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TITLE: Interactive Virtual Occupational Safety Training Designed for Home Healthcare Workers

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Title: Readily Accessible, Interactive Virtual Occupational Safety Training Designed with and for Ohio Home Healthcare Workers and Agencies

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This project is being conducted by researchers at Ohio State University in collaboration with external collaborators, Dr. Barbara Polivka, University of Kansas Medical Center, and Dr. Amy Darragh, Virginia Commonwealth University

Research Protocol

Background

Burden. Home Healthcare Services (NAICS 6216) is one of the top 10 fastest growing industry segments in the US.[16] In Ohio, it is projected that home healthcare service employment opportunities will increase 18.4% by 2030.[17] Over 1.3 million patient care providers are employed in this sector, with the largest occupations being home health and personal care aides (877,000).[18] Growth in these occupations is projected nationally to be 22% between 2022 and 2032. [19] Significant numbers of nursing assistants, licensed practical nurses (LPNs), registered nurses (RNs) and therapists (physical therapy (PT), occupational therapy (OT), etc.) also work in home healthcare (totaling 402,900).[16] Large, rapid increases in home healthcare and HHWs are due to an aging population with complex co-morbidities, increased outpatient services needing homecare follow-up, reduced hospital stays, cost savings of in-home assistance, and patient preferences.[19-21]

HHWs encounter multiple hazards in home healthcare work environments that are more challenging and variable than institutional care settings.[14,20,22] In 2021-22, the BLS reported 29,310 cases in Home Healthcare Services that resulted in days away from work (DAFW) and another 5610 cases involving work restriction or job transfer (DJTR).[16,23] The rate of lost time injury in home healthcare, as well as rates of 'sprains, strains, tears.' 'soreness, pain', and 'all other natures' exceeded (overall) average rates for private industry.

Need. Many Occupational Safety and Health Administration (OSHA) standards include requirements for employee training. This reflects OSHA's belief that training is an essential part of every employer's safety and health program for protecting workers from injuries and illnesses.[50] The injury burden described above shows that empirically validated training approaches are needed to address health and safety hazards in home healthcare to improve HHW health and safety outcomes. It is essential that HHWs can identify and effectively manage home hazards. Employers have a growing need for effective, efficient training given the high injury and HHW turnover rates,[19,44-46,52,53] but there is no consistent or standard health and safety training for HHWs. Moreover, current HHW training approaches are sporadic and limited in scope and efficacy. [3,6,11,38,54,55]

Online resources include the NIOSH 'Home Healthcare Workers: How to Prevent…'[56] series of Fact Sheets for HHWs and its 'Caring for Yourself While Caring for Others'[57] training materials (intended for multiple interactive sessions with a trainer and group of HHWs); online advice (e.g. 'Safety Tips for Home Healthcare Workers')[58] and online videos on patient handling that vary in validity of the provided advice. The Ohio Bureau of Workers' Compensation support of this research to practice (r2p) initiative will provide an engaging, interactive, evidence-based, low-cost training program that is widely available to HHWs and agencies.

Impact. Safety training has been shown to have positive effects on safety behaviors.[59-63] The proposed research is an important, well-conceived, and timely r2p effort that has the potential to positively affect the health and safety of HHWs. The HH-VSTS is grounded in the Gershon Health and Safety in the Home Healthcare Setting framework[29] and in the Griffin Model of Risk Information Seeking and Processing[64] which inform the hypothesized mechanisms of the HH-VSTS impact on hazard awareness (Fig. 2). Hazards included in the HH-VSTS were derived from a review of published evidence[29,48,65,66] and from HHW focus groups during the design phase of the HH-VSTS.[14] Hazards are embedded in contextually appropriate locations in the HH-VSTS home environment. The training is designed in modules to accommodate different training schedules (e.g., complete training and assessment in one session or in a series of shorter sessions).

The proposed research begins from the successful completion of the HH-VSTS development project (R01OH010425). The primary aims of the proposed project are consistent with Ohio BWC Priority Areas, including prevention of physical injuries (musculoskeletal disorders; injuries caused by falls, overexertion, and lacerations) and integration of PPT innovations into Ohio's workforce. The primary aims of the proposed project are consistent with the NIOSH Strategic Plan and the following NIOSH priority goals for extramural research:[67] Goal 3: Reduce occupational immune, infectious, and dermal diseases (goals 3.3B, 3.3G, 3.3H, 3.4D); Goal 4: Reduce occupational and musculoskeletal disorders (goal 4.8D); Goal 5: Reduce occupational respiratory disease (goal 5.4D); Improve workplace safety to reduce traumatic injuries (goals 6.4A, 6.13A, 6.13B) Goal 7: Promote safe and healthy work design and well-being (goal 7.2E).

The expected outcomes of the project are an innovative, validated, affordable, and effective health and safety training system that is widely and readily available to HHW and agencies throughout the Ohio and a robust commercialization plan, created in partnership with our Industry Partner and Technology Commercialization Expert, that will provide the roadmap for effective dissemination throughout Ohio.

Study Protocol Specific to Clinical Trial Phase of This Research

AIM 3 – STEP 2: Pilot study of generalizability of the enhanced HH-VSTS

Step 2. Exploratory Pilot Study

Overview. We will collect preliminary data on the extent to which the knowledge gained from the enhanced HH-VSTS transfers to a real-world environment. Following abbreviated use of the enhanced HH-VSTS, participants will perform a walk-through of a realistic environment to assess their learning.

Step 2 Approach. The pilot test will use a quasi-experimental design with between groups and within subjects features to evaluate the generalizability of the enhanced HH-VSTS to a home setting. Participants will complete one of the three training modules in the HH-VSTS and then perform an actual walk-through of a simulated home setting during which they will be asked to identify any hazard that they think they recognize. The simulated home setting is a furnished apartment in Atwell Hall that is used for training OT and PT students. The primary outcome is Learning Transfer, assessed by hazard identification. The secondary outcome is the hazard response. We hypothesize that:

H1: In the simulated home environment, participants completing their assigned HH-VSTS training module will identify a greater proportion of hazards than participants who did not complete that training module.
H2: In the simulated home environment, participants will identify a greater proportion of hazards related to their assigned HH-VSTS training module (e.g., environmental) as compared to the proportion of hazards related to the training modules they did not complete (e.g., slip/trip/lift or electric/fire/burn).
H3: In the simulated home environment, participants will identify a greater proportion of optimal hazard response strategies from their assigned HH-VSTS training module as compared to the unassigned training modules.

In this experiment, participants will be sequentially assigned to one of 3 training groups (Table 2). Each group will complete one of the three training modules within the HH-VSTS. Transfer of learning from the virtual environment to a home setting will be assessed by participants' 1) hazard identification (the primary outcome) and 2) hazard response (the secondary outcome). The walk-through will occur in a one-bedroom apartment staged with a systematic representation of health and safety hazards that can be present in home healthcare scenarios.

We will assess participants' ability to identify hazards in the apartment that are from HH-VSTS modules on which they were and were not trained. For example, participants who are assigned to the "electric, fire, and burn" module will serve as part of the control/comparison group for participants who are assigned to the slip/trip/lift module. These data will be used to test H1.
Participants will serve as their own control for testing H2 and H3.

Table 2. The three training groups, where "T" indicates training modules completed and "C" represents the comparative controls who will not complete that training module.

	Training Modules		
Participant Group	Electric, Fire, Burn	Slip, Trip, Lift	Environmental
1	T	C	C
2	C	T	C
3	C	C	T

Step 2 Participants. Twenty-four participants will be recruited for this pilot study. Participants will be 1) individuals without or have very little formal training in occupational safety focusing on the home setting, 2) ≥18 years old, and 3) able to read and write in English. Aim 1 and Aim 3-step 1 participants will not be eligible to participate in Aim 3-Step 2.

Step 2 Recruitment. Sources of potential participants will be identified in collaboration with our industry partner (Ohio Council for Home Care and Hospice), our existing contacts at local and regional home healthcare agencies as well as social media, and widely distributed informational flyers. The Ohio Council for Home Care and Hospice will assist with dissemination of recruitment materials. Our primary target will be new/novice home healthcare workers. We may also supplement our participant pool through recruitment of workers in related fields, via local hospitals (e.g., PCAs), long term care facilities (e.g., aides), and health sciences programs at OSU and local community colleges. Participants will receive a $100 incentive for using the enhanced HH-VSTS and performing the simulated home assessment.

Step 2 Measures. The primary outcome of interest is *hazard identification*. *Hazard identification* is the number of hazards identified in the simulated home, which will be analyzed descriptively as a hazard count and inferentially as the proportion of hazards found in the apartment. The secondary outcome is *hazard response. Hazard response* will be defined using a coding scheme that we developed previously.[71] The coding scheme includes three response categories: (1) Optimal, which is an effective response without negative impact to either the HHW or care recipient; (2) Mixed, defined as a response that can reduce the hazard, but can negatively impact either the HHW or the care recipient; and (3) Suboptimal, in which the hazard response is ineffective or inappropriate. Hazard responses also include conversation strategies used to communicate with families. We previously found that hazard response solutions were equally distributed across these three categories in a sample of professional home healthcare workers.[71] Demographic data will also be collected for Aim 3-Step 2 participants.

Step 2 Setting. A one-bedroom apartment, in the School of Health and Rehabilitation Sciences (Atwell Hall) on The Ohio State University campus, is available for the study. The apartment will be furnished as needed and the hazard design of the simulated home environment will include a systematic representation of 15 unique hazards (5 electric/fire/burn, 5 environmental, and 5 slip/trip/lift) addressed in the HH-VSTS. The 528 square foot apartment has 3 rooms: a bedroom, a bathroom, and a kitchen/living area. The hazards will be distributed throughout the apartment in an ecologically valid representation of an actual home.

Step 2 Procedures. After providing informed consent, participants will be sequentially assigned to one of three training groups. They will complete their assigned training module on a computer workstation in another room in Atwell, that is outside of the simulated apartment. Following completion of the enhanced HH-VSTS training module, the participant will perform a safety walk-through of the apartment. During the walk-through they will be asked to verbally: (a) *identify hazards* they encounter, and (b) describe their *hazard response strategy* for each identified hazard. A research team member blinded to the HH-VSTS training condition will remotely observe and document the hazards that are detected. The walk-through will be audio and video recorded. Both the participant and the research team member will be outfitted with a headset to allow for communication. Participants will be asked to point to and state "I see ____ (e.g., overloaded power strip)" whenever they think they recognize a hazard in the simulated home.

For each hazard identified, the research team member will prompt the participant to verbalize their response strategy to the hazard and the strategy they would use to discuss it with their client or client's family. The research team member will be trained not to provide any insights or answer questions about the hazards.

Video and audio responses will be captured using the INTERACT™ system for coding hazard identification and hazard response. The INTERACT™ system software is a behavioral coding system that allows for synchronized viewing, coding, and analysis of video and audio recordings. Each room will be monitored by video cameras and audio equipment and integrated with INTERACT™ for streamlined and efficient coding. Participating in the pilot study, including the completion of the assigned HH-VSTS module, the hazard assessment within the apartment, and a brief concluding conversation about their experience with the program and the walkthrough is estimated to require 1.5 – 2 hours.

Step 2 Data Management and Analysis. Quantitative data will be entered into REDCap. Data acquisition and processing of video and audio recordings will be performed using INTERACT™. Audio and video recordings will be analyzed to determine frequency of hazards correctly identified across hazard types, hazards missed across hazard types, and frequency of reported hazard response strategies. Hazard response strategies will be coded (Optimal, Mixed, Suboptimal) independently by two research team members who are blinded to the HH-VSTS training delivery method; differences in response strategy category will be resolved to 100% agreement. Coding schema will be integrated into INTERACT™ for coding and will be based on our hazard management best practices per our prior work.

For H1, descriptive statistics will be used to calculate the proportion of hazards identified in each of the training modules, comparing assigned to the unassigned comparison groups. For example, the proportion of hazards found in the environmental module will be compared between those who were assigned the environmental module and those who were not. Further, a between groups comparison of the proportion of hazards identified from the assigned training module compared to the proportion of hazards identified from the unassigned training modules will be conducted using the Wilcoxon rank sum test for each module condition.

For H2, a within-subjects comparison will be conducted to compare the proportion of hazards related to the assigned training module compared to the proportion of hazards found in the unassigned training modules. Assuming a non-parametric distribution, we will use a Wilcoxon signed-rank test to determine whether the number (percentage) of hazards identified related to the assigned training module differs from the number of hazards (percentage) identified from the unassigned training modules.

For H3, a within-subjects comparison will be used. Descriptive statistics (frequencies; proportions) will be used to compare the proportion of optimal hazard responses described for the assigned module as compared to the proportion of optimal hazard responses described for the unassigned training modules. Assuming a non-parametric distribution, we will use a Wilcoxon signed-rank test to determine whether the proportion of optimal responses described related to the assigned training module differs from the proportion of optimal responses described related to the unassigned training module.