Designing a Virtual Environment to Explore Infection Control in Nursing Homes
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The Problem
Older adults, aged 65+ are at risk of developing infection, with the highest rate occurring in institutionalized settings (Cristofaro, 2004).

Non-specific symptoms and signs serve to delay diagnosis and treatment by clinical staff, most often nurses and nursing assistants in nursing homes (Tingstrom et al., 2010).

Recently, an instrument meant to structure the assessment and interpretation of signs and symptoms of infection, the Early Detection of Infection Scale (EDIS), was developed in Sweden (Tingstrom et al., 2015).

Early Detection of Infection (EDIS)

Potential Advantages of a Virtual Environment
Virtual reality (VR) is a valid way to study human behavior in human factors research (see Vilar et al., 2015; Wilson et al., in press).

Lack of physical access to nursing homes during the pandemic can be ameliorated with VR so that social distance can be maintained.

International data collection could be facilitated with VR because there is no need for a physical presence in each country.

Building a Task with Case Studies (from Sweden)
Case 127. Martha (CONFIRMED INFECTION)
Martha is 80 years old. She has dementia and has been treated for breast cancer. She is on no medication. She has some decline in cognitive function (MMT 21/30). She is dependent on help with all the functions to cope with daily life (ADL 8). She is assessed with some general pain (DOL0PLUS 6) and is at risk of malnutrition. Her baseline morning temperature (morning) is 36.2°C in the ear and 36.3°C rectally.

Excerpts from the nursing home and patient records
NA = Nursing assistants, RN = Registered nurse
GP= General practitioner
DAY 1 NA
Visible in the eyes that she is not feeling well, anxiety, strength, general signs of illness, symptoms from the respiratory tract, symptoms from the urinary tract.
DAY 1 RN
DAY 2 RN
Feels good in the morning. Feels swelling in the throat at 10.30 Is not affected circulatory. Is a little red on the cheeks, nice color by the way. Rests a lot today. Doctor contact: suspects a swelling of the thyroid gland. Prescribes thyroid tests, blood status and CRP. Feels better in the afternoon. Sitting up in the armchair and drinking coffee.
DAY 3 RN
Quiet last night, slept well. Blood samples are taken. Feels as usual today, does not complain about the throat. Is tired and has rested all day. No respiratory effects or difficulty swallowing. Have eaten well today. Blood samples show Analysis of blood tests: White blood cells 13.4, CRP <10, urine culture contaminated.

Empirical Questions
An international collaboration between NCSU (US) and the University of Surrey (UK) along with other academic organizations based in Australia, Spain, South Africa, and Sweden began collecting survey data from nursing home clinic staff to validate EDIS as an international tool.

What similarities and differences exist between the different nationalities in terms of diagnosis and clinical outcomes?

Can the paper-based EDIS tool be further developed into a technology-based decision support tool for nursing home care workers?

What are the training needs for these care workers?

Small U.S. Sample (N=32) Surveyed
The sample was collected pre-Covid in 2019 from care facilities in NC.

Thirty-two nursing home care workers (30 were female, Mean age=36.8 years) were surveyed about infection control.

Respondents varied by job title such that 12 were licensed practical nurses, 7 were registered nurses, and 4 were nursing assistants with the remainder identifying as physical therapists, therapist assistants, and directors of nursing.

16 of 32 (50%) requested better training on how to assess infections.

9 of 32 (28%) were not aware of any decision support tool that can be used to detect infection but 17 of 32 (53%) think such a tool would be useful or very useful!

References

Designing the VR (Zach Pugh)—A Work in Progress

Next Steps
• Continue survey data collection post-Covid so that a multi-national comparison of data can reveal similarities and differences in infection control.
• Continuing development of the VR environment as further validation of the EDIS tool and as a mechanism to provide international training to nursing home care givers.