JOURNAL OF LONG-TERM CARE

Wet Your Whistle with Water (W3) to Improve Water Intake in Seniors' Care

RESEARCH

SAFURA SYED
KRISTINA DEVLIN
ALISON ANDRADE
KATE FLANAGAN
LORA BRUYN-MARTIN
VIRGINIA MILLAR
SUSAN BROWN
HEATHER KELLER

*Author affiliations can be found in the back matter of this article

LSE Press

ABSTRACT

Context: Dehydration is a concern amongst older adults residing in retirement (RH) and long-term care (LTC) homes.

Objectives: a) work with home team members to develop effective hydration strategies; b) implement these strategies; c) determine the capacity of home team members to provide process evaluation data on implementation, d) determine if administrative data is helpful in tracking dehydration-related events, and e) determine if a short, online education module can improve the hydration knowledge and attitudes of team members providing care.

Methods: Wet your Whistle with Water (W3) included: voluntary online education module for team members; hydration reminders; water stations in common areas; and bi-monthly recreation activities providing beverages. Hydration-related administrative data from 56 LTC residents were analyzed for pre-post comparison.

Findings: 218 individuals participated in the education and significant improvements in attitudes and knowledge noted. The LTC home held six hydration recreation programs with an average of 31 attendees and 15 beverages provided. Hydration station fluid intake was low (<120 oz per week). Bowel medications decreased non-signifcantly post-implementation; changes in other administrative variables were non-significant.

Limitations: W3 could not be fully implemented in the RH due to challenges with staffing and collecting administrative data. Team member compliance with refilling water jugs, COVID-19 restrictions, and outbreak status impacted usability of the hydration station.

Implications: W3 strategies were feasible but require home buy-in and a champion for implementation. Strategies (e.g., reminders) should be tailored to the home and be able to withstand outbreaks. Targeted education can improve confidence, attitudes, and knowledge.

CORRESPONDING AUTHOR:
Safura Syed
University of Waterloo, CA
safura.syed@uwaterloo.ca

KEYWORDS:
hydration; older adults; intervention; long-term care; retirement home

TO CITE THIS ARTICLE:
Syed, S, Devlin, K, Andrade, A, Flanagan, K, Bruyn-Martin, L, Millar, V, Brown, S and Keller, H. 2024. Wet Your Whistle with Water (W3) to Improve Water Intake in Seniors' Care. *Journal of Long-Term Care,* (2024), pp. 107–121. DOI: https://doi.org/10.31389/jltc.219

INTRODUCTION

Dehydration is a prevalent issue amongst residents in seniors' care, such as long-term care (LTC) homes, assisted living, or retirement homes (RH) (Parkinson et al., 2023). Residents are especially vulnerable to developing dehydration due to several factors associated with cognitive and physical limitations (Bunn et al., 2015). Conditions such as dysphagia, that occur in about one in seven residents, can result in dehydration due to poor fluid intake, and fear of incontinence and anxiety around washroom assistance may also lead to a decrease in fluid intake (Bunn et al., 2015; Painter, Le Couteur & Waite, 2017; Streicher et al., 2018). Finally, diminished thirst sensation and a lower capacity to effectively maintain water balance are both associated with physiological effects of aging that can increase the risk for dehydration (Lacey et al., 2019). Covid-19 pandemic and ongoing outbreaks lead to physical distancing, isolation procedures and staffing challenges, compounding the risk for low fluid intake and dehydration in LTC residents (Boockvar et al., 2021).

Dehydration is associated with poor health outcomes that range from delirium, constipation, urinary tract infections, reduced quality of life, increased risk for falls, increased number of hospitalizations, morbidity, and mortality (Edmonds et al., 2021; Hart, Marsden & Paxman, 2020; Hooper et al., 2015; Lean et al., 2019). Due to a lack of a gold standard to determine dehydration in LTC and RH, fluid promotion is considered a reliable approach to prevent dehydration (Hooper et al., 2015; Keller et al., 2022). As there are differences in sources of funding and service offerings in LTC and RH, strategies to address dehydration and capacity to undertake these strategies may vary between these two settings (Roblin et al., 2019). Care team members play an important role and are always working toward promoting fluid intake in residents. However, resident hydration is not always a priority, especially at times of a COVID-19 outbreak; providing sufficient fluids requires significant time and effort based on individual needs of residents (Cook et al., 2019a; Cook et al., 2019b). Team member education on the importance of hydration, barriers to fluid intake, and use of diverse strategies to address barriers may be necessary to promote fluid intake of residents (Bunn et al., 2015; Keller et al., 2022). Due to the multifactorial nature of how dehydration can occur in residents, individualized strategies within multicomponent interventions are needed to decrease the risk for dehydration (Bunn et al., 2015; Hodgkinson, Evans & Wood, 2003). Previous research has indicated an improvement of fluid intake in residents when strategies are tailored to the reasons they do not drink enough (Beck et al., 2021). Currently, a limited number of effective strategies promoting fluid intake have been identified and the sustainability of hydration promotion interventions is unknown (Bunn et al., 2015). Team members working with residents may have insight into how best to improve resident hydration.

The objectives of this study were to: a) work with home team members to develop effective hydration strategies; b) implement these strategies; c) determine the capacity of home team members to provide process evaluation data on implementation, d) determine if administrative data is helpful in tracking dehydration-related events, and e) determine if a short, online education module can improve the hydration knowledge and attitudes of team members providing care.

MATERIAL AND METHODS

Wet your Whistle with Water (W3) was a pre-post developmental evalulation study aimed at learning how to implement and evaluate hydration improvement strategies from a distance as required due to COVID-19 (Patton, 2011). This study was funded for a one-year period during COVID-19 and, as a stipulation of the funding, had to be an emerging intervention developed with knowledge users to support direct care in seniors living (Phase 1). This hydration promotion program was a collaboration between Schlegel Villages (SV) and the Schlegel-UW Research Institute for Aging (RIA) including researchers and RIA and SV leadership (described as the research team below). Leadership of SV and RIA were members of the development and evaluation team for W3, directing all decisions on this project and are co-authors. This group is referred to as the W3 study team. The implementation phase was Phase 2 (see Figure 1 Flow Diagram).

Ethics approval for W3 was provided by University of Waterloo Research Ethics Board (ORE #43556). Specific developmental evaluation questions were: could the RH and LTC home offer the W3 hydration strategies on a continual basis and what level of support was needed from researchers to do so; could home team members collect process evaluation data on a consistent basis; what administrative data on hydration and dehydration could be collected from resident records remotely for LTC and RH; and which team member roles complete the education module and does the module improve their knowledge and attitudes after completion?

PHASE 1: IDENTIFYING STRATEGIES TO INCREASE HYDRATION

Phase 1 of this project (April–September 2021) involved working with team members to identify innovative strategies to promote resident hydration that were considered feasible and acceptable. The W3 study team identified that the best way to solicit staff team member input into the emerging W3 strategies, was to conduct an on-line survey with team members in SV. SV team members had 1 month to post their ideas for strategies on the virtual questionnaire; they had the opportunity to win a gift certificate if their idea was chosen as innovative by the W3 study team. The research team reviewed 202 entries; these were categorized into how they influenced

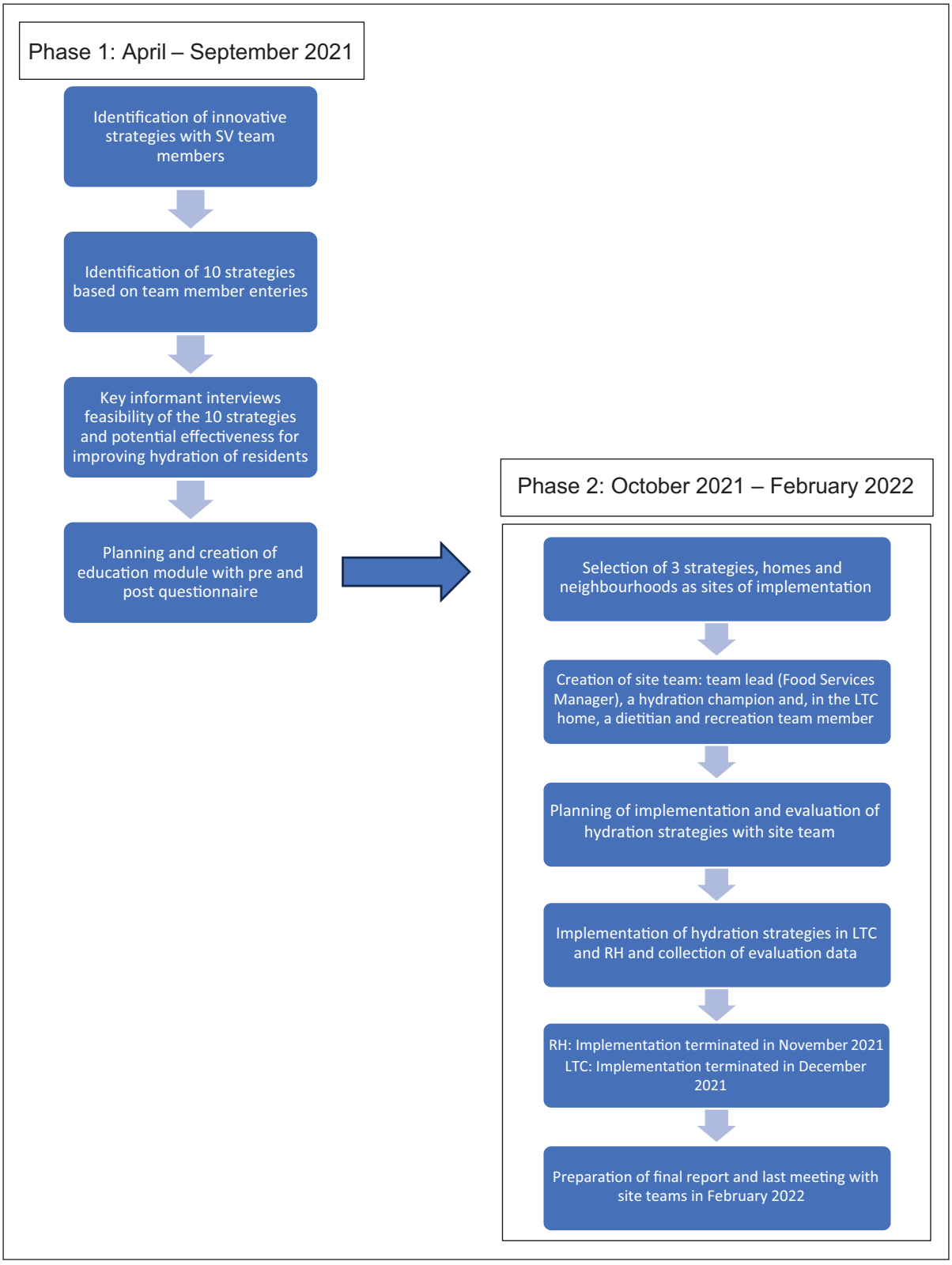

Figure 1 Implementation Flow Diagram.

hydration (e.g., reminders, increased accessibility to fluid). From these categories, ten strategies that were diverse and addressed various reasons for low fluid intake were selected by the W3 study team. These ten strategies were then discussed with seven key informants who were not part of the study team, including a dietitian, a neighborhood coordinator, a recreation team member and four food service managers. Key informants were individually interviewed to discuss the feasibility of the 10 strategies and potential effectiveness for improving hydration of residents, as well as how they could be adapted to the SV context in their home. The goal was to identify three strategies that would form the basis of the intervention, as it was considered feasible by the W3 study team that three separate strategies could be trialed for implementation in a six-month period, considering the context of COVID-19 in the Fall of 2021. All key informants identified as female, between the ages of 30–59, most of

whom had been working in the seniors' care sector for more than 10 years. They were provided with the list of hydration strategies and their descriptions to review prior to the interview. Interviews were conducted virtually by phone or Microsoft Teams, and were audio recorded by research team members (KD and SS). The interviews were 10–20 minutes in length. During the interview, key informants were asked to select the top three strategies they would use to support hydration in residents in their home. For each strategy, they were asked to describe why they selected this strategy and what supports or adaptations would be needed to successfully implement it. Other questions were asked around effective strategies for communicating with team members about W3, as well as thoughts on information to include in a hydration education module for team members. Three strategies were selected based on participant ranking of their top three strategies during phase 1 interviews, as well as ensuring that different reasons for poor fluid intake were addressed by the strategies: hydration station in common area of the neigbhourhood to promote accessibility of water between meals; recreation team-led hydration events to promote social drinking that would stimulate interest/make drinking fun; and use of reminders and huddles to instill the importance of hydration with team members. These, in addition to an education module for home team members, were the W3 hydration strategies.

PHASE 2: IMPLEMENTATION OF W3 HYDRATION STRATEGIES

Study sites

Two homes volunteered to be sites for ths developmental evaluation and two neighbourhoods in each site were selected by the home management and champions for implementation of W3. Neighbhourhoods were selected based on their interest in being involved in research as well as current capacity of team members. As it was of interest to compare implementation in RH versus LTC, one home of each type was recruited to the study. In the RH, fluid is only automatically provided to residents at mealtimes based on the request of the resident. During COVID-19, common areas where fluid was available, like the café were closed. In LTC, beverages are provided at meals and with a snack and beverage trolley after meals in the morning, afternoon and early evening. Further in LTC, food and fluid intake is tracked by staff members and recorded on the resident health care chart, whereas this does not occur in RH. Finally, there are more direct care staff in the LTC homes with specialized training (e.g., registered nursing staff) as compared to RH, where staff are often trained by the home and have limited formal training in seniors care.

Implementation plan

The W3 study team discussed the process of implementation of the W3 strategies throughout the summer of 2021. Each home created a small W3 team that included food service management, dietitian (LTC only), recreation, and dietary team members to support implementation between October 1, 2021, through to February 28, 2022 (Phase 2). The hydration champion selected was a team member working on the neighborhood that had the capacity for additional level of responsibility associated with running the intervention. Together, members of the site team were responsible for implementing the W3 hydration strategies and conducting evaluation activities. As this was a developmental evaluation, how the W3 strategies were implemented was negotiated with the homes considering their context. The education module was implemented based on guidance provided by leadership of SV.

The W3 study team and site teams met virtually on a monthly basis starting in July 2021; each home had separate meetings with the study team to support individual guidance. These meetings were used to orient the site team to the study, outline and review the three strategies, discuss how these could be implemented (e.g., location of posters, timing of huddles), and establish the best way to collect the process evaluation data. After the implementation launched, the focus of meetings shifted from planning for implementation to problem solving in the implementation process negotiated with the home, and promoting consistency of implementation and strategies to support sites with continuing the W3 strategies. Meetings discontinued when the RH withdrew from the study after six weeks of implementation (November 2021) and when the LTC home went into outbreak after 10 weeks of implementation (December 2021) (See Figure 1). A final meeting was held (February 2022) at the end of the project to determine next steps. Email was used inbetween meetings to ask and address questions and support communications.

Hydration strategy #1: Reminders

Both the homes implemented hydration-related reminders. Previous research has emphasized the importance of reminders—verbal and nonverbal—in improving fluid intake in residents (Robinson & Rosher, 2022; Simmons et al., 2001). Simmons et al. found that 81% of participants showed significant increase ($p < 0.001$) in fluid intake with frequent verbal responses. W3 reminders included team member huddles, posters, email pushes to home team members, and digital TV displays. Huddles were team member meetings led by the hydration champion and addressed two topics per month using researcher-prepared hydration education content; huddles could be repeated more than once to reach team members on different shifts. Examples of huddle education content include introduction to the W3 study, information on fluid requirements for older adults, tips on promoting fluid intake between meals. A total of 34 hydration reminder posters were created by the research team and each village selected a subset to display in the elevators and study neighbourhoods each week. Posters used simple language and images and

were targeted for team members, residents, and visitors. Weekly reminder messaging on educational hydration facts known as "Thirsty Thursday" were also sent to all team members through an online messaging system. Weekly reminder messages include drinking preferred fluids other than water and choosing water-rich foods and snacks to improve fluid intake. Finally, digital posters were displayed weekly on TVs in common areas using a digital program; these were the same content as the physical posters. As these last two activities were facilitated by the SV support office team and were thought to be beneficial for all SV homes, they were made available to team members in all Schlegel Villages. The RH specifically requested "table talker" displays with hydration messages directed to residents that were placed on the study neighborhood dining tables as an additional reminder. Twenty-three table displays were created and some examples of hydration messages include water-rich food and snacks such as soup, fruits, and yogurt that help reach daily fluid goals.

Hydration strategy #2: Hydration-themed recreation programs

Hydration-themed recreation programs provide an avenue for residents to drink water and other beverages between meals. Risk of dehydration is seen to decrease if drinking fluid is seen as a social activity (Clearly et al., 2008). An eight-week hydration intervention that utilized "happy hours" and "tea time" to promote fluid intake showed a 50% decrease in hydration-linked events in the treatment group when compared to the control group (Mentes & Culp, 2003). Recreation team members from the participating LTC home took a lead on developing fun and engaging themes and planned to host hydration-themed social programs twice a month during the implementation of W3. Examples of events hosted were pub night or karaoke night, where a variety of preferred beverages were served to residents. The recreation team members worked with the food service team to provide beverages and glassware, as well as thickeners for those residents that required this. Team members reminded residents of the time and date for the programs to encourage attendance.

Hydration strategy #3: Hydration/water stations

To allow easy access to water, hydration/water stations were set up in common areas of the LTC neighbourhoods; the RH was unable to implement this activity due to staffing challenges. Environmental approaches such as increased availability of fluids between meal times is seen as an effective way to improve fluid intake in older adults (Murphy & Aryal, 2020). The hydration station included cups for drinking, two easy-to-handle, plastic jugs with lids that could each hold 32 oz/948 mL of water, as well as thickener for residents if required. Dietary team members would fill each jug up to 24 oz and add ice until the water level reached 32 oz. The stations in each neighborhood were set up at 7:00 a.m. at the beginning of morning shift by dietary team members. Jugs were replenished mid-morning at 10:30 a.m. and post-lunch at 3:00 p.m. The hydration/water station was taken down for clean up at 6:00 p.m. The jugs were marked on the outside at every 8 oz to allow team members to record how much water had been consumed each time the jugs were replenished during the day and when the station was taken down in the evening. An instructional video on tracking fluid volume of jugs was created by the W3 study team to promote accuracy in tracking. The station also included signage created by the home to make it attractive and noticeable to residents and visitors.

Education module

Education of team members on hydration can promote improved knowledge. An interactive training session on hydration for team members provided in a study by Green et al. showed a significant increase ($p < 0.0001$) in self-reported knowledge on hydration care in LTC residents. A six-minute hydration education video was created by the W3 study team using an online video creation platform called Powtoon Limited (https://www.powtoon.com). Suggestions from home team members from phase one interviews were used when planning content for the hydration education video. Topics covered included: the importance of hydration to health, fluid requirements for older adults, barriers to fluid intake, and tips on how to improve water intake in residents. The hydration education video and evaluation questionnaire (described below) were available to all Schlegel Village team members from September 30 to November 30, 2021.

W3 EVALUATION

As W3 was a newly created multi-component program to promote water and other fluid intake in RH and LTC residents, this first implementation was considered a developmental evaluation (Patton, 2011), as we adjusted implementation and evaluation strategies throughout.

Process evaluation

Due to COVID-related restrictions researchers were not allowed to enter the villages; all implementation was developed and supported virtually by the W3 study team and all evaluation data either had to be collected virtually by researchers, or in-person by the home team members. This provided an excellent opportunity to determine if such a program could be implemented at a distance by researchers, and if team members with training, could collect process evaluation data related to the use of strategies to improve hydration. Virtual W3 study team and site team meetings provided an opportunity to learn about how the strategies were rolling out, what was and was not working, and support problem solving on implementation and evaluation. During these meetings, handwritten notes were made to document the implementation steps taken for the three strategies.

Process evaluation data for the W3 strategies were collected by home team members and collated by the hydration champion. The hydration champion kept track of the number of huddles hosted and number of attendees. The hydration champion was also instructed to determine if posters that they had put up at the beginning of the week were still present; they also recorded which poster was used and at what location. Recreation team members kept track of the hydration-themed program name/theme, the number of people in attendance, and the number and volume of beverages served.

Usage of the hydration station was tracked in two ways. Daily tracking information was collected by the dietary care team who replenished the water jugs, including time, date, location, beverage type, volume left, and any additional notes team members wanted to add. To aid in this reporting, as noted above, the jug had gradations at every 8 oz to promote an accurate report. An instructional video was also provided to support team member reporting use of the water jug. The hydration champion also observed how much the hydration station was used during one-hour time slots, two times each week. They noted how many people (team members, residents, visitors) took water from the jug during this time frame. To facilitate completion of this process evaluation, the homes provided input on the best methods and how to simplify instructions and data collection. Team members either recorded process evaluation data by using paper and pencil or by using a QR code linked to a form on Microsoft Forms, an online survey platform. The hydration champion assembled hard copy data collection and sent this securely to the researchers for input and analysis.

Hydration education module

The hydration education video was imbedded in Qualtrics and was accompanied by a pre- and post-questionnaire to assess the change in confidence, knowledge, and attitudes of team members. The questionnaire consisted of four demographic questions, seven pre- and seven post-questions. Four of the pre- and post-questions were consistent to determine any change as a result of watching the educational video (Table 1). Total time to complete the education module and pre- and post-questionnaire was estimated at 10 minutes. As per ethics board requirements, participants could skip any question on the pre- or post-questionnaires they did not want to answer. An information page outlined the purpose of this research activity, and the team member participant answered a consent question before beginning the pre-module questionnaire. Reminders to complete the education module were sent to team members through the internal messaging system by Schlegel Villages and during study neigbourhood huddles led by the hydration champion. An incentive to complete the education module was provided in the form of a 1 in 10 chance to win a $10 gift card.

Resident health information

Electronic health data collection systems, Point of Care ™ (PoC) and Point Click Care ™ (PCC), were used by researchers to extract information recorded by home care providers on fluid intake and potential dehydration-related events. PoC is used by care providers to track fluid intake at meals and in-between meals; team members in LTC are expected to report fluid intake after meals at minimum. PCC is used by care providers to record events that may be related to dehydration including incidence of urinary tract infections, use of bowel medications, the incidence of delirium, falls, hospitalizations and cause, referrals to dietitian, number of notifications of dehydration, diet order for fluid push, prescriptions for modified texture foods and change in fluid consistency. PCC is used in both RH and LTC. These outcomes were chosen based on prior literature (e.g., fluid intake, bowel medications) (Mentes, 2006) as well as clinical understanding of potential reasons for low fluid intake (e.g., change in diet texture) (Namasivayam-MacDonald et al., 2018).

PCC and PoC were accessed virtually and data on fluid intake and effects of dehydration were extracted by researchers. Where possible, data items were extracted through an automatic report created for the study during the time frame required. Data on fluid intake and effects of dehydration for the LTC home neighborhood residents were compared pre- (September 1–30, 2021) and post-implementation (December 1–31, 2021). Average daily fluid intake was determined during pre- and post-implementation periods with an internal PoC report. Resident PCC records in the RH were reviewed pre-implementation (September 1–20, 2021). Post-implementation data in the RH was not collected since the RH had withdrawn from the study. As a result, the pre-implementation data for the retirement home is not reported further. Data were anonymized and residents were deidentified with a participant ID number to protect confidentiality. Ethics review permitted a waiver of resident consent for accessing their health record for this administrative data collection.

Changes required due to COVID-19

Shortly after implementation, the RH needed to withdraw from the study due to staffing issues. Specifically, they had challenges retaining a team member who could be the champion. The Director of Hospitality attempted to act in this capacity in addition to their other duties, which resulted in limited implementation. Further, the LTC home was only able to implement the strategies between October and December 2021 due to a subsequent COVID-19 outbreak. Planned further evaluation that included interviews with team members in the implementation neighbourhoods and determination of sustainment of the W3 strategies (Phase 3) was not conducted due to COVID-19 and staffing changes.

PRE-TEST QUESTIONS	RESPONSE OPTIONS
Questions asked at pre-test and post-test	
Q1. As a care provider, I am confident that I can prevent dehydration in my residents.[a]	5-point agreement scale. Response options were "Strongly agree", "Agree", "Neutral", "Disagree", or "Strongly disagree".
Q3. How much fluid does the typical resident require in a day?[a]	**(a)** Less than 1000 mL per day (less than 4 cups) **(b)** 1000–1500 mL per day (4 to 5 cups) **(c)** 1500–2000 mL per day (6 to 8 cups) **(d)** More than 2000 mL per day (9 to 12 cups)
Q5. Delirium (mental confusion, sudden change in mental status) can be a consequence of dehydration.[a]	True/False for Pre-test 5-point agreement scale for post-test, options as above
Q6. The best way to increase fluid intake in residents is between meals.[a]	5-point agreement scale, options as above.
Questions only asked at pre-test	
Q2. The sensation of thirst increases in older adults.	True/False
Q4. Older adults are at a lower risk of dehydration as compared to younger adults.	True/False
Q7. Improving hydration of residents is a priority for improving their overall health.	5-point agreement scale, options as above.
Questions only asked at post-test	
Q4. How easy will it be to use what you have learned in this education module in your job?	5-point scale. Response options were "Very easy", "Easy", "Neither hard nor easy", "Hard" or "Very Hard".
Q5. I am committed to helping my residents consume enough fluids each day.	5-point agreement scale, as described above.
Q7. Providing water with other care routines can promote hydration.	True/False

Table 1 Education module pre- and post-test questions for evaluation.

[a] Paired questions pre- and post-test.

DATA ANALYSES

Process evaluation data on strategy implementation are presented qualitatively and descriptively (e.g., counts of activities). As per ethics requirements, participants could skip questions on the pre- or post-education module questionnaires; proportions for various responses are based on the number completing each question. Wilcoxon signed rank test and McNemar's chi squared test were used to determine change for the four repeated pre-and post-questions from the education module. Medians and proportions for PCC/PoC data extraction are presented by pre- and post- implementation. Only residents who were in the study neighbourhoods pre- and post-implementation in the LTC were included in this analysis. Change in use of bowel medications, incidence of falls, urinary tract infection, and hospitalizations were evaluated using the Wilcoxon signed rank test due to the non-parametric nature of the data. Change in average fluid intake was analyzed through a paired samples t-test pre-and post-implementation of hydration strategies as data was parametric. The Shapiro-Wilk test was conducted to test for normality of data distribution. R Project for Statistical Computing was used for all analyses (version R-4.2.2).

RESULTS

IMPLEMENTATION OF W3 STRATEGIES

A hydration champion/team leader was vital in implementing and evaluating hydration interventions including leading huddles and removing/posting posters in the neighborhood. In both homes the hydration champion was a member of the Food Services team and had management experience.

Reminders

Reminders were the only W3 hydration strategy that the RH reported on. In the LTC home, six posters were used and these were typically replaced on a weekly basis between October 2021 and December 2021; posters had to be discontinued during outbreaks in the homes. The LTC home used posters on fluid requirements, reasons to stay hydrated, and tips on staying hydrated. The RH used three posters on how to meet fluid needs, consequences of dehydration and ways to quench thirst.

The LTC home held ten huddles in the two participating neighbourhoods between October and December 2021. Seven (each n = 5 to 6 attendees) of the ten huddles included W3 study prepared content such as an introduction to the W3 project, fluid requirements for

older adults, and importance of hydration in the cold and flu season. The remaining three huddles were targeted to dietary team members (each n = 3 attendees) and focused on the process of providing and monitoring the hydration stations. The RH hosted eight huddles (each n = 9 to 15 attendees) across the two study neighbourhoods and througout the village from October 2021 to November 2021. The huddles encompassed topics such as an introduction to W3, how to meet resident fluid needs and how to support hydration stations.

New reminders were also created as part of this developmental evaluation. The LTC home requested that the W3 study team create news items for their monthly newsletters. Topics included an introduction to the W3 study, information about the different hydration strategies, tips on building hydration strategies, and improving hydration during flu season. These articles were published from September 2021 to March 2022.

Thirsty Thursday email pushes occurred once per week between October and November 2021 and were completed by SV support office. After the initial planning and creation of a schedule for the support staff, this was seamlessly accomplished. However, these email pushes were discontinued at the end of the second month of implementation, due to concerns for over-messaging and the need to prioritize communications to team members as a new wave of COVID-19 was occurring in villages. The TV digital displays were launched successfully by the SV support office between November 2021 and continued to February 2022.

Hydration events

The recreation team readily incorporated fluids into planned social events and did not require extensive additional effort when implementing this strategy. The LTC home held two hydration-themed programs in October, one in November and three in December 2021. Residents from the two implementation neighbourhoods, along with residents from anotherneighborhood, were in attendance at the programs. Beverages offered included water, pop, coffee, tea, juice, alcohol, and hot cocoa. The programs from October to December had an average of 31 attendees (22 to 38 attendees) with an average of 13 beverages (9 to 22 beverages, typically 250 mL) provided to residents. The last program in December occurred at the start of COVID-19 restrictions being introduced which resulted in a drop in attendance (n = 6) and number of drinks (n = 8) provided.

Hydration stations

Hydration stations were generally well-implemented once training by the champion was completed. The dietary team tracked intake from hydration stations from October 2021 to December 2021. The hydration champion also observed the hydration station twice a week at different times to determine instances of use. Fluid intake for both neighbourhods in LTC was was highly variable (<20 to 120 oz per week) and neighborhood dependent. The highest consumption in both neighbourhoods in the LTC home was between morning and early afternoon based on tracking sheets and observations, with 13 visits to the hydration station over 22 observations by the champion in both neighbourhoods. The dietary team played a vital role in setting up, maintaining, and taking down the stations. Dietary team compliance with refilling jugs, COVID-19 restrictions, and other outbreak status impacted usability of the station month-to-month, which was reflected in the fluid tracking data.

TEAM MEMBER CAPACITY FOR CONDUCTING PROCESS EVALUATION

The champion was integral to process evaluation data collection. They tracked poster use and huddles conducted, as well as attendee numbers. Further, they trained dietary team members on how to estimate and record the hydration station jug use. These champions, also observed the jug use at least for two hours per week. However, in our monthly mentoring meetings, they suggested this was not a good use of their time and yielded minimal data. As champions were food service managers, they had capacity and opportunity for data collection, collected this on paper and then transferred electronically to the W3 team. Hydration station water consumption was tracked by dietary team members in LTC. They required training and continued support for this activity; some preferred a paper form as compared to the QR code linking to an on-line survey. The champion then transferred these paper forms to the on-line form. Data were recorded by the dietary team at four timepoints each day: set-up, station refreshment twice during the day, and end-of-day clean up. However, this data collection was not as complete as the recreation activity tracking, despite huddles with the champion to support completion of this process evaluation. Recreation team members had experience with tracking fluid intake before the W3 study and had no challenges with using the W3 online study form for this purpose.

UTILITY OF ADMINISTRATIVE DATA

A total of 112 resident charts were reviewed across the two homes and neighbourhoods for indicators of dehydration and fluid intake. A pre- and post-implementation comparison of dehydration events and fluid intake was possible only for the LTC home (n = 56) which implemented W3 for three months (Table 2). Fluid intake data and hydration-related outcome data were tracked and easily accessible for the LTC. Since documentation requirements are different in LTC and RH, there were fewer data available to be collected from resident charts in RH. For example, fluid intake data were not recorded in the RH, creating difficulties to determine change in resident fluid intake. There was also minimal data available related to

VARIABLE		n	%
Age	<19	5	2%
	20–29	54	25%
	30–39	43	20%
	40–49	53	24%
	50+	63	29%
Gender	Woman	192	88%
	Man	23	11%
	Other[a]/Prefer not to say	3	1%
Role	Personal Support Workers	79	36%
	Nursing	49	22%
	Environmental Services	30	14%
	Food Services	21	10%
	Recreation	18	8%
	Other[b]	16	7%
	Not Provided	5	3%
Amount of time worked in Seniors' Care	<1	66	30%
	1–5	73	33%
	6–10	25	11%
	11–15	29	13%
	16+	23	11%
	Prefer not to say	2	2%

Table 2 Demographic information of team members who viewed the W3 Education Module (n = 218).

[a] Other category used for small counts (<5%) to promote data remaining unidentifiable.

[b] Other category includes leadership, administrative, marketing and therapy roles.

the following dehydration-related events for the RH: bowel medication use, incidence of urinary tract infections, notifications of dehydration, and diet orders for fluid push (as there is no dietitian service in RH).

BENEFIT OF THE EDUCATION MODULE

A total of 218 individuals from Schlegel Villages completed the consent form for the education module and answered at least one question on the pre-module questionnaire and were considered participants (Table 3). Proportions provided are based on the number of valid responses to each question. The majority of participants identified as women (n = 192, 88%) and more than half were between the ages of 40 and 60 (n = 116, 53%). Just over half of participants were either personal support workers (PSWs) (n = 79, 36%) or nursing team (n = 49, 22%). Participants also worked in environmental services (n = 30, 14%), food services (n = 21, 10%), and recreation (n = 18, 8%). The other category included leadership, administrative, marketing and therapy roles (n = 16, 7%) A third worked in seniors' care for five or fewer years (n = 73, 33%) and a third less than a year.

Confidence in preventing dehydration increased post-review of the educational video (Wilcoxon signed rank test = 1028, p = <0.001). All knowledge questions demonstrated a similar significant improvement post-review (Table 4). Analysis of the pre-test results showed that two thirds (39%) of participants provided the correct answer with respect to thirst changes in older adults and almost all (92%) correctly noted that older adults were at a higher risk for dehydration compared to younger adults. Finally, 99% agreed (agreed or strongly agreed) that improving hydration was a priority for enhancing the overall health of residents. Analysis of the post-test results showed that 88% of respondents felt they could easily (very easy and easy) apply the knowledge learned from the education module in their job and 96% reported they were committed (strongly agree and agree) to helping residents drink enough fluids.

DISCUSSION

W3 is a hydration promotion program with the purpose of increasing LTC resident fluid intake. The purpose of this

QUESTION (PRE AND POST)	PRE % (n)	POST % (n)	p-VALUE
As a care provider, I am confident that I can prevent dehydration in my residents.	33% (n = 44/130)[a]	55% (n = 73/132)[a]	p < 0.001
How much fluid does the typical resident require in a day?	23% (n = 30/132)[b]	8% (n = 10/132)[b]	p < 0.001
The best way to increase fluid intake in residents is between meals.	34% (n = 44/132)[a]	68% (n = 90/132)[a]	p < 0.001
Delirium (mental confusion, sudden change in mental status) can be a consequence of dehydration.	95% (n = 125/132)[c]	99% (n = 131/132)[a]	p = 0.04
Question (Pre-test only)			
The sensation of thirst increases in older adults.	39% (n = 50/130)[c]		
Older adults are at a lower risk of dehydration as compared to younger adults.	8% (n = 10/132)[c]		
Improving hydration of residents is a priority for improving their overall health.	60% (n = 79/132)[a]		
Question (Post-test only)			
How easy will it be to use what you have learned in this education module in your job?		50% (n =65/131)[d]	
I am committed to helping my residents consume enough fluids each day.		74% (n = 96/130)[a]	
Providing water with other care routines can promote hydration.		99% (n = 131/132)[c]	

Table 3 Results for Pre-Post Evaluation of the W3 Education Module.

Note: n completing questions at pre and post test varied; only participants with complete data at pre and post test were used for comparisons.

[a] Response of "Strongly Agree" on a Likert scale.

[b] Proportion of wrong responses.

[c] Proportion responding to true for a true/false question.

[d] Response of "Very easy" on a Likert scale.

DEHYDRATION INDICATOR	SEPTEMBER 2021 N = 56	DECEMBER 2021 N = 56
Urinary Tract Infection[a]	8	5
Bowel Medication Protocol Used	862	649
Delirium Incidence[a]	0	1
Fall occurrence[a]	19	13
Hospitalization[a]	4	1
Registered Dietitian Referral[a]	19	19
Notifications of Dehydration[a]	0	0
Prescribed Fluid Push[a]	3	3
Modified Texture Diet /Fluid[a]	21	21
Fluid Intake (mL) (median, IQR)	1448 (1257, 1749)	1447 (1185, 1781)

Table 4 Comparison of dehydration related events and fluid intake pre- and post- W3 implementation in two LTC neighbourhoods.

[a]These values are the number of residents with this dehydration indicator being noted at least once in their medical record during the time frame for data collection.

study was to develop strategies with grass-roots team members to improve resident hydration, conduct an evaluation of their implementation and determine the feasibility of process data collection by team members and use of administrative data to report outcomes. The learning in this process can be helpful for others conducting intervention research in LTC and RH.

DEVELOPING AND IMPLEMENTING INTERVENTIONS IN LTC AND RH

Team members were interested in improving hydration in their residents and provided diverse strategies that targeted various issues impacting why residents do not drink (e.g., access to water, making drinking a social occasion, and using reminders). An open call for ideas with the incentive

of receiving a small gift certificate was effective at eliciting diverse ideas. Including grass-roots members in coming up with the strategy concepts and then having interviews with diverse team members to further develop the strategies we believed supported success in uptake. Including members of the team in developing the strategies led to buy-in from the sites and team members implementing W3. Further, giving the homes the opportunity to tailor the strategies as part of a developmental evaluation for each site helped to "make it their own."

Reminder implementation was feasible in the RH and LTC. Several forms of reminders were used including posters, huddles and system-wide communications (e.g., TV ads and email pushes) which promoted reach. The site team noted that regular rotation and introduction of new hydration promotion posters was needed to keep up the interest of team members, family and residents. These findings are consistent with prior research, that reminders are easy to implement, however their effect is likely insufficient to change behavior (Bhatti et al., 2017; Gaff et al., 2015).

The use of huddles were part of normal practice in this RH and LTC and it was easy to adapt these to a discussion on hydration. Using a routine mechanism to support fluid intake like a huddle, promoted uptake of the activity. Using this communication system to promote water offers and remind staff of the importance of providing fluid was supported by a huddle script used by food service managers. Prior work using peer-to-peer education like huddles has demonstrated changes in team member behaviors, such as sit-to-stand exercise completed by team members (Slaughter et al., 2020). It was noted in our virtual meetings with the site at the end of the program that the neighborhood coordinator or a nursing lead should conduct huddles where the audience was the nursing team to promote increased uptake.

Implementation of the recreation events and water station in RH was not successful due to staffing shortages and increased workloads related to the COVID-19 pandemic. Recognizing the differences in staffing and tailoring strategies to RH based on staff availability and resources is required for future hydration-related interventions. In LTC, hydration stations were routinely set up by dietary staff after training, but the use of water from the jugs was highly variable, and low overall. Although this was a new activity for the dietary staff, it was within their usual activities and readily implemented. The low uptake of water use in this study, corresponds to research conducted in hospital settings showing that personal water jugs in patients' rooms were not as effective at increasing fluid intake as fluid offers from a trolley delivered by team members between meals (Gaff et al., 2015). The site team suggested offering more options for fluids rather than just plain water to encourage consumption, however if not used, this would result in waste.

Recreation events on the other hand, where fluid is offered by a team member and drinking is part of a social event, had greater uptake in terms of fluid offers and consumption. Again, this is a routine feature of the recreation staff role, and although providing beverages at social events required some planning and coordination between the recreation and dietary team, it was feasible. The only concern was the potential added expense, especially for specialty drinks. Prior research also demonstrates that fluid intake increases when fluid is offered at social events (Reed et al., 2005).

EDUCATION CAN IMPROVE KNOWLEDGE

Uptake of the voluntary W3 education module was modest during the eight weeks it was available. However, this brief educational video proved to be effective in improving participants' confidence, attitudes, and knowledge of hydration. Participation demonstrated the acceptability of an on-line, short, engaging video, which could be reviewed on breaks or off time. Participation tended to be from team members who had worked fewer than five years, suggesting an interest and need for continuing education of newer employees. Representation from the two study homes was not greater than non-study homes, suggesting that further efforts and effective promotion to recruit participants from specific study locations in the future are needed. Offering an incentive was important to promote participation. Prior work has also demonstrated that team member education through a group learning activity can increase knowledge and improve attitudes (Greene et al., 2018). Outside of a research study, LTC and RH operators are encouraged to use similar online platforms for educating team members on topics like hydration. If the training is permitted on work time and considered mandatory, this may promote completion.

IMPACTS OF COVID-19 AND OUTBREAKS ON INTERVENTIONS

Posters, themed hydration recreation events and the hydration station had to be terminated during a COVID-19 outbreak due to infection control procedures outlined by public health. Huddles and the virtual education module were the only components of W3 that could be allowed to continue during an outbreak. In the future, the adaptability of strategies to outbreak scenarios will need to be considered. However, when an outbreak is in place, other communications often need to be prioritized to staff. The Thirsty Thursday email pushes were stopped as SV leadership did not want to overwhelm team members with direct communications. It is recommended that direct email pushes should be used judiciously in the future during outbreaks. In LTC, a trolley service of fluid and snack between meals was common practice in the home W3 was conducted in. Using this touch point to remind residents to drink or providing them with specialty

drinks to pique interest could support hydration. Other work has suggested several ways to promote hydration during an outbreak (Keller et al., 2022), including creating physically distanced interactions (e.g., residents sitting in their doorways) to share fluids and offering fluid at every contact point when a staff member is in a resident's room.

PROCESS DATA COLLECTION AND ADMINISTRATIVE DATA

Process evaluation data were collected by team members for W3. Where data collection was a usual activity for team members (e.g., food service manager and recreation team members), there were few challenges in collecting these data. However, team members who do not typically collect data (e.g., dietary team members) had more challenges recording use of the hydration station. This may also have been challenging as the dietary team had to estimate consumption of water, based on the remaining amount in the jug. We created training videos and the champion had huddles specifically for this team to promote recording of this activity. Further we allowed team members to use either the online survey or a hard copy data collection form. Training and tailoring process evaluation data to the capacity of team members is important for future work.

Observation of hydration stations by the hydration champion occurred only a few times a week and did not provide a good reflection of use and this evaluation activity is not recommended for future work with a static activity like a hydration station. Recreation team members observed how much fluid was consumed at their themed hydration events and this observation is typical for recording fluid intake at meals and snacks.

Administrative data has the advantage of being available for all residents and with the use of electronic health records, there is the opportunity to create summary reports to support data extraction. The challenges with using administrative data are the availability of outcomes of interest, accuracy of the recording and the context around the event. Further, if an outcome was not observed (e.g., a fall) it cannot be recorded. Prior work has similarly noted the ease of using administrative outcome data, but also these challenges (Bunn et al., 2015). We found that the RH had less outcome data available than the LTC home as there is less oversight and professional care staff in this setting. If including RH and LTC homes together in future work, consideration of what is available in each setting and how it is recorded across these practice settings is needed. Although there were no statistically different occurrences of outcomes pre- and post-W3 implementation in the LTC home, urinary track infections, falls, bowel protocol, and hospital use may be good data points to include in future research.

Accuracy of administrative data is a challenge, especially for potentially subjective variables. Hospital transfers and use of medications are controlled events, and thus accuracy is high. However, fluid intake specifically, may have not been as accurate as other outcome measures extracted from the electronic chart. For example, we noted that fluid recording was often only once per shift rather than after each meal or snack and that team members summarized fluid intake across encounters (Meal + snack) rather than entering these data discretely by the time point or activity. Further, it is unclear how well the team members estimated fluid intake from observation. Where possible, research assistants conducting standardized fluid intake observations during and between mealtimes would yield more accurate data related to fluid consumption. Prior research has relied on team members and researchers to collect fluid intake, with similarly noted problems for home team member completion of data collection (Michelsen et al., 2022). Finally, context of some potential hydration outcomes is important. For example, reasons for hospital transfers were not always provided in the electronic record. This results in it being hard to interpret the potential effect of poor hydration on these outcomes.

STRENGTHS AND LIMITATIONS

This study developed and evaluated team-member identifed strategies focused on increasing resident fluid intake in RH and LTC homes. A major strength of this study includes engaging home team members throughout the process of identifying and negotiating the implemention of the strategies to promote fluid intake, and as part of developmental evaluation, being flexible, and tailoring the approaches and methods as needed. This study was not without limitations. Implementation and evaluation were truncated in both homes due to the COVID-19 pandemic and outbreaks in the homes. This occurred early in the implementation process for the RH, resulting in limited information on implementation and evaluation. Further, data collection either had to be remote if conducted by researchers, or completed by staff. Team members with limited experience collecting data had challenges with tracking the use of hydration strategies, resulting in missing data. These challenges speak to the need to rely on research observers in future studies. Further, interviews with team members although planned at the outset, were not possible due to rolling outbreaks in the long-term care home post-implementation. Future work should include staff interviews to comment on the implementation process and success of any new strategies to promote hydration. While administrative data were useful to track hydration-related information in LTC such as fluid intake and bowel medication use, there were concerns about accuracy of data, especially related to fluid intake, which is dependent on home team member availability to track and chart. Increased team member turnover, adequate training, increased workload and time constraints are other factors that may have impacted accuracy of

administrative data (Greenspan et al., 2012). Much of the administrative data related to hydration was unavailable for RH as this information is not collected. Variability and lack of uniformity in collection of health records is a noted limitation in literature (Greenspan et al., 2012; Zermansky et al., 2007).

CONCLUSION

This study provides important lessons on developing and implementing multicomponent strategies with team members in LTC and RH to improve resident hydration. Strategies should be tailored to each home and be adaptable to outbreaks. Home buy-in is crucial for implementation, and developing and supporting a strong implementation team is essential. Diverse reminders, water stations and hydration-focused recreation programs were feasible to implement in LTC with a champion supporting implementation. Data collection by team members should be limited to those who have this role as part of their current job description, and training to support accuracy is needed. Short, engaging on-line videos can enhance team member confidence, attitudes, and knowledge of hydration. Administrative data can be potentially useful, although primary ourcomes, such as fluid intake, would be more accurate with trained research observers. Future research on hydration can use the lessons from this developmental evaluation for conducting implementation studies.

DATA ACCESSIBILITY STATEMENT

Due to confidentiality agreements with the host long term care home, data are not available to those who have not signed this agreement.

FUNDING INFORMATION

Funding for this study was provided by Centre for Aging and Brain Health Innovation.

COMPETING INTERESTS

The authors have no competing interests to declare.

Some of the co-authors work for the corporation of which this home was a part.

AUTHOR CONTRIBUTIONS

All authors conceived the design and data collection for this project. SS completed data collection and KD supported analysis. SS and HK wrote the first draft of the manuscript and all authors edited and reviewed drafts of the manuscript.

AUTHOR AFFILIATIONS

Safura Syed orcid.org/0009-0008-2841-7154
University of Waterloo, CA

Kristina Devlin orcid.org/0000-0002-9092-712X
University of Waterloo, CA

Alison Andrade
Brescia University College, University of Western Ontario, CA

Kate Flanagan
University of Waterloo, CA

Lora Bruyn-Martin
Schlegel Villages, CA

Virginia Millar
Schlegel Villages, CA

Susan Brown
Conestoga College, CA

Heather Keller orcid.org/0000-0001-7782-8103
Schlegel-University of Waterloo Research Institute for Aging, CA

REFERENCES

Beck, AM, et al. 2021. Narrative review of low-intake dehydration in older adults. *Nutrients*, 13(9): 1–16. DOI: https://doi.org/10.3390/nu13093142

Bhatti, A, et al. 2017. Hydration stickers—Improving oral hydration in vulnerable patients. *BMJ Quality Improvement Reports*, 6(1). DOI: https://doi.org/10.1136/bmjquality.u211657.w6106

Boockvar, KS, et al. 2021. Co-Occurring dehydration and cognitive impairment during COVID-19 in long-term care patients.' *Journal of the American Medical Directors Association*, 22(11): 2270–2271. DOI: https://doi.org/10.1016/j.jamda.2021.09.002

Bunn, D, et al. 2015. Increasing fluid intake and reducing dehydration risk in older people living in long-term care: A systematic review. *Journal of the American Medical Directors Association*, 16(2): 101–113. DOI: https://doi.org/10.1016/j.jamda.2014.10.016

Clearly, S, Hopper, T and **Forseth, M.** 2008. Using routine seating plans to improve mealtimes for residents with dementia. *Canadian Nursing Home*, 19: 4–7.

Cook, G, et al. 2019a. Hydration practices in residential and nursing care homes for older people. *Journal of Clinical Nursing*, 28(7–8): 1205–1215. DOI: https://doi.org/10.1111/jocn.14727

Cook, G, et al. 2019b. Hydration interventions for older people living in residential and nursing care homes: overview of the literature. *British Medical Bulletin*, 131(1): 71–79. DOI: https://doi.org/10.1093/bmb/ldz027

Edmonds, CJ, et al. 2021. Dehydration in older people: A systematic review of the effects of dehydration on health outcomes, healthcare costs and cognitive performance.

Archives of Gerontology and Geriatrics, 95: 104380. DOI: https://doi.org/10.1016/j.archger.2021.104380

Gaff, L, et al. 2015. A study of fluid provision and consumption in elderly patients in a long-stay rehabilitation hospital. *Journal of Human Nutrition and Dietetics*, 28(4): 384–389. DOI: https://doi.org/10.1111/jhn.12294.

Greene, C, et al. 2018. I-Hydrate training intervention for staff working in a care home setting: An observational study. *Nurse Education Today* , 68: 61–65. DOI: https://doi.org/10.1016/j.nedt.2018.05.014.

Greenspan, SL, Nace, D, Perera, S, Ferchak, M, Fiorito, G, Medich, D, Zukowski, K, Adams, D, Lee, C, Saul, M and **Resnick, NM.** 2012. Lessons learned from an osteoporosis clinical trial in frail long-term care residents. *Clinical Trials*, 9(2): 247–256. DOI: https://doi.org/10.1177/1740774511430516

Hart, K, Marsden, R and **Paxman, J.** 2020. Generation of thirst: A critical review of dehydration among older adults living in residential care. *Nursing and Residential Care*, 22(12):. 1–12. DOI: https://doi.org/10.12968/nrec.2020.22.12.6

Hodgkinson, B, Evans, D and **Wood, J.** 2003. Maintaining oral hydration in older adults: A systematic review. *International Journal of Nursing Practice*, 9(3): 19–28. DOI: https://doi.org/10.1046/j.1440-172x.2003.00425.x

Hooper, L, et al. 2015. Clinical symptoms, signs and tests for identification of impending and current water-loss dehydration in older people. *Cochrane Database of Systematic Reviews*, 2015(4): CD009647. DOI: https://doi.org/10.1002/14651858.CD009647.pub2

Keller, H, Wei, C, Slaughter, S, Yoon, MN, Lengyel, C, Namasivayam-Macdonald, A, Martin, L, Heckman, G, Gaspar, P, Mentes, J and **Syed, S.** 2022. Qualitative analysis of a virtual research meeting summarizes expert-based strategies to promote hydration in residential care during COVID-19 and beyond. *BMJ Open*, 12(2): e055457. DOI: https://doi.org/10.1136/bmjopen-2021-055457

Lacey, J, et al. 2019. A multidisciplinary consensus on dehydration: definitions, diagnostic methods and clinical implications. *Annals of Medicine*, 51(3–4): 232–251. DOI: https://doi.org/10.1080/07853890.2019.1628352

Lean, K, et al. 2019. Reducing urinary tract infections in care homes by improving hydration. *BMJ Open Quality*, 8(3): e000563. DOI: https://doi.org/10.1136/bmjoq-2018-000563

Mentes, J. 2006. Oral hydration in older adults: Greater awareness is needed in preventing, recognizing, and treating dehydration. *The American Journal of Nursing*, 106(6): 40–50. DOI: https://doi.org/10.1097/00000446-200606000-00023

Mentes, JC and **Culp, K.** 2003. Reducing hydration-linked events in nursing home residents. *Clinical Nursing Research*, 12(3): 210–228. DOI: https://doi.org/10.1177/1054773803252996

Michelsen, CF, et al. 2022. A study on accuracy and precision of fluid volume measurements by nurses, patients and healthy persons in a clinical setting. *Nursing Open*, 9(2): 1303–1310. DOI: https://doi.org/10.1002/nop2.1173

Murphy, J and **Aryal, N.** 2020. Improving the provision of nutritional care for people living with dementia in care homes. *Nursing Older People*, 32(5): 23–29. DOI: https://doi.org/10.7748/nop.32.2.10.s9

Namasivayam-MacDonald, AM, Slaughter, SE, Morrison, J, Steele, CM, Carrier, N, Lengyel, C and **Keller, HH.** 2018. Inadequate fluid intake in long term care residents: Prevalence and determinants. *Geriatric Nursing (New York, N.Y.)*, 39(3): 330–335. DOI: https://doi.org/10.1016/j.gerinurse.2017.11.004

Painter, V, Le Couteur, DG and **Waite, LM.** 2017. Texture-modified food and fluids in dementia and residential aged care facilities. *Clinical Interventions in Aging*, 12: 1193–1203. DOI: https://doi.org/10.2147/CIA.S140581

Parkinson, E, Hooper, L, Fynn, J, Wilsher, SH, Oladosu, T, Poland, F, Roberts, S, Van Hout, E and **Bunn, D.** 2023. Low-intake dehydration prevalence in non-hospitalised older adults: Systematic review and meta-analysis. *Clinical Nutrition (Edinburgh, Scotland)*, 42(8): 1510–1520. DOI: https://doi.org/10.1016/j.clnu.2023.06.010

Patton, MQ. 2011. *Developmental evaluation: Applying complexity concepts to enhance innovation and use.* Guilford Press.

Reed, PS, et al. 2005. Characteristics associated with low food and fluid intake in long-term care residents with dementia. *Gerontologist*, 1(1): 74–80. DOI: https://doi.org/10.1093/geront/45.suppl_1.74

Robinson, SB and **Rosher, RB.** 2002. Can a beverage cart help improve hydration? *Geriatric Nursing*, 23(4): 208–211. DOI: https://doi.org/10.1067/mgn.2002.126967

Roblin, B, Deber, R, Kuluski, K and **Silver, MP.** 2019. Ontario's retirement homes and long-term care homes: A comparison of care services and funding regimes. *Canadian Journal on Aging/La Revue canadienne du vieillissement*, 38(2): 155–167. DOI: https://doi.org/10.1017/S0714980818000569

Simmons, S, Alessi, C and **Schnelle, J.** 2001. An intervention to increase fluid intake in nursing home residents: Prompting and preference compliance. *Journal of the American Geriatrics Society*, 49(7): 926– 933. DOI: https://doi.org/10.1046/j.1532-5415.2001.49183.x

Slaughter, SE, et al. 2020. Effectiveness of reminders to sustain practice change among direct care providers in residential care facilities: a cluster randomized controlled trial. *Implementation Science*, 15(1): 1–51. DOI: https://doi.org/10.1186/s13012-020-01012-z

Streicher, M, et al. 2018. Dysphagia in nursing homes—Results from the nutrition day project. *Journal of the American Medical Directors Association*, 19(2): 141–147. DOI: https://doi.org/10.1016/j.jamda.2017.08.015

Zermansky, AG, Alldred, DP, Petty, DR and **Raynor, DK.** 2007. Striving to recruit: The difficulties of conducting clinical research on elderly care home residents. *Journal of the Royal Society of Medicine*, 100(6): 258–261. DOI: https://doi.org/10.1177/014107680710000608

TO CITE THIS ARTICLE:
Syed, S, Devlin, K, Andrade, A, Flanagan, K, Bruyn-Martin, L, Millar, V, Brown, S and Keller, H. 2024. Wet Your Whistle with Water (W3) to Improve Water Intake in Seniors' Care. *Journal of Long-Term Care*, (2024), pp. 107–121. DOI: https://doi.org/10.31389/jltc.219

Submitted: 10 April 2023 **Accepted:** 03 January 2024 **Published:** 14 February 2024