID: PMC7923502.
6. Weiner BJ, Lewis CC, Stanick C, Powell BJ, Dorsey CN, Clary AS, Boynton MH, Halko H. Psychometric assessment of three newly developed implementation outcome measures. Implement Sci. 2017 Aug 29;12(1):108. doi: 10.1186/s13012-017-0635-3. PMID: 28851459; PMCID: PMC5576104.
7. Locke BW, Tsai TY, Reategui-Rivera CM, Gabriel AS, Smiley A, Finkelstein J. Immersive Virtual Reality Use in Medical Intensive Care: Mixed Methods Feasibility Study. JMIR Serious Games. 2024 Aug 9;12:e62842. doi: 10.2196/62842. PMID: 39046869; PMCID: PMC11344185.
8. Haley AC, Wacker DA. Cinematic virtual reality for anxiety management in mechanically ventilated patients: a feasibility and pilot study. Acute Crit Care. 2022 May;37(2):230-236. doi: 10.4266/acc.2021.00843. Epub 2022 Feb 4. PMID: 35172527; PMCID: PMC9184980.

21.0 Confidentiality, Privacy and Data Management

For data level classification: https://security.psu.edu/awareness/icdt/

For approved UP/Commonwealth storage platforms:
https://security.psu.edu/awareness/storage/
https://datastoragefinder.psu.edu/computing/backup-storage/finder

Please visit https://datastoragefinder.psu.edu and https://security.psu.edu/awareness/storage/ for assistance with identifying appropriate data storage options. If the software to be used does not appear on that site, please visit https://procurement.psu.edu/electronic-click-through-contracts to consider whether a software request form must be completed.

NOTE: Please refer to PSU Policy AD95 for information regarding information classification and security standards and requirements. **UP/Commonwealth campuses:** If you have questions about Penn State's Policy AD95 or standards or need a consultation regarding data security, please contact Penn State IT – Information Security at security@psu.edu. **College of Medicine:** If you have questions about Penn State's Policy AD95 or standards or need a consultation regarding data security, please contact Philemon Canakis in the Penn State IT Security Group at pcanakis@pennstatehealth.psu.edu.

21.1 Which of the following identifiers will be recorded for the research project? Check all that apply. If none of the following identifiers will be recorded, do not check any of the boxes.

	Hard Copy Data	Electronic Stored Data
Names and/or initials (including on signed consent documents)	☒	☒
All geographic subdivisions smaller than a State, including street address, city, county, precinct, zip code, and their equivalent geocodes,	☐	☐
All elements of dates (except year) for dates directly related to an individual, including birth date, admission date, discharge date, date of death; and all ages over 89 and all elements of dates (including year) indicative of such age, except that such ages and elements may be aggregated into a single category of age 90 or older	☐	☒
Telephone numbers	☐	☐
Fax numbers	☐	☐
Electronic mail addresses	☐	☒
Social security numbers	☐	☐
Medical record numbers	☐	☒
Health plan beneficiary numbers	☐	☐
Account numbers	☐	☐
Certificate/license numbers	☐	☐
Vehicle identifiers and serial numbers, including license plate numbers	☐	☐
Device identifiers and serial numbers	☐	☐
Web Universal Resource Locators (URLs)	☐	☐
Internet Protocol (IP) address numbers	☐	☐
Biometric identifiers, including finger and voice prints	☐	☐
Full face photographic images and any comparable images	☐	☐
Any other unique identifying number, characteristic, or code (such as the pathology number)	☐	☐
Study code number with linking list	☐	☐
Genomic sequence data	☐	☐
State ID numbers	☐	☐
Passport numbers	☐	☐
Driver's license numbers	☐	☐

21.2 Are the identifiers above linked (directly or indirectly via code list) to research data?

☐ No – skip to 21.3
☒ Yes – complete 21.2.1

21.2.1 Explain how the list that links the code to identifiers is stored, whether and how it is stored separately from coded data, and who has access:

When appropriate, a list/key that links indirect identifiers (code numbers, participant IDs, etc.) to direct identifiers should not be comingled (i.e., stored in the same location) as the identifiable data, including copies of signed informed consent forms. For some types of research, this may not be practical. In all cases, access to that list/key must be restricted to authorized project personnel.

All patient data, including identifiers, will be stored together within REDCap. All survey responses and data used for analysis will also be collected and stored directly in REDCap. The database will be password-protected and only accessible by study team members.

21.3 Are paper records of research data (including copies of signed consent forms) being collected or stored:

☐ No – skip to 21.4
☒ Yes – complete 21.3.1 and 21.3.2

21.3.1 Where will the paper records be securely stored?

Locked file cabinet in PI's office

21.3.2 Will everyone on the study team have access to the stored paper records?

☒ Yes – skip to 21.4
☐ No – Explain what limitations are in place:

[Type protocol text here]

21.4 Are electronic records of research data being collected or stored?

☐ No – skip to 21.5
☒ Yes – Complete rest of 21.4

Use of one of the IT-approved solutions listed is strongly recommended. If "Other" is chosen for storage of identifiable data, the IRB may set an ancillary review for further assessment of compliance with institutional data security policy.

21.4.1 How is the data being collected? (e.g., data capture using online surveys/questionnaire, surveys via email, observation of chat rooms or blogs, survey platform, application, or device)

Data will be recorded in the patient's electronic health record according to standard care and transferred into Penn State REDCap for analysis. All survey responses and data used for analysis will be collected and stored directly in REDCap.

21.4.1.1 If you've indicated that data is being collected via a device or application (e.g. FitBit, Apple Watch, eye tracker, etc.), will the developer/external entity have access to the research data?

☐ No
☐ Yes

21.4.2 Specify the level of data that will be stored electronically (refer to definitions at the top of this section – links to levels/storage: https://security.psu.edu/awareness/icdt/

☐ Level 1 (e.g. public data, de-identified)
☐ Level 2 (e.g. identifiable)
☒ Level 3 (e.g. PHI, SSN)
☐ Level 4 (e.g. Classified data)

21.4.3 Indicate where the electronic data associated with this research study will be stored (Check all that apply)

21.4.3.1 PSU - Penn State University and Commonwealth Campuses

- Penn State IT provided database application:
  - ☐ Penn State REDCap
  - ☐ Penn State Qualtrics
  - ☐ Penn State, College, or Department IT managed file server, OneDrive, or SharePoint
  - ☐ Penn State GoogleDrive

- Other – Specify the database application or server:
  - ☐ Provide details about the data security features or attach security documentation provided by sponsor or group.

Please visit https://security.psu.edu/awareness/storage/ for assistance with identifying appropriate data storage options. If the software to be used does not appear on that site, a software request form must be completed.

21.4.3.2 PSH/COM - Penn State Health/College of Medicine

- Penn State IT provided database application:
  - ☒ Penn State REDCap
  - ☐ Penn State Qualtrics
  - ☐ Penn State Health, College of Medicine, or Department IT managed file server
  - ☐ Office365, OneDrive, or SharePoint
    - Specify the O365 tenant to be used (PSU, PSH)
  - ☐ Oncore (Penn State Cancer Institute only)
  - ☐ Florence eBinders
  - ☐ External Institution's REDCap
  - ☐ Web-based system provided by the sponsor or cooperative group via contract

- Other – Specify the database application or server:
  - ☐ Provide details about the data security features or attach security documentation provided by sponsor or group.

21.5 Will any type of recordings (e.g., audio or video) or photographs of the subjects be made during this study or will you interact with subjects via live video streaming(video chat)?

☒ No – skip to 21.6
☐ Yes – Live video chat ONLY without recording. If this is the ONLY box checked, complete 21.5.1 only.
☐ Yes – Recording (audio, video, photographs, recording of video chat). If this is the ONLY box checked, skip to 21.5.2:

21.5.1 Select the video chat platform:

☐ PSH HIPAA Compliant Teams
☐ PSU Zoom
☐ Other: Specify:
[Type text here if box is checked]

21.5.2 Select the type of recording or image being made and what is being used to record or capture the image:

☐ Audio – Describe what will be used to capture the audio:
[Type text here if box is checked]

☐ Video – Describe what will be used to capture the video:
[Type text here if box is checked]

☐ Photographs of the subjects – Describe what will be used to photograph the subjects and whether facial images will be captured or collected:
[Type text here if box is checked]

☐ Recording of video chat
- ☐ PSH HIPAA Compliant Teams
- ☐ PSU Zoom
- ☐ Other: Specify:
[Type text here if box is checked]

☐ Other - Specify:
[Type text here if box is checked]

21.5.3 Will any of the recordings be transcribed?

Note: If a transcription service outside of Penn State will be used, a business associate agreement or data transfer agreement may be needed.

☐ No
☐ Yes – indicate who will be doing the transcribing? (Ex: Zoom, Rev.com, Datagain, 3Play Media). If necessary, please clarify if the transcription service is HIPAA compliant or not.

[Type protocol text here]

21.5.4 Will the recordings be destroyed or cleaned (removed of all identifiers)? If so, describe below.

[Type protocol text here]

21.6 Certificate of Confidentiality (COC) - Is the research biomedical, behavioral, clinical or other research that is funded by the National Institutes of Health (NIH)?

☐ Yes – this means at least one of the following is true:
- The research involves human subjects as defined by the DHHS regulations (See Worksheet
- HRP-310).
- The research involves collecting or using biospecimens that are identifiable to an individual.
- If collecting or using biospecimens as part of the research, there is a small risk that some combination of the biospecimen, a request for the biospecimen, and other available data sources could be used to deduce the identity of an individual.

- The research involves the generation of individual level, human genomic data.

Note: If <u>any</u> of the 4 items above are true, a COC is automatically issued by NIH and applies to the research. Information about the COC must be included in the consent form.

☒ No - answer the following question.

If the research is not funded by NIH, will the investigator apply for a COC for this research study?

☒ No
☐ Yes

Note: For research not funded by NIH, the IRB may require a COC if the research is collecting personally identifiable information and the information is sensitive and/or the research is collecting information that if disclosed could significantly harm or damage the subject.

21.7 Does this research involve the generation of large-scale human genomic data as defined in NIH Genomic Data Sharing Policy (https://sharing.nih.gov/genomic-data-sharing-policy))?

☒ No
☐ Yes – describe the plan for de-identifying the dataset before sharing it with NIH-designated data repositories.

[Type protocol text here]

Note: Data sharing with an NIH-designated data repository may require execution of an institutional certificate. Please review the 'Institutional Certification for NIH Genomic Data Sharing' section of the Investigator's Manual for information about seeking institutional certification.

21.8 Does this research involve data sharing to public/restricted data repositories or as part of a journal requirement?

Data sharing is an important part of rigorous scientific discovery and the validation of results. Planning for data sharing is strongly recommended. Please refer to: https://libraries.psu.edu/about/departments/research-informatics-and-publishing/services/data-management-and-sharing

Data sharing includes sharing of identifiable, coded, or de-identified data. The data can be shared with public or restricted data repositories. Increasingly, journals require the sharing of data as a stipulation for publication. NIH-funded studies **require data sharing**, unless explicitly granted an exception from the NIH.

☒ No – skip to section 21.9
☐ Yes (strongly recommended as may be required for publication and future grant submission)

21.8.1 What type of data will be shared: De-identified, coded, identifiable (if identifiable, list the identifiers that will be shared)

☐ De-identified
☐ Coded (there is a study code ID being sent, but no identifiers with the study code)
☐ Identifiable – Specify the identifiers that will be shared:

[Type protocol text here]

21.8.2 What type of repository will be used to share the data: Public, controlled, etc. Note: The specific name of the repository is not necessary.

[Type protocol text here]

21.9 Does this research involve transfer or disclosure of data and/or specimens to and/or from Penn State?

☒ No - skip to section 22.0
☐ Yes - answer the following questions:

21.9.1 Specimen and/or data are being transferred or disclosed (electronically or physically) **TO** Penn State. Please insert study information in first blank row. Please add additional rows as necessary for each individual entity, do not have more than one entry in a row. (Example provided in grey)

Sharing Entity (if international, specify country)	Data or Specimen Type	Method of Transfer	Storage Location	Identifiers (Refer to table 1 in 21.1)	Linking List Location	Additional notes, if needed.
EXAMPLE: US based or International based Institution name (if international, specify country)	Consent forms, questionnaires, activity data from FitBit, liver biopsy sample, biopsy results, audio recordings.	Aspera, Office 365, REDCP, Sponsored platform/location	REDCap, Lab, CRC	Study code, Date of birth	☒ ONLY with External Entity ☐ External Entity and Penn State ☐ Penn State ONLY	

21.9.2 Specimen and/or data are being transferred or disclosed (electronically or physically) **FROM** Penn State. Please insert study information in first blank row. Please add additional rows as necessary for each individual entity, do not have more than one entry in a row. (Example provided in grey)

Receiving Entity	Data or Specimen Type	Method of Transfer	Domestic / International Destination	Identifiers (Refer to table 1 in 21.1)	Linking List Location	Additional notes, if needed.

EXAMPLE: Institution name	Consent forms, questionnaires, activity data from FitBit, liver biopsy sample, biopsy results, audio recordings.	Aspera, Office 365, REDCP, Sponsored platform/location	☒ Domestic (US Based Destination) ☐ International Destination (specify country)	Study code, Date of birth	☐ ONLY with External Entity ☐ External Entity and Penn State ☒ Penn State ONLY	

UP/Commonwealth Data Transfer:
Office of Sponsored Programs - Data transfers or disclosures may require a Data Use Agreement (DUA). If the third party is requiring us to sign a contract regarding the data, this contract must go through the Office of Sponsored Programs https://www.research.psu.edu/osp/overview-pages/data-use-agreements.

PSU/Commonwealth Material Transfer:
Office of Technology Transfer - All material transfers, either sending or receiving, require a Material Transfer Agreement (MTA). Please contact the Office of Technology Transfer for more information. https://ott.psu.edu/

Penn State Health/College of Medicine Data transfer:
Office of Research Affairs - Data transfers or disclosures may require a Data Use Agreement (DUA). If the Office of Research Affairs has not yet been contacted, please email e-contracts@pennstatehealth.psu.edu. If a third party is requiring us to sign a contract regarding the data, the contract must go through the Office of Research Affairs. Please submit at the following link: https://pennstatehershey.tfaforms.net/267.

Penn State Health/College of Medicine Material transfer:
Center for Medical Innovation - All material transfers, either sending or receiving, require a Material Transfer Agreement (MTA). If a MTA Intake Form has not been completed for this material transfer, please go to https://pennstatehershey.tfaforms.net/744 and complete the on-line MTA intake form. If you have any questions, please email CMI@pennstatehealth.psu.edu.

22.0 Identifiable Data and Specimen Banking for Future Undetermined Research

If this study is banking **identifiable** data and/or specimens at Penn State that will be used for **future undetermined research**, please describe this process in the sections below. This information should not conflict with information provided in the above sections regarding whether or not data and/or specimens will be associated with identifiers (directly or indirectly). If there are no plans to use identifiable data/specimens for future, undetermined research, then this section is **NOT applicable**.

[Do not type here]

22.1 Data and/or specimens being stored

Identify what data and/or specimens will be stored, and the data associated with each specimen.

N/A

22.2 Location of storage

Identify the location where the data and/or specimens will be stored.

N/A

22.3 Duration of storage

Identify how long the data and/or specimens will be stored. If data and/or specimens will be stored indefinitely, indicate such.

N/A

22.4 Access to data and/or specimens

Identify who will have access to the data and/or specimens.

N/A

22.5 Procedures to release data or specimens

Describe the procedures to release the data and/or specimens, including: the process to request a release, approvals required for release, who can obtain data and/or specimens, and the data to be provided with the specimens.

N/A

22.6 Process for returning results

Describe the process for returning results to participants from the banked data and/or specimens.

N/A

REPRESENTATIVE IMMERSIVE VR IMAGERY TAKEN FROM THE ALCOVE APP