

Using the Consolidated Framework for Implementation Research (CFIR) to foster the adoption of a new dementia education game during the COVID-19 pandemic

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Abstract

Background and Objectives: The pandemic of coronavirus disease 2019 (COVID-19) challenged educators to move staff education online and explore innovative ways to motivate learning to support dementia care for patients in geriatric settings. This article presents how the Consolidated Framework for Implementation Research (CFIR) was used to support the adoption of an online dementia education game in Canadian hospitals and long-term care homes (LTC). The dementia education was co-developed with local staff and patient partners to teach practical person-centered care communication techniques.

Research Design and Methods: CFIR guided our strategy development for overcoming barriers to implementation. Research meetings were conducted with practice leaders, frontline healthcare workers, and a patient partner. Our analysis examined four interactive domains: intervention, inner context, outer settings, and individuals involved and implementation process.

Results: Our analysis identified five effective strategies: Easy access, Give extrinsic and intrinsic rewards, Apply implementation science theory, Multiple tools, and Engagement of champion. The CFIR provided a systematic process, a comprehensive understanding of barriers, and possible enabling strategies to implement gamified dementia education. Interdisciplinary staff ($n=3,025$) in ten hospitals and ten LTC played online games. The evaluation showed positive outcomes in knowledge improvement in person-centered dementia care.

Discussion and Implications: Gamified education in dementia care offers a social experience and a component of fun to promote adoption. In addition, CFIR is useful for engaging stakeholders to conduct project planning and team reflection for implementation. The real-time discussion and adjustment helped overcome challenges and timely meet the needs of multiple organizations.

Keywords: Nursing, Healthcare, Training, e-health, Technology, Implementation science, Gamification

Introduction

The substantial increase in demand for healthcare personnel during the COVID-19 outbreaks necessitated hiring new staff or redeploying existing staff to support patient care (White et al., 2021). Simultaneously, many hospitals and healthcare institutions were forced to switch staff training mode from in-person to online, which posed a challenge for educators to provide the needed training to ensure patient safety and quality of care. The lack of adequate education in dementia care puts high pressure on the healthcare educators in hospitals and Long-term care homes (LTC), to address the special needs of increasing population of older adults with dementia (Seifert et al., 2020). Healthcare workers in hospitals and LTC need to provide care for people living with dementia every day. Caring for people with dementia requires complex knowledge and skills in person-centered ways. Lack of knowledge in person-centered care can lead to the use of physical restraints and antipsychotic medications, which should be avoided in the care settings to minimize the risk of further harm such as falls, functional declines, and mortality (Abraham et al., 2019). Furthermore, infection-control strategies can be barriers to providing appropriate care for patients with dementia. Visitor restrictions, lack of understanding of infection control measures, the use of personal protective equipment, and physical distancing can be barriers to communication and cause frustration, resistiveness to care, or physical and verbal behaviors in patients with dementia (Hung, 2020). Healthcare workers struggle to manage responsive behaviors, which risk injuries (physical and emotional) for patients and staff. Responsive behavior refers to physical and verbal behaviors in response to a person's unmet needs (Dupuis et al., 2012; Hung et al., 2019). With the objective of training healthcare staff to address some of these challenges, we developed and implemented an online game-based dementia education at ten Canadian hospitals and ten LTC homes to teach practical person-centered care communication techniques.

Gamification in education

Traditional online learning modules can be uninteresting and tedious (O'Connell et al., 2020). Passive reading in e-learning does not allow for active participation or encourage critical thinking to try things out in a safe learning environment. As a result, it is difficult to retain knowledge for practice change.

Gamification, which refers to applying game thinking to non-game contexts (Brull & Finlayson, 2016), is increasingly used in the educational setting to enhance the learning experience. Educational games aim to change attitude, motivation, and behaviors to increase learning and engagement (Landers et al., 2018; Karagiorgas & Niemann, 2017). Kapp (2012) defined a game as "a system in which players engage in an abstract challenge, defined by rules, interactivity, and feedback, that results in outcomes often eliciting an emotional reaction" (p. 23). Application of game dynamics, simulations of relatable scenarios, and digital avatars representing learners can lead to better participant engagement during e-learning. In addition, educational games can provide a social experience (Waytz & Gray, 2018), motivate learning new knowledge (Toh & Kirschner, 2020), develop creativity (Vartanian & Beatty, 2015), and reduce feelings of isolation (Nieto-Escamez & Roldán-Tapia, 2021).

Consequently, educators have been increasingly employing gamification to encourage active learning in the classroom (Márquez-Hernández et al., 2019; Reed, 2020). For instance, Reed (2020) found games to be an effective tool to help learners experience and understand complex theories (e.g., person-centered care in our case) and learn problem-solving skills in a risk-free environment; most students reported a positive attitude toward online games for nursing education. During the COVID-19 pandemic, game-based education has been used to motivate students to participate in online education (Rincon-Flores, 2021). For example, pharmacy undergraduate students (n=44) played a game to learn about chemistry (intermolecular forces) remotely (Da Silva Júnior et al., 2021). The students reported that the game created a pleasant learning environment, and they preferred it compared to traditional classes. Similarly, O'Connell et al. (2020) presented a game related to obstetrics and gynecology to medical students, which involves several rounds of rapid-fire questions and clinical cases, and tested the participant's knowledge of ultrasound imaging using a Kahoot game. The medical student participants found the game activities educational, entertaining, engaging, and preferable, compared to the traditional lecture format. Further, a recent review of studies about using gamification in teaching during the pandemic lockdown found superior learning outcomes in studies

using gamification compared with traditional teaching strategies (Nieto-Escamez & Roldán-Tapia, 2021).

Although there is extensive literature on the use of gamification in education, it primarily describes the game mechanisms and their potential for students in academic institutions (Dicheva et al., 2015). The implementation science literature for gamified education in frontline clinical practice is lacking and needed to inspire, motivate, and improve practice development.

This novel study addresses two important gaps in dementia research: (a) innovation in dementia education by applying gamification in design, (b) implementation at scale for impact. The scale-up gap warrants attention in fast-paced healthcare organizations as education programs need to be scalable to reach a large number of staff across units and hospitals. This work contributes to advancing the field of knowledge in dementia training by offering useful insights about how an online staff training intervention can motivate and engage hospital staff across disciplines to participate in learning. Our lessons learned add to the much needed field of knowledge translation by providing practical strategies to support frontline healthcare workers to learn complex theoretical knowledge of person-centered care in practice.

Research questions

1. To what extent, will an online game-based dementia education help healthcare workers learn person-centered care approaches?
2. What strategies helped overcome the barriers to online game-based dementia education uptake among healthcare workers?

Intervention Development

The e-learning game was co-designed with 70 interdisciplinary clinicians (nurses, unit clerks, care workers, occupational therapists, physiotherapists, physicians, and a student in the game design program of a local college) in three units of a large urban hospital. Six co-designed workshops were conducted in two acute medicine units and one mental health unit to identify user needs and

preferences. The Information and Technology (IT) team in the hospital provided support in producing the game-based education. Three iterations of user testing were performed to ensure the content was relevant and well accepted. For example, the initial staff opinions about automatic feedback in the games were incorporated into the second version of the game, resulting in more suitable graphics and improved navigation for players. Then, staff were again invited to test the second version and comment on whether there were further improvements that could be made, which were incorporated into the final version of the e-learning games.

Methods

Study Design

This study used a qualitative research design and was reported using the consolidated criteria for reporting qualitative research (COREQ).

Research team and intervention

The game's development was led by a nurse (the first author) and a patient partner, a person living with dementia (the co-author). The members of the research team included men and women with experience in qualitative research methods. The first author is a Ph.D trained academic researcher. The second author is a patient partner. The patient partner offered his expertise in developing the education content based on his experience of living with dementia. He participated in regular research meetings, co-design workshops, data analysis, and paper content decision-making and edits. The third author is physician and graduate student, who specializes in senior care. The research team works with the implementation team, which includes clinical nurses specialists, educators, and operation leaders in the study sites.

The dementia education game was designed to teach person-centered care approaches for dementia care in practical ways. Since the online platform offers easy access to learners during the COVID-19 pandemic, the game was made accessible on mobile phones, tablets, and computers. The dementia education game accessible on multiple internet-enabled devices allowed for widespread

participation and social experience among healthcare workers. Moreover, learners get to see the consequences of their actions in a safe virtual environment. We included game mechanics: challenges, rewards, competition, and leaderboards in the game design to stimulate staff engagement to play and learn (Brull & Finlayson, 2016). The game's content was based on clinical scenarios offered by frontline healthcare workers (nurses, unit clerks, care workers, occupational therapists, physiotherapists, and physicians). We used positive reinforcements, fun animation, and visual cues in the game to replace verbosity and text. We utilized story narratives from the staff's real-life clinical experience to make the learning relatable. Catchy phrases were used to convey the key messages in the games. Leaderboards are visual indications of learners' ranks with respect to one another. After the game, staff participants were asked to complete a 10-item knowledge test and a 3-item learner experience survey (see Figure 1).

We used a 10-lettered mnemonic ("ART & SCIENCE") of person-centered care to make it easier for learners to remember the ten practical communication techniques associated with each letter. For example, in the first word ART: A stands for Acknowledge emotion; R refers to Relax the pace; T is a reminder to Take note of personal history, get to know the person. See Figure 2 for the video link to the ten practical communication techniques – the whole 10-lettered mnemonic, The "ART & SCIENCE" of person-centered care. In the game, we provide challenges, positive reinforcement, scores for recognition of achievement, and opportunities for competition between players.

In the game, learners explore different challenges when caring for a patient with dementia and reinforce their knowledge of responding, de-escalating, and building trust. To play the game, participants first create their avatar, which allows the learner to customize their character (e.g., hairstyle and gender) (Figure 3). Learners can choose to remain anonymous. Then they proceed through three levels with increasing complexity and the range of response options which enables them to practice the approaches and address a complex situation to meet a patient's needs. In the first level, players are presented with patient scenarios and choose between three approaches: acknowledging the emotion, relaxing the pace, or taking note of history and habits to provide the patient with what they

need. In the second level, different patient scenarios require players to choose one of seven strategies for communication (i.e., Stop and try again, Calming down, Inquire meaning behind behaviors, Easy prompts, Non-verbal expression, Collaborate, Embrace the moment). For example, “Stop and try again, do not impose” is one of the strategies. In the final level, a more complex clinical scenario requires the player to proceed step-by-step through a clinical case encounter. Each level is timed, and participants receive points for choosing the appropriate responses. At the end of the activity, the participant’s highest score is tallied against the top scores in the leaderboard (ranking) to provide an element of healthy competition. We rewarded the participants with intrinsic (a satisfying experience of winning scores) and extrinsic (a tangible gift of a reusable water bottle) motivation for participation. The leaderboard and avatars promote fun in the game in which participants may choose an anonymous identity for competition with their colleagues.

Participants

The target audience for the intervention included interdisciplinary healthcare workers (e.g., nurses, care aides, physicians, and rehabilitation staff). Through convenience sampling, the first author asked clinical nurse specialists and educators in her provincial gerontological nursing network to invite healthcare workers in hospitals and LTC homes to participate in this study. The implementation took place in ten hospitals and ten LTC homes in British Columbia, Canada. Emails outlining the purpose (What is it), procedures (How to play), and the link to access the game (Where) were sent to participants. In addition, posters were used to invite all healthcare workers to play and learn about person-centered communication approaches for dementia care. See Table 1 for the characteristics of the sample.

The Consolidated Framework for Implementation Research (CFIR)

CFIR is a well-established implementation science determinant framework that seeks to provide predictive or interpretive explanations for influences on outcomes of implementation initiatives. The CFIR is based on the synthesis of 18 theories, models, and frameworks (Damschroder et al., 2009) and includes 39 constructs identified as influencing implementation, organized into domains of

intervention, inner setting, outer setting, individuals, and process. As indicated by the CFIR developers, not all constructs will be relevant to every project but rather are to be considered and selected for relevance (Damschroder et al., 2009). In our team meetings, we identified relevant constructs based on the grounded expertise of the implementation team members, which included local clinical nurse specialists and clinical educators. Considering the identified anticipated barriers, we co-developed an implementation plan. Then we adapted the strategies from the plan to rapid cycle improvements with quick adjustment involving a shared grass-root effort. In addition to the experiential knowledge, our strategies were also informed by evidence-based implementation strategies articulated in the complimentary materials of the CFIR, specifically the CFIR-ERIC Strategy Matching Tool (Weir et al., 2021). The ERIC compilation lists 73 discrete implementation strategies that can be used as building blocks to plan the implementation and potentially address anticipated barriers. We selected feasible strategies to overcome perceived barriers identified by the implementation team. The development of the strategies was not linear but involved an ongoing discussion with clinical nurse specialists, local champions, and educators in an iterative process of regular meetings.

Data generation

Guided by the CFIR, the first author facilitated regular monthly one-hour team meetings to monitor and discuss progress and problem-solve barriers to implementation. She audio-recorded all meetings and took field notes. Also, the nurse educators observed education sessions (when staff were invited to learn about the game at huddles) at each site and documented observation notes. Sufficient data were gathered to answer research questions after two years of meetings and observations. Our data also include the post-game survey results: knowledge test and learner experience. Our online survey aimed to elicit open comment about user experience in the participant's own words. The online survey allowed us to collect a greater number of responses in a set period compared to individual interview approaches, so while data may be less detailed, there is more of it overall to compensate. To be able to gather online survey response broadly across a wide population of healthcare workers in different healthcare organizations was particularly important in the context of COVID-19 pandemic. We did

not want to add burden to staff for interview booking. Consent was obtained in the survey; participants may choose to complete the survey or not after the game. We were not able to track if anyone refused to participate or dropped out.

Data analysis

Descriptive statistics were used to examine the demographic characteristics of participants and their rating responses to the survey. Thematic analysis (Braun & Clarke, 2006) was used to analyze user comments, meeting notes and nurse educators' observations and field notes. The first author led the analysis, and the procedures were completed in three steps. First, she read and re-read the data in the transcriptions to familiarize herself with the content. Second, she manually searched for the codes and patterns across the data and identified initial themes. Both inductive and deductive approaches were used. While the data set was coded inductively, CFIR constructs informed deductive coding. For example, "Easy access" was an inductive code used to capture a common response in the team. "Engagement of champion" was a sensitized concept, a deductive code, informed by the CFIR constructs. This process involved going back and forth between the data and the literature. The third step involved discussing and analyzing the identified themes with the implementation team and the patient partner during research meetings to achieve analytic consensus. Our team analysis focused on reviewing, validating, and refining the final themes.

Rigor

The demonstration of quality regarding the research process is essential to ensure we present a trustworthy representation of participants' experiences. Researchers may be biased towards what they wanted to see or value (Morse, 1989). We recognize that we use our lens (informed by our own background) to make sense of data. Thus, we used a reflexive approach to enhance the trustworthiness of the study. A key to achieving rigor is reflexivity, with researchers continually engaged in reviewing the assumptions, practice, power relations, and potential influences of socio-political contexts (Braun & Clarke, 2019). Our regular team reflection allowed us to articulate and reflect on our intentions, critically discussing and comparing our assumptions. We paid careful attention to examine how our values and beliefs might inform and shape our decision-making and approaches. For example, we

built rapport with champions and asked them to help us to assess barriers. We repeatedly reflected and explored how we might appropriately and effectively engage others in problem solving.

In the concurrent data collection and analysis process, we asked what worked well and what did not to explore and co-developed strategies for robust results. The knowledge-building into why implementations succeed or fail were both important. We wanted to learn if there are small efforts that may produce deep and broad improvements in implementation. Therefore, key stakeholders (e.g., individuals in practice leadership, clinical nurse specialists, and educators) were strategically included in the process for shared ownership of the project. People on the ground helped us adjust, modify, expand, refine, and re-evaluate the process throughout the implementation. We took notes to capture analytical thoughts and iterative analyses. We offered a transparent and detailed description of the study context, what happened along the way from education development to spreading the games to establish dependability. Dependability is ... For credibility, the inclusion of a patient partner and clinicians in the research team helped demonstrate recognition of experiential knowledge. Our team reflexive meetings helped bring a more comprehensive understanding of the complexity of clinical situations and staff experiences.

Ethical considerations

The university research ethics board (H15- 03036) and the hospital research institute (V15- 03036) approved all procedures in this study. Participation was voluntary.

Results

Research question 1. To what extent, will online game-based dementia education help healthcare worker learn person-centered care approaches?

Our survey demonstrated that healthcare workers could learn person-centered care approaches using online game-based dementia education. Interdisciplinary healthcare workers in 10 hospitals and 10 LTC homes (n=3,025) participated in this dementia education intervention over two years (March 2020 to March 2022). Participant characteristics are presented in Table 1. Overall, forty percent of the participants responded to the learner experience survey and knowledge test embedded at the end of

the e-learning course. Eighty-four percent of the participants were female. Sixty-five percent were nurses, and thirty-five percent were non-nurses, including physicians, allied health practitioners (occupational therapists, physiotherapists, rehabilitation assistants, music therapists, and social workers), unit clerks, care staff, and administrative personnel.

The learning experience results indicated that most interdisciplinary healthcare workers (90%) found the games in online education fun. In the open comments, a lot of participants stated they liked small chunks of learning in short sessions. Many said they found the games gave them a fun way to learn person-centred care, which brought enjoyment of learning theoretical knowledge. The language in the game was helpful for them to apply the new knowledge in clinical practice, which implies some retention of information. Some staff said they did not have time to take a course and might fall asleep in lecture presentation but the games helped to absorb the knowledge quickly. Some nurses and care staff reported the scenarios in the games were realistic and relevant to their everyday practice. One nurse wrote that she was a new hire and they appreciated the opportunity to engage in virtual scenarios so mistakes can be made without causing any harms. A few other staff also responded with similar comments about the virtual space was a safe place for staff to practice and improve their skills. The feedback showed the gaming education content promotes active learning. Educators mentioned that they liked the automatic immediate feedback, which fostered learning, and helped staff to quickly identify what they performed correctly and what needed improvement. Ninety-five percent indicated that they would recommend the game to others. Many played more than once to increase their score. In the post-game knowledge test, the results show that 90% of the users could answer all ten questions correctly. Ninety-three percent found that e-learning helped them learn and understand person-centered care (Table 2).

Research question 2. What strategies helped overcome the barriers to online game-based dementia education uptake among healthcare workers?

The CFIR constructs overlap and interact with each other in influencing the implementation of an intervention. Our analysis identified five constructs as the most relevant: relative advantage, intervention source, patient needs and resources, culture, and personal knowledge and beliefs. See Table 3 for the CFIR constructs and the barriers to implementation of the gamified dementia education. Based on the implementation team experience, participant feedback, and survey, we identified five key strategies to overcome barriers identified for each CFIR construct. These strategies are captured in the acronym E-GAME: Easy access, Give extrinsic and intrinsic rewards, Apply implementation science theory, Multiple tools, and Engagement of champions.

Relative advantage – Easy access

The first major domain of the CFIR is related to the characteristics of the intervention being implemented in organizations. Relative advantage is one of the critical constructs which refers to stakeholders' perception of the advantage of implementing the intervention versus an alternative solution. For example, the practice leaders and educators mentioned that face-to-face workshops were not feasible for staff orientation and regular training during the pandemic. The virtual platform offered an advantage in the effectiveness or efficiency of the education intervention delivery. The implementation team felt the biggest barrier was a lack of time and willingness in healthcare workers to spend time in dementia care education. In addition, anxiety about infection spread and staffing shortage was high in all our hospital and LTC sites. The team met regularly throughout the implementation to refine the implementation strategies. We iteratively responded to opportunities and challenges experienced through the implementation process.

We kept the education in bite-size. Each game was short (about 2 minutes). The online, quick, and fun games provide a learning opportunity accessible at any time or place and can be completed at the learners' pace. We packaged the content in catchy language and added visual graphics to attract attention. The implementation team was also concerned that many healthcare workers might not be

familiar with using online platforms for education. Thus, it was important to provide easy access and incentives to motivate engagement. To encourage uptake of the game, we made access easy by using multiple platforms from Learning Hub (internal institutional website and external internet links). For motivation, we gave out prizes and pocket cards. In the implementation process, the local educators identified that the firewalls in hospitals and LTC computers could make access to the game challenging. To address this barrier, we created a direct external link to the game so staff could access the games by mobile devices. In addition, a QR code was created and placed on the promotional posters, which were strategically posted in pause areas, such as the water fountain and staff washroom, or directly distributed by the nurse educators.

Intervention source – Give both extrinsic and intrinsic rewards

Intervention source is another CFIR construct in the domain of Intervention Characteristics. Health care workers in various hospitals and LTC homes may see the intervention as externally developed even though the education content was co-developed with local clinicians. Therefore, we highlighted that local nurses and frontline staff co-produced the educational content in our promotional materials. We encouraged early adopters to use word of mouth to send referrals through incentives. The implementation team explored several options of prizes and decided on the reusable water bottle as many staff regularly use such bottles. A pocket card was made for the staff to place with their lanyards to support the ongoing use of the new knowledge learned (person-centered care approaches). The pocket cards summarize the ten communication approaches lessons. In addition, the pocket cards served as a promotional tool to drive users to the game. We promoted the game with prizes emphasizing that it was a short and fun game. The leaderboard provided the learners with further motivation to repeat the games to raise their scores. Repetition helps to retain learning. Healthy competition and recognition made learning fun. It is observed that gaining practical knowledge and skills in dementia care is essential to render person-centered care.

Game-based learning activities also provide users with a social experience to motivate cultural change by influencing attitude, language, and practice. For example, the staff talked

about the game content and their game-playing experiences in their clinical teams. Nurse educators (from the implementation team) reported that the staff was motivated to play and learn because of the game's flexibility, convenience, and self-paced features. Comments from staff included "The game was fun, much better than sitting in the classroom or reading a paper," "I like it that I can do it over my computer, iPad, or the phone," "I can keep playing again and again to get a better score." The game mechanics used in the project (challenges, time pressure, scores, rewards, leaderboards) were also reported as motivating. An educator remarked, "My staff started to use the language in the game, like acknowledge the emotion, after they played the game. They use the phrases they learned in the game in the staff huddle and the care planning meeting. It's kind of nice."

Staff also liked the supporting materials such as pocket cards and water bottles, as evidenced by this comment: "I appreciate the resources. Staff [members] are remembering the dementia approaches that we have on the pocket cards and are utilizing them. The cards and the water bottles are a big hit."

Our study showed that the game's content was an important determinant of uptake, and basing the games on the storytelling of real-life clinical examples made learning relevant and useful. One participant said, "My manager appreciates the simplicity of the message – We hear people use it, and that means the education works. People get it." Another educator added, "I think the fact that story-narratives in the games are from frontline staff's real-life experiences is appealing. People can relate to the stories, which was helpful to generate empathy and motivate affective learning."

Reflecting on the meeting notes, we identified that building the team connection and shared goals through regular meetings was critical. The regular meeting allowed us to spend time to co-develop the practical strategies to encourage uptake. The collegial relationship was invaluable and allowed us to plan a comprehensive approach to overcome anticipated barriers

and establish a positive collegial relationship to complete the project together. The team meetings further supported our camaraderie, providing updates on progress, successes, and challenges.

Patient needs & resources - Multiple tools

Patient needs & resources is one of the CFIR construct in the outer setting domain. Improving the health and well-being of patients and residents is the mission of all healthcare organizations committed to providing person-centered care. The pressing demand of meeting the needs of people with dementia was integral to the education implementation that sought to improve patient outcomes. The implementation team expressed that limited resources to improve care for people living with dementia is a significant barrier. To tackle this challenge, we employed multiple tools. We underlined the key message about person-centered care for patient outcomes in our promotional materials. Our strategies included using staff orientation and team huddles to introduce the game and engage local champions. Posters about the game in the bathroom on each unit made the message of dementia education highly visible. The water bottle prize made staff excited about learning dementia care. Educators used the pocket cards in huddles to support care planning and addressing issues.

Culture - Apply implementation science theory

In the CFIR inner setting domain, culture is viewed as relatively stable, socially constructed norms, values, and shared beliefs of a given organization. Organizational culture was perceived as a critical component barrier by operation leaders and educators. One of the clinical nurse specialists mentioned that not every healthcare organization in the province commits to invest resources to implement dementia education for their staff. It is also challenging to unlearn old practices and change the culture. Another experienced educator explained that many seasoned care staff might not want to change their work style, "This is what we do here." High leadership turnover in both hospitals and LTC homes challenged us with a lack of continuity and clarity about leadership's role in promoting dementia education. CFIR - ERIC guided our strategies. We established an implementation team that included key stakeholders, including a patient partner and site-based nurse educators and practice leaders. The staff and patient engagement process ensured that the project was practical, useful, and

meaningful. The implementation team addressed the challenge by carefully crafting our key message – why this is important and using early champions at the site to share these messages. We obtained formal commitments from leaders, built a coalition of collaborators, and leveraged their positions to promote and demonstrate effectiveness.

Individual beliefs - Engagement of champions

The fourth major domain of the CFIR is the individuals involved with the implementation process. Individuals in the care settings can influence others with consequences for implementation. Individual beliefs based on subjective experiences can help generate enthusiasm about the intervention among peers. Although the educators believed people would prefer the fun game over traditional online modules and reading test material, they had concerns about the cohort effect—that the new and early career nurses and healthcare workers would be more interested in online learning than more seasoned workers. Therefore, the team decided to include care staff champions to promote the education. The champions acted as change agents who actively promoted the implementation process. The champions and early adaptors were encouraged to share success stories. We also included the e-learning content in new employee orientation packages. We quickly noted that there was also a desire to share learning with other areas in regional clinical meetings. A very experienced nurse commented, “This game was really good. I think this would be a great game for our nursing students to play to learn some basic dementia knowledge before they come to any unit in the hospital.” What was surprising to us was the social experience that resulted from the game. Staff talked about the game among themselves, which led to increased use of the language taught in the person-centered care game. Also, we found the pocket card, which helped reinforce learning as it was referred to in team huddles, charting, and care planning.

Discussion and Implications

This study explored and identified strategies to overcome barriers to implementing online dementia education. CFIR guided the implementation, and a grassroots inclusive process was valued in the implementation as it encouraged the engagement of key stakeholders and recognized everyone’s input. In our study, the staff played the games for fun, and they talked about the game-playing

experiences and shared stories with peers in the hospital and LTC. Our findings suggested that the social experience positively influenced implementation, bringing enthusiasm through story sharing within and between sites. In addition, the feedback of positive outcomes shared in staff huddles and local clinical meetings encouraged uptake and spread of the dementia education intervention.

As identified in previous research, the enthusiasm and experience of champions contributed positively to implementations (Coffey et al., 2021). Furthermore, storytelling might be a factor in maintaining behavior, as suggested by Baranowski et al. (2010). Storytelling is a ubiquitous part of the clinical culture, and how they maintain engagement is yet to be thoroughly investigated. Our educators observed the staff use the language in the game (e.g., acknowledge the emotion, relax the pace) in team huddles for care planning. The small win/early success stories told by champions about applying the communication techniques encouraged the educators to spread the games widely across hospital departments. The desire to get a higher score also motivated the staff to play the game repeatedly. In a previous study, games increased the enjoyment of nursing learning and improved the long-term retention of information (Blakely et al., 2009). In that study, they identified seven characteristics of nurses that might be affected positively by gaming. It was suggested that gaming could (1) promote active learning and offer immediate feedback, (2) provide the opportunity to work in a controlled environment, (3) increase the number of experiences available, (4) promote motivational learning, and (5) promote discussions and interactions among students. Furthermore, games may reduce anxiety and stress, break up monotonous lessons, increase motivation, and promote relaxation in the learning environment. Similarly, we expected and found our games brought enjoyment of learning and supported retention of information. This was evidenced by staff using the new knowledge in huddles and care planning. More research is needed to compare learning outcomes of game-based education with traditional didactic methods. For example, a recent Virtual Reality (VR) simulation, "Talk with Ted," has been used to teach communication skills in dementia care (Dementia Australia, 2020). The Artificial Intelligence (AI) technology provides an immersive simulation experience for care workers; the participants were able to recall their learnings eight weeks following the training.

However, much remains to be learned on the challenges with using technology and gamification in clinical education in the future. Some staff in our study had low digital literacy and needed support to learn how to play the games. In addition, not all staff have access to tablets and computers that work for the game. Participants in our study also wanted more leadership support to enable staff to access digital training with protected time. This is congruent with previous research highlighting the important role of structural factors, such as staffing levels and workload, and organizational change through effective clinical leadership in facilitating the implementation process. Some staff mentioned they wished to have stable and consistent wireless internet access for virtual education. Our findings suggested a greater need for organizational investment to increase future staff practice development capacity. Future research should also investigate the potential of online game-based education in rural areas where classroom education can be costly and challenging.

There are several limitations of our study worth noting. Consistent with previous studies, a lack of staff time and leadership turnover in our study sites are prevalent barriers to implementing dementia care interventions in hospitals and LTC homes (Abley et al., 2019; Hung et al., 2019; Surr et al., 2016). Moreover, this study pertains to data from one province in Canada, and our findings are limited by the lack of pre-intervention baseline data for comparison. We also did not assess behavioral changes in staff practice (staff outcome) over time. Future research should evaluate behavioral change, such as staff person-centered care practice, staff injury resulting from behavioral events, and patient satisfaction. Currently, there is a paucity of data on the maintenance of behavior change produced by gamified educational interventions. It would be useful to determine whether educational games help maintain practice change. Also, it will be essential to investigate specific elements of games (e.g., challenges, storytelling, character, reinforcements) and how well those elements support learning and knowledge retention. Research with psychologists and behavior analysts may offer more in-depth knowledge of how game-based education influences attitude, knowledge, confidence, and behavior. Therefore, more research is needed to apply theoretical frameworks such as CFIR to produce helpful knowledge for practice change.

Conclusion

The CFIR framework supported the exploration of anticipated barriers and strategies for implementing the dementia education intervention. Our study underlines game-based learning is not only possible but helpful to support healthcare worker education and enhance the quality of learning experience during the pandemic. Healthcare workers in hospitals and LTC homes identified online gamified education as a fun way to gain practical knowledge about dementia care. The CFIR is useful for guiding an iterative process of planning and evaluation for implementation. Ongoing discussion and adjustment are key to addressing the challenges and needs of healthcare organizations.

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Conflict of Interest

None

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The data are not available to other researchers for replication purposes. The study reported in this manuscript was not pre-registered.

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Table 1. Participant Characteristics ($n=3,025$).

Variable	<i>n</i>	%
Age		
<35 years	636	21
35-50 years	1663	55
50+ years	726	24
Gender		
Female	2118	70
Male	907	30
Setting		
Long-term care facility	1059	35
Hospital	1966	65
Job role		
Nursing (Registered Nurse Registered Practical Nurse, Licensed Practical Nurse)	1028	34
Health Care Aid/ support Worker	1271	42
Allied Health (Occupational Therapist, Physical Therapist, Social Worker, Recreational Therapist)	212	7
Student	212	7
Manager or Director of Care	121	4
Housekeeping	121	4
Volunteer	60	2

Table 2. Results in Learner experience.

Question	Totally Agree	Agree	Neutral	Disagree	Totally Disagree
Were the games fun?	50%	40%	10%	0%	0%
Did the games help you learn practical knowledge about person-centered care?	80%	13%	2%	0%	0%
Would you recommend the game to others?	50%	45%	5%	0%	0%

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Table 3. Barriers and strategies.

CFIR Construct	Barrier	Facilitating Strategy
Intervention Characteristics		
1. Relative advantage	<p>Challenge: no time on shift to do game, if on Learning Hub can have log-on or other access issues; limited space to promote and participate in the game</p> <ul style="list-style-type: none"> • People may not be willing to spend time playing the game because they have low digital literacy 	<p>Easy access</p> <ul style="list-style-type: none"> • Accessible on multiple platforms from Learning Hub and through a weblink • The game already is well designed, use eye-catching branding of the game, strategic placement (e.g., at water fountains, bathrooms) • Incentives: short game and potential for a prize will encourage off shift access • Monitoring: site and Learning Hub to ensure good access
2. Intervention source	<ul style="list-style-type: none"> • Health care workers in various hospitals and long-term care homes may see the intervention is externally developed, although the education was co-developed with local clinicians 	<p>Give both extrinsic and intrinsic rewards</p> <ul style="list-style-type: none"> • Prizes: incentivize and encourage friendly competition • Early adopters encourage referrals through incentives and social experience narratives • Leverage the co-production by local nurses and frontline staff
Outer Setting		
3. Patient needs and resources	<ul style="list-style-type: none"> • Limited resources to improve care for people living with dementia 	<p>Multiple tools</p> <ul style="list-style-type: none"> • Promotional material: key messages include the need • Involve patient partner in the promotion • Champions: share success stories and facilitate how the new knowledge can be applied in practice • Educators use pocket cards: ART & SCIENCE acronym language in huddles to address issues
Inner Setting		
4. Culture	<ul style="list-style-type: none"> • Very few healthcare organizations commit to investing resources to implement dementia education for their staff • Difficult to unlearn old practice and change culture, care staff may not want to change, "This is what we do here." • Challenge: no time to slow down. Care staff generally do not have a culture of learning • High leadership turnover challenge: a lack of continuity, unclear what role can leadership play in promoting the game-based dementia education 	<p>Apply implementation science theory</p> <ul style="list-style-type: none"> • Obtain formal commitments from leaders, build a coalition of collaborators: leverage their positions to promote and demonstrate effectiveness (use ART&SCIENCE cards in huddles, etc.) • Healthy competition for high scores between individuals, units, sites; seeing is believing
Individual Characteristics		
5. Individual beliefs	<ul style="list-style-type: none"> • Challenge: new and early career nurses and healthcare workers may be more interested in online learning compared to more seasoned workers (cohort effect) 	<p>Engagement of champion</p> <ul style="list-style-type: none"> • Champions and early adopters: demonstrate success stories, identify care staff champions • Identify formal and informal leaders at all levels: provide promotional materials and ART & SCIENCE cards, provide the key messages for them to share • Orientation: include the game in all new orientation packages • Champions: ensure diverse groups have access

Note. CFIR = Consolidated Framework for Implementation Research.

Figure 1. Post-game survey items and questions.

Figure 2. The video of the mnemonic, The "ART & SCIENCE "of person-centered Care. Link:

<https://youtu.be/baSi54Fc-sg>

Figure 3. Avatar creation at the beginning of the game.

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Figure 1

Knowledge test items - True or False

1. Person-centered care focuses on managing the patient's behaviors. For example, a patient looks worried and calls out at breakfast. The staff says, "Finish your food; I'll tell your wife how good you've been."
2. Person-centered care promotes care efficiency by multi-tasking.
3. Person-centered care means understanding the lifestyle choices of the person living with dementia and respecting their rich life history.
4. Person-centered care focuses on getting the care task completed according to care professionals' schedules.
5. Person-centered care means reflexive practice, remaining calm, and being fully present with the person.
6. Person-centered care inquires about the person's personal needs and asks the meaning of a behavior (including emotional, social, and physical needs).
7. Person-centered care enables success in carrying out activities by providing multiple cues.
8. Person-centered care means ignoring the individual's non-verbal communication.
9. Person-centered care means doing a care task to the individual's family rather than working with the individual.
10. Person-centered care promotes the importance of relationships and embraces the positives. Use humor to make coping easier.

Learner experience questions - Please rate and provide comments about your experience

1. Were the games fun?
2. Did the games help you learn practical knowledge about person-centered care?
3. Would you recommend the game to others?

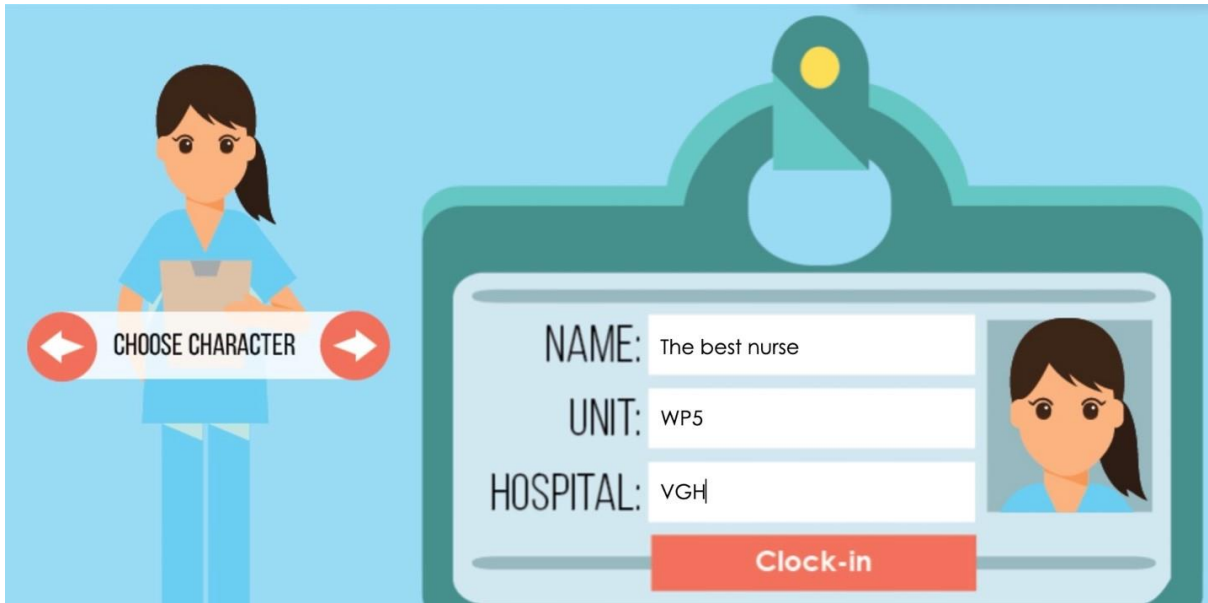
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Figure 2



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Figure 3



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