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Evaluating FREDeX (Falls Reduction and Empathy Development eXperience) – a novel simulation training program for healthcare workers

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Abstract

Background: *Care after falls constitutes a substantial cost to the Australian health system. The Falls Reduction and Empathy Development Experience (FREDeX), a hybrid simulation training program, was designed in rural NSW. This paper initiates a multi-pronged evaluation of FREDeX.*

Methodology: *Pre- and post-training survey data was collected from voluntary FREDeX trainees. Surveys included validated empathy, compassion, and person-centred-care assessment tools, as well as questions about workshop quality and open-ended response questions.*

Findings: *There was significant improvement in trainees' empathy, compassion, and person-centred care scores. Trainees expressed positivity about FREDeX, noting facilitators and challenges of the program, and implications for professional practice. FREDeX enhanced empathy, aiding better patient understanding, communication, and personalised care.*

Implications: *Significant evidence has emerged demonstrating the efficacy of virtual reality and other simulation training for empathy and compassion in clinical contexts. FREDeX enhances soft skills through a hybrid simulation training approach, proving to be engaging and educational. It is valuable for the delivery of person-centred care, and a compelling program based on effectiveness and ease of implementation.*

Originality and value: *FREDeX has demonstrated implications for improving empathy and compassion in rural and urban healthcare professionals and*

enables more person-centred care. The positive outcomes from FREDeX suggest broader adoption of hybrid simulation training may enhance soft skills and healthcare quality, emphasising the potential of technology-driven learning for health workforce capacity.

Limitations: *While this evaluation demonstrates the value of FREDeX, further evaluation will seek to bridge the gap between demonstrated improvements in assessed metrics of care ability and direct improvements to patient care, by assessing fall rates, harm assessments, and clinical notes for participating facilities. This will endeavour to determine changes in fall prevalence and improvement in management and care for falls.*

Keywords: *falls management, empathy, simulation training, virtual reality, good health, wellbeing*

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INTRODUCTION

Falls lead to approximately 27,000 hospitalisations and 400 deaths in NSW each year, costing the Australian health system more than all other single causes of injury, including road trauma (Australian Commission on Safety and Quality in Health Care [ACSQHC] 2019; Clinical Excellence Commission [CEC] 2020). Training about the sensory and functional loss experienced by people as they age, or about cognitive function and sensorial disturbances due to dementia and cognitive impairment is necessary to ensure appropriate fall management and care (Annear & Lucas 2018; Alzheimer's Australia NSW 2014; Davis & Bartlett 2008). Optimal care after a fall extends beyond clinical acumen and mechanical proficiency, it includes soft skills, like bedside manner and patient rapport. A considerate, personalised, compassionate, and empathetic approach to care improves therapeutic outcomes through the improved efficiency of communication (Moudatsou et al. 2020) and curtails clinician burnout (Wilkinson et al. 2017). Empathy, compassion and person-centred care are key characteristics of optimal care and are integral in education (Giddens et al. 2022; Indritz & Hadsall 1999).

Empathy is the ability to understand the experience of the patient, intellectually identify with their emotions, and integrate this into professional practice through improved communication with patients and colleagues (Wilkinson et al. 2017). Compassion is the awareness and willingness to relieve the suffering of others (Chochinov 2007; Sinclair et al. 2016). Both empathy and compassion have been shown to influence carer responses to patient needs, leading to better therapeutic relationships and outcomes, and are a growing focus for healthcare within a person-centred approach (ACSQHC 2011; Dewar & Nolan 2013; O'Driscoll et al. 2018; Sinclair et al. 2016).

Efficient and effective training programs are important for bolstering these skills in healthcare workers (HCWs). Implementation of these values has demonstrable benefits to patients, their families and their carers (ACSQHC 2011). Approaches to improving these skills in practitioners through novel technology-supported training programs have increasingly been explored and implemented with success. Significant evidence has emerged demonstrating the efficacy of virtual reality (VR) and other simulation training for empathy and compassion in clinical contexts (Amini et al. 2021; Bennett et al. 2016; Brydon et al. 2021; Dean et al. 2020; Deladisma et al. 2007; Gillespie et al. 2021; Kilteni et al. 2012; Menzies et al. 2016; Mirelman et al. 2016; Tong et al. 2020; Zackoff et al. 2020).

SETTING

The Falls Reduction and Empathy Development eXperience (FREDeX) training protocol was developed by the Western NSW Local Health District (WNSWLHD), with academic partners, in response to an identified need for better knowledge and understanding of falls prevention, management and care by health professionals. WNSWLHD is geographically the largest LHD in NSW (246,676 km2) serving 276,000 people, 11.1% of whom identify as Aboriginal. This is a vulnerable population with low socio-economic status and risk factors for poorer health (WNSWLHD 2022). In 2020, 38 serious falls occurred in WNSWLHD facilities, 97% of these falls were sustained by people living with physical impairment, 46% of falls patients had a cognitive impairment at the time of the fall, and over 10% of those had a possible delirium (Johnson 2020; WNSWLHD 2020).

FREDeX is an evidence-based simulation training program with a multidisciplinary approach that integrates academic, clinical, and VR simulation fields to deliver an impactful training experience for nurses in residential aged care (RAC), hospital and multi-purpose service (MPS), and community care contexts. Trainees participate in a hybrid simulation, involving VR visual and physical impairments, affecting one's ability to perform activities of daily living (ADLs), followed by real-world navigation of similar ADLs while restrained by an empathy suit (Bennett et al. 2016).

OBJECTIVE

A multi-pronged project will evaluate the impact of FREDeX on clinical practice and falls care in WNSWLHD and the implications for transferability to other LHDs. This paper reports the findings of the first part, an exploratory descriptive analysis of the pre- and post-training surveys, hypothesising a change in trainee empathy, compassion, and care. The pre- and post- training surveys were designed to evaluate the impact of FREDeX on HCW empathy, compassion and person-centred care and integrated three validated assessment tools: the Kiersma-Chen Empathy Scale (KCES) (Kiersma et al. 2013), which measures changes in empathy levels among healthcare workers, providing insight into their ability to understand and share patients' feelings; the Compassion Competence Scale (CCS) (Lee & Seomun 2016), which assesses healthcare professionals' capacity to recognize, understand, and address the care needs of others, which is crucial in falls care;. and the Person-centred Care Assessment Tool (P-CAT) (Edvardsson et al. 2010), which evaluates the extent to which provided care is tailored to individual needs and preferences, ensuring a holistic approach to falls prevention and management.

METHOD

DESIGN AND SURVEYS

This study used pre- and post-training survey data collected from a voluntary sample of WNSWLHD FREDeX trainees from across the LHD during delivery in June 2021–March 2022. All trainees who had completed FREDeX were eligible to take part in the evaluation. The FREDeX surveys use the KCES (Kiersma et al. 2013), CCS (Lee & Seomun 2016), and P-CAT (Edvardsson et al. 2010), capturing pre-training and post-training time series data. The post-training survey included additional workshop quality and open-response items.

The KCES was employed in its full and original form. Minor modifications were made to the CCS and P-CAT to contextualise the tools for the WNSWLHD setting by merging some items. Responses were standardised between tools using a 7-point Likert scale.

All surveys were completed during the training session and managed electronically through an LHD-approved survey system, QARS (Quality Audit Reporting System). Responses were anonymous and linked through a unique nine-digit identifier generated by participants (first three letters of your residential street, the last three letters of your surname, and the last three numbers of your mobile number, e.g., Jane Smith, Pitt Street, 0412345678=PITITH678). Incomplete, non-linkable, or otherwise illegible surveys were excluded from the analysis. Data were collected and reported

in accordance with Australia Institute of Health and Welfare guidelines (AIHW 2021) to protect communities and individuals.

ANALYSES

Data were exported from QARS and cleaned and analysed using Microsoft Excel.

Gross changes in quantitative assessment tool outcomes were analysed for directionality and statistical significance with paired t-tests; significance was $p \leq 0.05$. Differences in outcome between demographic variables, including gender, age, facility type and sector were analysed through unequal variance t-tests or Welch's ANOVA to account for variability in group sample sizes and heteroscedasticity.

For note, there was a revision to the KCES after FREDeX was implemented – the KCES-R (Aronson et al. 2022). This revision replaces the reverse-coded items due to their impact on participant response and scoring accuracy. As such, the decision was made, with advisement from Dr. Chen, co-developer of the KCES-R, to remove the four reverse-coded items from this analysis.

Trainee responses regarding workshop quality were assessed using proportional analysis and reported as a percentage of trainees' agreeableness to each item (Appendix A).

Coding of open-response items (Appendix B) was informed by Saldaña's methods (Saldaña 2009) and the frequency of higher-order codes was determined to identify themes. Trustworthiness of the analysis was ensured through investigator triangulation – AA led the initial analysis and findings were reviewed and finalised with LW and ES. Because survey responses were anonymous, the authors were not able to attribute any quotes to specific individuals.

This project was approved by the Greater Western Human Research Ethics Committee, 2021/ETH01341.

RESULTS

The FREDeX surveys were returned by 174 of 213 trainees (82%). Of these returned surveys, 32 were removed due to unlinkable identification codes, leaving 142 linked surveys. A variable number of incomplete responses were noted between the different survey domains. Upon removing these, a total of 130 responses were usable for the KCES, 122 for the CCS, and 116 for the P-CAT (Table 1).

Table 1: Pre-post score averages for all three assessment tools and their subscales used in the FREDeX training survey

Scales	N	Pre-training Mean Score (SD)	Post-training Mean Score (SD)	Mean Difference (+-95%CI) [Δ%]	p Value
KCES Total	130	66.22(8.38)	69.96(6.23)	3.43(1.12)[4.9]	<0.001***
Subscale					
KCES-C	130	41.58(5.46)	44.37(4.09)	2.56(0.73)	<0.001***
KCES-A	130	24.64(3.20)	25.59(2.31)	0.87(0.44)	<0.001***
CCS Total	122	112.05(13.59)	115.52(9.97)	2.92(2.11)[5.77]	<0.01**
Subscale					
CCS-C	122	49.88(6.02)	51.48(4.41)	1.37(0.96)	<0.01**
CCS-S	122	37.57(4.78)	38.55(3.41)	0.84(0.72)	<0.05*
CCS-I	122	24.60(3.34)	25.5(2.56)	0.77(0.54)	<0.01**
P-CAT Total	116	56.41(7.18)	59.76(8.62)	2.73(1.38)[4.57]	<0.001***

KCES: Kiersma-Chen empathy scale. KCES-C: cognitive domain. KCES-A: affective domain. CCS: compassion competence scale. CCS-C: communication domain. CCS-S: sensitivity domain. CCS-I: insight domain. P-CAT: person-centred care assessment tool. SD: standard deviation.

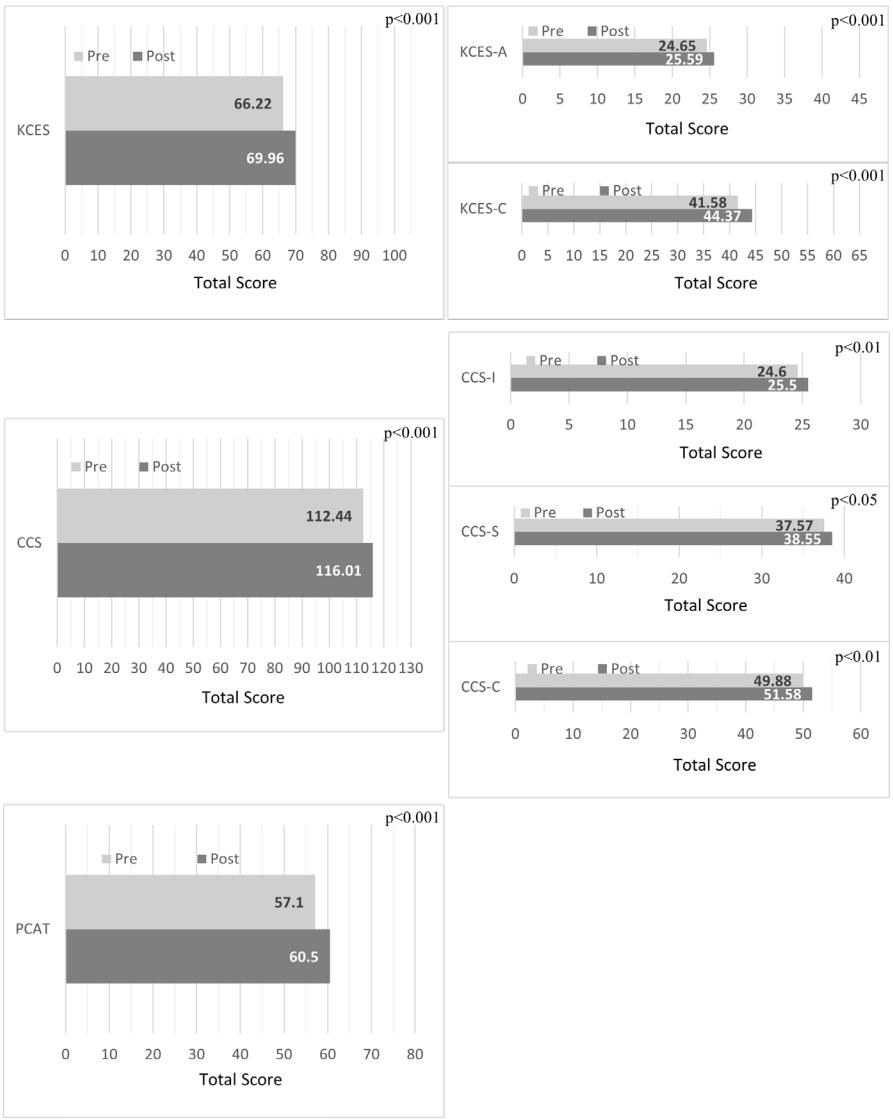
Six trainees were from community care settings, 95 from hospitals and MPSs and 41 from RACs across the WNSWLHD. Of these respondents, 120 were females, 20 were males and two did not identify.

SUM SCORE ANALYSES OF ASSESSMENT TOOLS

Paired t-test analysis of each assessment tool demonstrated a statistically significant positive shift in sum scores for all three scales, the KCES (3.43 ± 1.12, $p<0.001$), CCS (2.92 ± 2.11, $p<0.01$), and P-CAT (2.73 ± 1.38, $p<0.001$) (Figure 1/Table 1). A statistically significant improvement was also seen in

both subscale domains of the KCES (affective domain: 2.56 ± 0.73, p<0.001; cognitive domain: 0.87 ± 0.44, p<0.001), and in all subscale domains of the CCS (insight: 1.37 ± 0.96, p<0.01; sensitivity: 0.84 ± 0.72, p<0.05; communication: 0.77 ± 0.54, p<0.01) (Figure 1). Average KCES scores improved by 4.9%, CCS by 5.77%, and P-CAT by 4.57%.

Figure 1: FREDeX assessment tool pre- and post-survey scores and significance testing



Left: Pre- and post-training average total scores in the KCES, CCS, and P-CAT respectively.
Right: Pre- and post-training average total scores in the KCES affective and cognitive domains, and the CCS insight, sensitivity, and communication domains respectively.
KCES: Kiersma-Chen empathy scale, CCS: compassion competence scale, P-CAT: person-centred care assessment tool; pre-training scores are the lighter bar in each graph

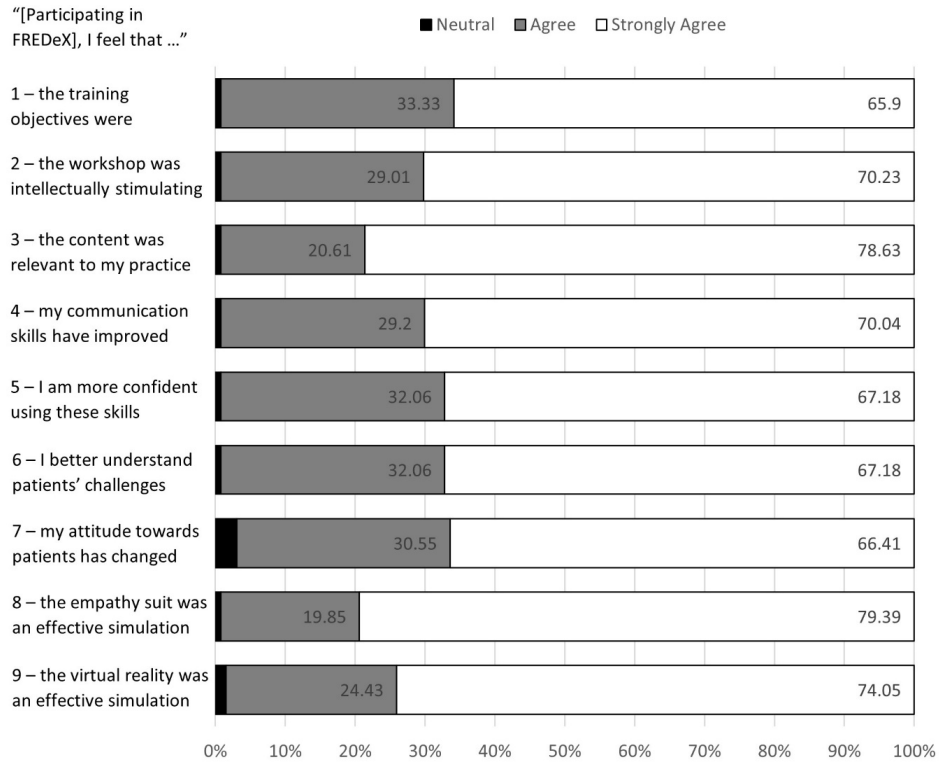
DEMOGRAPHIC ANALYSES

Independent unequal variance t-test analyses by gender, and ANOVA age bracket analyses demonstrated that any differences in pre- to post-training mean sum scores between groups for the KCES, CCS, and P-CAT were not statistically significant. Analysis of variance by facility type also demonstrated that no differences in pre- to post-training mean sum scores were statistically significant. A one-way Welch's ANOVA evaluating the effect of facility type on pre-training scores revealed a statistically significant difference between at least two groups in both the CCS ($F(2,14.26)=5.4$, $p<0.05$) and P-CAT ($F(2,18.52)=4.07$, $p<0.05$). These outcomes suggest consistency in the efficacy of the training between facility types; however, the explanatory power of this finding is limited by heteroscedasticity, non-normality and a limited sample size in the community group.

WORKSHOP QUALITY SURVEY ITEMS

There were 131 post-training surveys with complete responses regarding workshop quality. Overall, trainees were positive about FREDeX and all responses about workshop quality ranged between 'Neutral' and 'Strongly Agree' (Figure 2). Trainee responses to close-ended evaluation questions indicate strong agreeance that the objectives of the training were achieved, including increased insight into the patient experience and enhanced empathy, compassion, and person-centred care skills.

Figure 2: Proportion of FREDeX trainee responses to workshop quality survey questions



OPEN-RESPONSE SURVEY ITEMS

Open responses were categorised into three major themes: enabling factors, challenging factors of the training program, and implications for real-world professional practice (Figure 3).

Figure 3: Categorical analysis of the FREDeX open-response survey questions

Experiential outcomes of training	
Enabling	**Challenging**
Effective learning experience; Enjoyable learning experience; Effective training methodology; Comprehensively positive; Real-life experience;	Hard to operate (technology barriers); Technical and connectivity issues;
Physically engaging tools; Visually immersive tools; Effective learning tools (empathy suit and VR); Physical experience; Experiencing patients' vision;	Comfortability of suit (hot, heavy); Difficult to get on; Impairment in conducting ADLs; Restrictions to movement;
Comprehensively positive; Emotionally impactful (loss of independence, requiring assistance);	Disorienting experience; Overwhelming experience;
Outcomes for real-world professional practice	
Increased empathy; Taking more time; Improved everyday practice; Effective care; Better communication; Lifelong learning; Empowering people; Self-development.	

VR: virtual reality. ADL: activity of daily living

Enabling factors included the effectiveness of the simulation tools, such as the empathy suit and VR experiences, in simulating visual and physical impairments.

> The suit and virtual experience, this really put you in the shoes of someone with limitations and developed skills to understand the difficulties people face with day-to-day tasks.

For many trainees, the experience was comprehensively positive.

Challenging factors primarily included aspects of discomfort. Physical discomfort resulted from restrictions to movement and vision, because of the VR goggles and empathy suit, and emotional discomfort was associated with these restrictions. Some noted that technical issues in delivering the VR component had a negative effect.

> [FREDeX] allowed me to understand the difficulties of tremors when doing daily tasks, e.g., reading the menu and picking stuff up. I was able to understand the isolation and fear of the older lady living alone.

FREDeX also provided useful challenges that informed the trainees' professional development. When reflecting on integrating this learning into practice, trainees expressed how FREDeX increased empathy, prompted self-development and provided lifelong impactful learning that would improve their everyday practice as they would take more time, become better communicators and empower their patients. Trainees felt better equipped to communicate with their patients about their needs:

> [In my professional practice I will] listen to patients more, if they say they can't do something then they can't and [there] may be a reason why.

Overall, trainees enjoyed FREDeX and felt the simulation tools were engaging and effective. Some suggested that an enhancement to the training would be the inclusion of group debriefing sessions to discuss strategies for care.

DISCUSSION

FREDeX can bolster trainee empathy and compassion, as has been previously explored using other simulation training models, both VR (Amini et al. 2021; Gillespie et al. 2021; Tong et al. 2020) and non-VR (Bennett et al. 2016; Deladisma et al. 2007). Statistically significant improvement was found in KCES and CCS scores after training, indicating improved empathetic perspectives and compassion competence. FREDeX enabled greater sensitivity and insight into a patient's lived experience. This is related to the provision of person-centred care which requires the ability to appreciate the patient's circumstances through empathetic and compassionate lenses. Importantly, person-centred care also translates empathy and compassion into intention for behavioural change both for the individual and the care team (ACSQHC 2011). Positive outcomes in the P-CAT scores highlight the potential success of FREDeX in eliciting this translation

in trainees. Trainees also expressed clear intention to apply this in their work; '… I will be able to be more patient and empathetic towards my patients'.

Improvements in the empathy domains with FREDeX are somewhat unique. Improvement in cognitive empathy was greater than that in the affective domain. This is inconsistent with some VR empathy training research that identified greater improvement in the affective domain (Brydon et al. 2021). However, the assertion that VR empathy training primarily bolsters affective empathy has not held in other research (Barbot & Kaufman 2020), suggesting an evolving and immature understanding of this dynamic. The difference seen here may be influenced by the landmark multi-modal design of FREDeX training, which integrates the unique insight availed through embodied VR scenarios with the real-world empathy-suit experience. This hybrid approach provided trainees opportunity for both self-development and team-based reflective discussion. The communication domain scores for compassion improved most notably, demonstrating the unique value provided by the hybrid training model and reflective discussions.

The assessment tool outcomes correlate with the workshop quality results and the themes identified from the trainee open responses. FREDeX was well received by trainees; many expressed a desire for more frequent opportunities for simulation training and expansion of simulation training to other clinical contexts: 'get as many people involved as possible in all areas …'. FREDeX itself has been tailored for delivery to rural HCWs; however, given the flexibility of VR as a training modality and the generalisability of the empathy suit in simulating physical and visual restrictions potentially caused by a broad range of pathologies, the hybrid training model employed by FREDeX may provide value in other contexts and fields.

LIMITATIONS

A total sample of 174 trainees took part in the evaluation, but only 142 returned usable data with linkable identifier codes. Additionally, a variable number of trainees did not complete the survey in full, resulting in additional loss of sample size upon analysis of results for each assessment tool or demographic variable. These losses amounted to a decrease in sample size of up to 34% in some analyses. Although this was the entire eligible population, this degree of loss introduces a possible impact on the statistical robustness and explanatory power of this study.

The disparity in sample size between genders limits meaningful inference; however, a lack of statistically significant difference in a positive shift elicited by FREDeX training may indicate that gender is not a major barrier to engagement with, and efficacy of, training. In light of the established disparity in gender representation within nursing, allied health, and similar carer roles, the sampled responses are likely reflective of gender ratios within the industry (AIHW 2022). While this makes comparison of metrics difficult, it does not call into question the efficacy of FREDeX training on HCWs. The disparity in sample size between facility types, particularly the lack of trainees from community care settings, was prohibitive to meaningful inference, and future work would benefit from greater inclusion of community carers in FREDeX training.

The timing and initial effect seen in the assessment of the pre- and post-training surveys may not be sustained over time. This is the first phase of the FREDeX evaluation. The design of this evaluation includes a 6–12-month

follow-up with trainees to assess the sustained impact of the FREDeX training. The findings of this later phase will be reported separately.

FUTURE WORK

The goal of FREDeX is better care for patients. While this evaluation suggests the value of FREDeX for HCWs, further evaluation will seek to bridge the gap between demonstrated improvements in assessed metrics of care ability and direct improvements to patient care by assessing fall rates, harm assessments, and clinical notes for participating facilities. This will seek to determine changes in the prevalence of falls and improvement in management and care for falls. Although the FREDeX training program was implemented across WNSWLHD and different facility types, continued evaluation post-translation to other LHDs could identify trends in response and effectiveness related to setting and facility type.

The rural health workforce consists of a high proportion of overseas-trained workers of culturally and linguistically diverse backgrounds. In rural and remote areas, 41% of HCWs comprises overseas-trained professionals (AIHW 2018). FREDeX training will now be included in the routine orientation program for international registered nurses (RNs) across the WNSWLHD starting in 2024. Rural patient demographics are also diverse. This diversity influences perspectives on communication, empathy, compassion and person-centred care. Future work should aim to scale implementation with greater breadth of data collection including demographic information such as trainee ethnicity, primary language, and/or religion to elucidate interactions with delivery of care and efficacy of FREDeX training. Additionally, the assessment tools were selected for their psychometric validity and reliability; however, they have not been developed or assessed for transferability and generalisability across culturally diverse contexts. Future implementation of training and evaluation should consider these restrictions and seek to utilise assessment tools that are culturally inclusive.

CONCLUSION

FREDeX has the potential to bolster trainees' soft skills and has additional unique value through its hybrid multi-modal approach. Trainee responses demonstrated an improvement in empathetic care and compassion competence, underlying better understanding and a greater intention to deliver quality person-centred care. FREDeX was well received by trainees, who found it exciting, engaging and educational. In exploring best practice for the training of soft skills for health care workers to bolster delivery of person-centred care, the demonstrated value of FREDeX, considered alongside its cost-effectiveness and ease of implementation, makes it a compelling training program.

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Declaration

The authors declare no conflict of interest. There is nothing to declare in relation to the use of this data for other studies. Other studies related to the evaluation of FREDeX use distinctly discrete data.

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APPENDICES

Appendix A: FREDeX Post-Training Close-Ended Survey Questions.

Survey Item Number	Questions
	I feel that the training objectives were achieved:
Q2.1	Experience and understand the nature of aging and impairment.
Q2.2	Understand social marginalisation and isolation that can be experienced by persons with physical and cognitive impairments.
Q2.3	Identify coping strategies used by people with physical and cognitive impairments in their daily lives.
Q2.4	Distinguish between limitations for cognitive and physical impairment.
Q2.5	Understand the carers' role in supporting people with cognitive and physical impairment.
Q2.6	Enhance skills to care for people with cognitive and physical impairment in a clinical setting.
Q2.7	I feel the workshop was intellectually stimulating.
Q2.8	I feel the content of the workshop was relevant to my day-to-day practice.
	I feel I improved the following skills as a result of the workshop:
Q2.9	Communication.
Q2.10	Reflection.
Q2.11	Listening.
Q2.12	Patience.
	I feel confident to use these skills:
Q2.13	Communication.
Q2.14	Reflection.
Q2.15	Listening.
Q2.16	Patience.
	I feel I better understand the following as a result of the workshop:
Q2.17	The challenges of physical and cognitive impairment.
Q2.18	The coping strategies used by people with physical and cognitive impairment.
Q2.19	The carer role.
Q2.20	I feel my attitude has changed as a result of the workshop.

Survey Item Number	Questions
	About the facilitator:
Q2.21	They ran the workshop well.
Q2.22	They provided effective assistance throughout the workshop.
Q2.23	They were responsive to my needs during the workshop.
Q2.24	The Empathy Suit helped me to effectively simulate limitations of physical and cognitive impairment.
Q2.25	The Empathy Suit helped my learning about falls prevention and care management.
Q2.26	The Virtual Reality goggles helped me to effectively simulate limitations of physical and cognitive impairment.
Q2.27	The Virtual Reality goggles helped my learning about falls prevention and care management.

Appendix B: OPEN-RESPONSE ITEMS IN THE FREDEX PRE- AND POST- TRAINING SURVEYS

Survey Item Number	Questions
Q3	Please explain how you might integrate your learning from the workshop into your professional practice?
Q4	What was good about the workshop?
Q5	What about the workshop could we do better?
Q6	What about the Empathy Suit was most helpful?
Q7	What about the Empathy Suit was challenging?
Q8	What about the Virtual Reality goggles was most helpful?
Q9	What about the Virtual Reality goggles was challenging?