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Original article

Improving hydration of care home residents by increasing choice and opportunity to drink: A quality improvement study

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SUMMARY

Background & aims: Dehydration is recognised as an important problem among care home residents and can be associated with severe consequences. Insufficient provision of fluids to meet resident preferences and lack of assistance to drink have been identified as key factors driving under-hydration of care home residents. Using targeted interventions, this study aimed to optimise hydration care for frail older people in a care home setting.

Methods: The study used quality improvement methods to develop and test interventions to extend drinking opportunities and choice in two care homes. Changes were made and evaluated using Plan-Do-Study-Act (PDSA) cycles. Data were captured on the amount of fluids served and consumed, and staff and resident feedback. The long-term impact of the interventions was assessed by measuring daily laxative and antibiotic consumption, weekly incidence of adverse health events, and average fluid intake of a random sample of six residents captured monthly.

Results: The interventions were associated with an increase in the amount and range of fluids consumed, in one home mean fluid intakes exceeded 1500 ml for three consecutive months. Laxative use decreased significantly in both homes. A number of practical and organisational barriers affected the sustainability of interventions.

Conclusions: Interventions to optimise the hydration of care home residents can be effective. Plan-Do-Study-Act cycles provide an effective methodology to implement new interventions into existing practice in care homes. Sustainable change requires strong leadership, organisational support and teamwork.

1. Introduction

Older people are vulnerable to dehydration due to physiological changes occurring with age, such as loss of thirst reflex, muscle tissue and kidney function [1,2]. Both, physical and cognitive impairments may also affect their access and ability to consume fluids [3]. The consequences of dehydration in older people are severe and include delirium, falls, urinary and respiratory tract infection and constipation [4,5]. Dehydration is also associated with increased hospital admissions and poor clinical outcomes [6]. Under-hydration has been recognised as a particular problem for residents in long-term care settings dependent on care staff for their hydration needs, especially those needing active assistance, or prompting, to drink [7–10].

A recent study in the United Kingdom found that 12% of those admitted to hospital from care homes were dehydrated and that the condition is significantly more prevalent in this population compared to patients admitted to hospital from their own homes [6]. In order to maintain health and prevent dehydration, adults, including older people are recommended to consume a minimum of 1500 ml of fluids per day [11]. Studies have identified that a significant proportion of care home residents have signs of dehydration or impending dehydration [1,2]. Our work exploring patterns of fluid provision and consumption [7] suggested that few care home residents consumed the recommended minimum.

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There is a paucity of studies that have designed or tested interventions to improve the hydration of older people in care homes [12]. Moreover, little is known about the sustainability of such interventions as many studies relied on supernumerary staff to undertake tasks within the intervention protocols [13–16]. Practicality and acceptability of these interventions need to be tested in the care home environment, and systems developed that enable evidence to be embedded into everyday practice.

Detection of dehydration in non-acute settings is not easy. Clinical signs and symptoms and urinary indices are not specific and sensitive enough to be used in this population [17]. Conversely, the more reliable blood osmolality is not appropriate, and not routinely available in a care home setting. Therefore, in this study we used a pragmatic approach to measure the efficacy of fluid provision by observing changes in fluid intake. Preliminary work, reported separately [7] identified a range of difficulties experienced by staff in meeting this fundamental care need for frail older care home residents. This study reports the use of improvement science methods to design, implement and measure the effect of interventions aimed at increasing fluid provision and optimising hydration of care home residents. The paper was written using SQUIRE guidelines for reporting improvement projects [18].

2. Materials and methods

2.1. Setting

The study was undertaken in two privately operated care homes in West London. Both homes had a mix of residential and nursing care beds, Home A had 160 individual rooms and Home B 146 rooms. The study unit in Home A comprised 25 rooms arranged in two corridors of seven and 18 beds with a separate lounge, dining room and a small kitchenette. In Home B, the study unit comprised 34 rooms arranged in two corridors of 12 and 22 rooms, a combined lounge and dining area and a kitchenette. Both study units provided care for frail older people, some with mild or moderate cognitive impairment. Both homes operated a 12 h shift system with a day shift staffing ratio of one healthcare assistant (HCA) to five residents. In Home A, one registered nurse managed the unit and a clinical nurse manager worked across the entire home between 8 am and 5 pm weekdays. In Home B, a registered nurse manager worked on the unit between 8 am and 5 pm weekdays, with an additional registered nurse on duty. At night Home A unit was staffed by one registered nurse and two HCA and at Home B, one registered nurse and three HCA.

2.2. Planning the interventions

At each home a dedicated project team, comprising the unit manager, HCA and university researchers, co-designed strategies to improve resident hydration. The respective teams, met once a week to plan and organise testing of interventions and review measurement data. Analysis and review of the data then informed the design and implementation at the next step of improvement activity.

2.3. Rationale for the interventions

Previous observations had identified that resident hydration was not prioritised by staff. There were few points in the day when fluids were offered however they were not consistently given to all residents at these times, especially to those who needed assistance to drink. Systems were not in place for serving drinks before or after meals and residents were rarely offered more than one drink at each opportunity. This meant that the majority of residents would rarely be able to consume the minimum recommended daily amount of 1500 ml. In addition, residents were not routinely asked what they preferred to drink and the full selection of drinks available was not communicated to them. The most commonly given drinks were tea, water and squash. Interventions were therefore needed to increase the number of opportunities and support for residents to obtain fluids and enable them to choose from a range of drinks.

An Action Effect Diagram (AED) [19] was developed to connect the overall aim of the study (optimising hydration), with the factors that contributed to effective hydration care and the interventions designed to target these factors (Fig. 1). The AED was used to help guide the improvement activities and communicate with relevant stakeholders.

The design and implementation of the interventions varied according to each home's circumstances and systems of care. Interventions were tested using Plan-Do-Study-Act (PDSA) cycles [20]. This improvement methodology emanates from the work of Edward Deming and has been widely used in UK healthcare for testing changes in real-world settings [19,21].

2.4. Description of improvement activity

1) Extending drinking opportunities comprised three interventions:
   - Pre-breakfast drinks: a structured approach to providing drinks to residents moved to the dining room prior to breakfast was introduced at Home A.
   - Drinks after meals: systems were established to ensure that residents were offered hot drinks after lunch and dinner at Home B.
   - Protected Drinks Time (PDT): a structured approach to ensuring that all residents were served a drink and where needed, provided with assistance to drink during the mid-afternoon drinks round at Home A and B.
2) Supporting and extending residents' choice of fluids was achieved through developing a Drinks Menu, which provided a communication tool to support resident decision making when choosing a drink and encourage staff to offer more than one drink. The Drinks Menu was also used in conjunction with PDT and was introduced in both homes (Fig. 2).

The project team in each home decided on the priority of the interventions, hence the differences in order and execution were anticipated. In Home A, the project team decided to introduce and test PDT first, the Drinks Menu was introduced three months later and the drinks before breakfast were the last intervention tested. At Home B, the project team decided to start with some small scale testing of the Drinks Menu and incorporated this into PDT at a later stage. Drinks after meals were introduced after the menu and PDT were implemented. Details on the length of the testing of each intervention are provided in Table 1.

2.5. Measurement of the effect of interventions

1) Specific data were collected for each PDSA cycle. The effect of interventions were assessed by recording the number, type and volume of drinks served to, and consumed by, the residents. Some cycles focused on feasibility issues and therefore did not include an estimated measurement of fluid consumption. Field notes and staff feedback were collected immediately following each cycle.
2) Individual fluid intakes were captured every 4 weeks between February 2016 and January 2017 by observing the volume of fluids consumed by six randomly selected residents on each unit between 6 am and 9 pm. The mean volume and standard deviation (SD) consumed at each observation was plotted on a run chart with the median line calculated prospectively from the first ten observations.

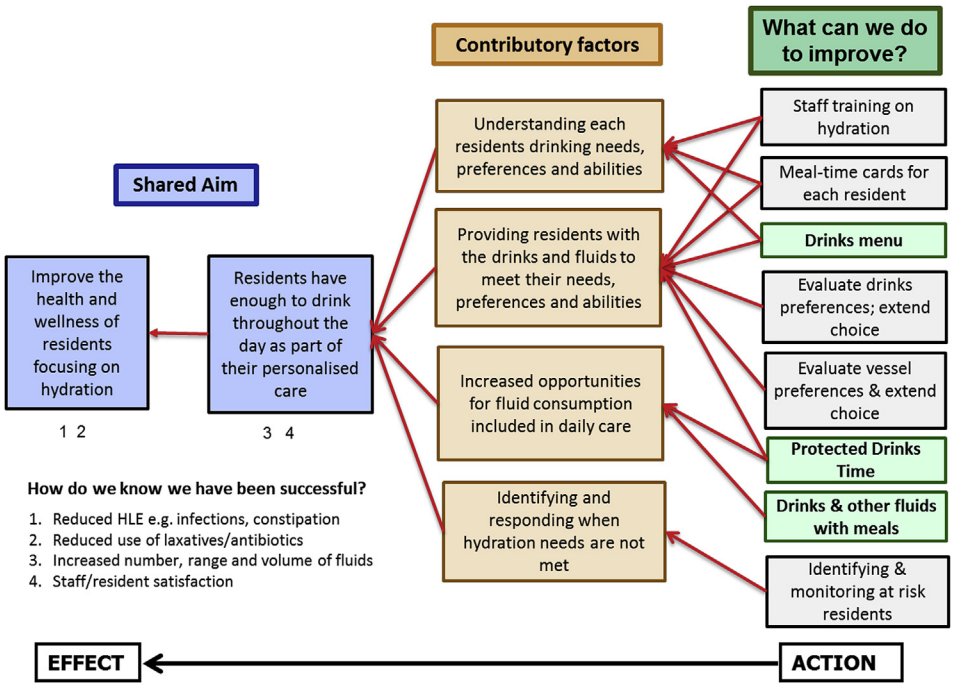

Fig. 1. Action Effect Diagram for improving hydration of care home residents. Highlighted in bold are the interventions reported in this paper.

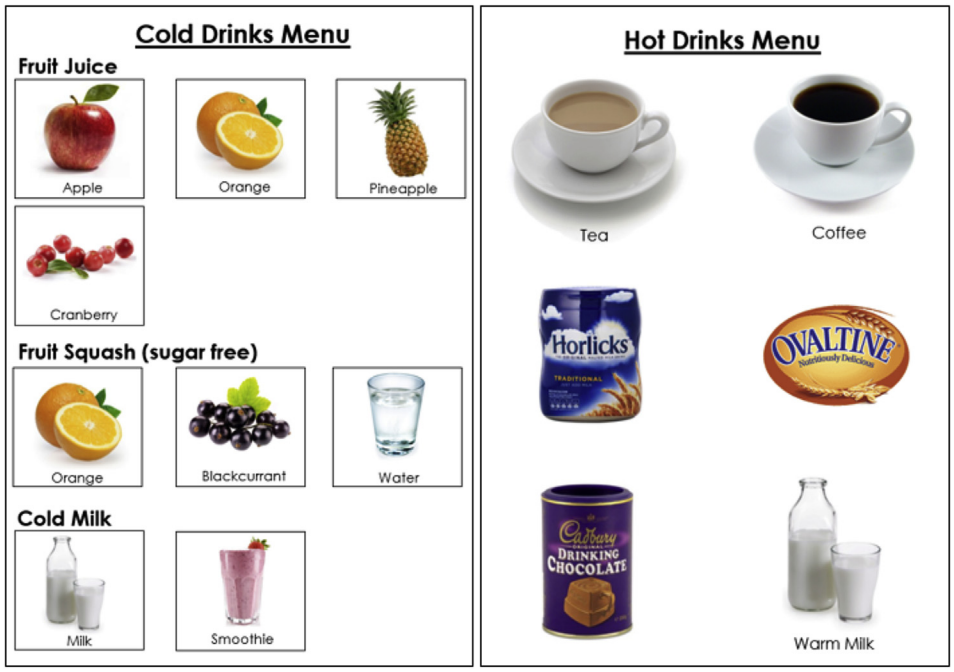

Fig. 2. Drinks Menu used by staff to encourage residents to select their preferred drinks and consume more fluids.

3) Adverse Health Events (AHE) associated with dehydration (urinary tract infection (UTI), pneumonia/chest infection, falls, incidence of dehydration and hospital admission) were collected weekly from January 2016 to February 2017.
4) The number of laxative doses and courses of antimicrobial therapy were captured from prescription charts four-weekly from November 2015 to February 2017. Laxative data were aggregated weekly and a statistical process control XmR chart was created for mean laxative doses/resident/day. The mean and the control limits were recalculated if any special cause variations occurred [22]. The rationale for using these measures was that if fluid intakes increased, the incidence and/or severity of constipation and infections should decrease with concomitant reduction of laxative and antibiotic use.

2.6. Funding and ethical approval

This project was funded by the National Institute for Health Research North West London Collaboration for Leadership in Applied Health Research and Care (NIHR NWL CLAHRC).

Table 1
The number of cycles and the duration for testing the interventions. (Duration was defined as the time from the first to the last PDSA cycle).

Intervention	Number of PDSA cycles	Duration
Home A		
Drinks before breakfast	4	4 days
PDT + Drinks Menu	8	8 weeks
PDT	*4*	
PDT + Drinks Menu	*4*	
Home B		
Drinks after meals	3	
Drinks Menu + PDT	7	9 weeks
Drinks Menu	*5*	
Drinks Menu + PDT	*2*	

The study was considered to be 'service evaluation' and did not require submission to the Heath Research Authority, but approval was obtained from the College of Nursing, Midwifery & Healthcare research university ethics panel at the University of West London.

3. Results

3.1. Drinks before breakfast/with meals

At Home A, the offer of a drink before breakfast for residents in the dining room resulted in average fluid consumption ranging between 158 and 170 ml (Table 2) for all cycles except the second, where staff were not briefed before the activity. By the final cycle, all residents present in the dining room received a drink with a maximum fluid intake of 380 ml in the period before breakfast. Receiving a pre-breakfast drink had no adverse effect on the amount of fluid a resident subsequently consumed at breakfast (data not shown). Modifications made during the test cycles included briefing of HCA and preparing flasks of hot drinks for use by HCA in the dining room (final format is presented in Table 3). Staff reported that offering residents a drink before breakfast had minimal impact on their workload and that it could be incorporated within the daily routine. Verbal feedback from residents was encouraging, one resident commented that having a drink at this time gave them "something to do" as they waited for breakfast to be served.

At Home B, the offer of a drink after meals for residents in the dining room/lounge resulted in average fluid intakes ranging from 124 to 158 ml with more than half of residents accepting the offer of a drink following their meal. Although every resident was offered a drink during the first cycle, this did not occur during subsequent cycles. All residents who accepted the offer of a drink after lunch also accepted a drink at the next drinking opportunity, mid-afternoon PDT (data not shown). Modifications made during the test cycles included the catering assistant preparing flasks of hot drinks for HCA to use in the dining room. Staff reported they had enough time to offer and provide drinks to residents as part of their routine. Nonetheless, data on fluid intakes indicate that some residents did not receive the assistance they needed to drink (Appendix 1).

3.2. Protected Drinks Time & Drinks Menu

In Home A, across the five cycles where data was collected, the proportion of residents receiving a drink at PDT was 80–100% with a mean fluid intake ranging from 142 to 182 ml. By the final cycle, 39% of residents received more than one drink, although some residents (26%) were still consuming little (less than 50 ml) at PDT (Appendix 2). Across the cycles, modifications were made to allocate staff to activities, ensure the cups and trolley used to serve drinks were returned to the unit after lunch, and that staff returned from their breaks on time. Modifications were supported by staff briefings in order to inform and reinforce practice. Verbal feedback from staff and residents indicated that PDT was an effective way of providing drinks to residents. However, sustaining PDT was problematic. Within two months of implementation, monthly observations of fluid intake indicated a reduction in both the number of drinks provided, and the percentage of residents given a drink. This was corroborated by specific data captured on PDT approximately a month after implementation, which showed a reduction in both, the number of drinks provided (0.43 per resident) and the percentage of residents given a drink (43%).

In Home B, across the seven cycles where data was collected, the proportion of residents receiving a drink in the mid-afternoon was 80–100% with mean fluid intake ranging from 149 to 246 ml (Appendix 3). By cycle seven, 60% of residents received more than one drink, with just 10% (3/30) residents consuming less than 50 ml. Modifications included introduction of a second drinks trolley and staff allocation sheet, staff briefings, designating staff to record resident fluid intake, use of a simpler pictorial Drinks Menu and skills modelling for HCA in using the Drinks Menu. HCA reported that the clear allocation of roles and responsibilities encouraged a greater sense of team work. Verbal feedback obtained from residents during PDSAs was positive, many said they were happy to have both a hot and a cold drink. However, in practice, HCA did not always devote time to assisting residents with drinking or offering drinks refills.

At both homes, staff were observed to use the Drinks Menu inconsistently. Some HCA reported that it was time consuming to offer residents a choice or that residents were unable to make a choice due to cognitive impairment. Implementation of the Drinks Menu was also compromised when drink stock was not available on the unit. Inconsistent communication as to who was responsible for ensuring a sufficient stock of the full range of drinks on the unit contributed to this problem.

3.3. Impact of interventions on fluid intakes

In Home A, fluid intake increased when the interventions worked successfully (Fig. 3). However, the improvement was difficult to sustain and mean fluid intakes of 1500 ml or more were not achieved. In Home B, the PDT and Drinks Menu were successfully embedded in routine practice, however this took several

Table 2
Drinks before breakfast PDSA cycles (Home A).

	Cycle			
	1	2	3	4
No. residents observed (no receiving a drink)	7 (7; 100%)	9 (5; 56%)	10 (7; 70%)	7 (5; 71%)
No. drinks given	12	6	14	8
% of residents given more than one drink (of those who were given one)	57%	11%	50%	29%
Fluids served (% consumed)	2000 (55%)	1200 (45%)	2660 (44%)	2300 (37%)
Mean consumed for those receiving a drink (ml)	158	108	169	170
Median fluid intake (min–max)	200 (0–300)	100 (20–220)	180 (30–360)	150 (0–380)
No (%) of residents who consumed less than 50 ml	14%	56%	40%	57%

Table 3
Final format of the interventions to enhance hydration of care home residents.

1) Extending drinking opportunities	
Drinks before breakfast (Home A)	Drinks after meals (Home B)
• The HCA who brings the resident to the dining room prior to breakfast asks what they want to drink, prepares and serves the drink. • Flasks of tea/hot water pre-prepared by HCA and placed in dining room Team leaders remind the HCA and provide assistance if necessary	• Two HCA who are assigned to serve and feed residents in the lounge, offer hot drinks to the residents when clearing the plates after meals. • Flasks of tea/hot water pre-prepared by catering assistant and placed in dining room by HCA
Protected Drinks Time (Home A)	Protected Drinks Time (Home B)
Distribution of drinks to all residents from a trolley and HCA allocated to specific roles: • 1 HCA serves residents in lounge, assists and encourages them to drink and offers additional drinks. HCA encouraged to make themselves a drink to model social aspect of drinking. • 2 HCA distribute drinks to residents in own rooms using a trolley. Deliver drinks to those who can drink independently first and provide assistance to those who need it. Offer additional drinks. The team leader briefs staff in the morning, allocates responsibilities and reminds staff to commence PDT shortly before 3 pm.	Two drinks trollies introduced to enable drinks to be served by two teams and focus HCA time on assisting residents. Staff allocation sheet used to assign HCA to specific roles: • 1 HCA serves residents in lounge, assists and encourages them to drink. HCA encouraged to make themselves a drink to model social aspect of drinking. • 3 HCA assigned to each trolley; serve drinks and assist residents in own rooms • 1 HCA allocated to answer resident bells during PDT if required and 1 to document fluid intake. The unit manager briefs staff in the morning, completes the allocation sheet and reminds staff to commence PDT shortly before 3 pm.
2) Extending choice	
Drinks Menu (Home A & B)	
• A simple pictorial menu showing the hot and cold drinks available is placed in the dining room, lounge and in resident rooms and used with formal drink activity • Catering staff to ensure sufficient supplies of all items on the menu are held on the unit • Menu used before breakfast, after lunch and dinner, and during the afternoon PDT • Residents encouraged to choose both a hot and cold drink	

HCA = healthcare assistant; PDT = Protected Drinks Time.

months to take effect. With both trolleys available to support PDT, fluid intakes increased above 1500 ml and were sustained for three consecutive months. The standard deviation (SD) for each sample provided an indication of the variation in fluid intakes between the different residents included in the sample. Wide SD indicated that the fluid intakes of residents in the observed sample were highly variable; narrow SD indicated that the fluid intakes were similar across the residents in the sample. In Home A, the SD suggest that the initial increase in fluid intakes benefited only some residents (probably independent drinkers). By the end of the study narrower SD indicated that fluid intakes were more consistent across the sample, but the mean intake was still less than 1500 ml. In Home B, the mean fluid intake increased to more than 1500 ml by the eight month and was sustained at this level. Compared to Home A the SD were relatively narrow over the period of study indicating less variation in fluid intakes between residents in the sample.

3.4. Impact of interventions on adverse health events and medication use

There was no change in the incidence of Adverse Health Events (AHE) and throughout the project there was no significant relationship between monthly fluid intake and incidence of AHE (data not presented). However, this is not unexpected given the small sample size, modest increase in fluid intakes and the relatively low incidence of these events. Dehydration proved difficult for staff to identify and was rarely reported (four events in Home A and eight in Home B over the study period).

There was a significant decrease in the average daily laxative consumption at both homes after six months of improvement activity (Fig. 4). There was no change in the use of antibiotic therapy observed throughout the project (data not presented).

4. Discussion

Our study has demonstrated that interventions aimed at increasing both choice and opportunity to drink were effective in increasing fluid consumption in care home residents. Our earlier work had demonstrated that residents are at risk of under hydration because they are not routinely offered sufficient drinks during the day or assisted to consume fluids where necessary. The interventions were therefore designed to address problems by integrating new drinking opportunities with existing staff activity and guiding staff to address resident needs and preferences. In addition, given that we had previously demonstrated that the majority of residents were not offered enough to drink, our interventions aimed to increase drinking opportunities for all residents rather than solely targeting individuals perceived to be at risk of dehydration.

Although other authors have suggested that older people's fluid intakes are governed by their reluctance to drink [1,2], this study found that when given the opportunity, choice and assistance, residents accept more drinks and will have drinks before, with, and after meals. Concerns raised by staff that providing extra drinks would reduce the amount residents consumed at the next drinking opportunity were shown to be unfounded. Providing additional structured drinking opportunities supported an increase in the number of residents receiving drinks and resulted in more fluids being consumed. Whilst PDT benefited most residents, including those who needed assistance, the additional drinking opportunities (before breakfast and after meals) primarily targeted those who were independent as they tended to be offered only to those in the dining room/lounge. Further work is required to extend this intervention to residents in their own rooms, including ensuring adequate support to drink is provided.

Other studies reported that residents often restricted the fluids they consumed to avoid incontinence [1], this was also reported in our previous work where the residents mentioned toileting issues prevented them from drinking adequate amounts [7]. However, during this study, we did not observe the residents refusing the drinks or limiting the amounts consumed due to this reason. In fact, where preferable fluids and appropriate assistance were given, residents tended to consume entire drinks and sometimes requested refills.

A number of key factors influenced the success with which change was embedded into practice and subsequent sustainability of the interventions. These included allocation of staff to activities, availability of stock/equipment, establishing clear communication systems, and leadership of the care team.

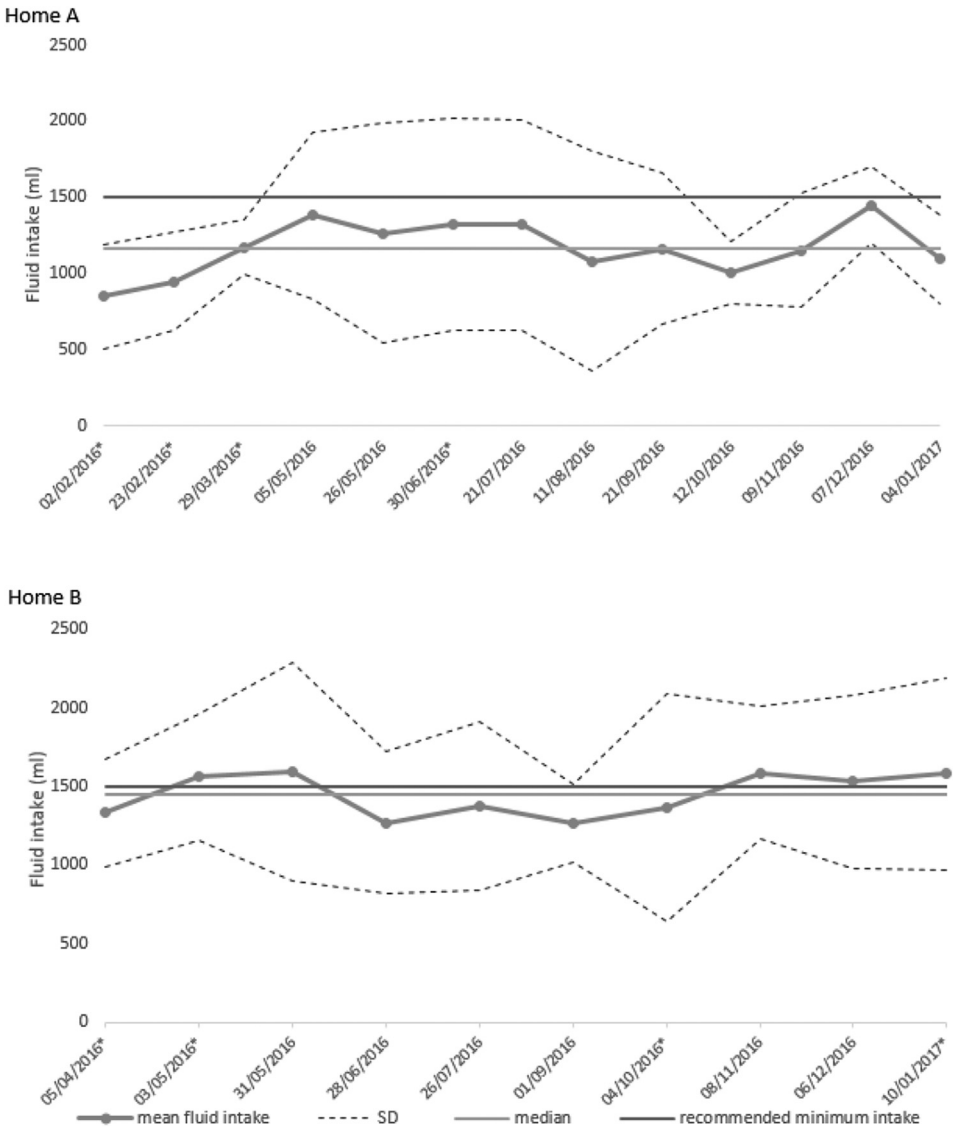

Fig. 3. Run charts illustrating mean fluid intake data from routine observations where four-six randomly selected residents were observed from 6 am to 9 pm. Median was calculated prospectively from the first ten data points. *Observations of less than six residents, this occurred when a resident was taken absent after observations were underway.

The development and utilisation of a staff allocation sheet was central to embedding PDT into the care routines. In both homes, prior to the introduction of PDT, one or two HCA prepared and delivered drinks to all residents. However, two or three drink choices were prepared and no staff were allocated to doing this. There was also no structure for supporting residents to consume the drinks given. Assigning each HCA a specific role during PDT encouraged teamwork and directed HCA time to actively helping in drink distribution and supporting residents to drink. Furthermore, clear role allocation helped avoid confusion as to which residents had or had not been given a drink.

The consistent availability of supplies and equipment to effectively deliver PDT and the Drinks Menu was problematic in both homes. Problems were context specific with the logistics of having cups, drinks and trolley available in time for 3 pm being key issues in Home A, and issues with availability of the full selection of drinks to equip two trolleys in Home B. These barriers could be avoided by addressing the interaction between HCA and catering staff and developing processes to assign clear responsibility for ensuring equipment is available when required.

Communication between HCA about residents care needs and preferences was observed to be predominantly verbal with residents' care plans rarely accessed by HCA. New staff were more likely to ask established staff about residents' fluid preferences rather than ask residents directly. This was the norm on both units and partly explained the reluctance of HCA to use the Drinks Menu; they assumed they knew their residents preferences. Reliance on assumed preferences resulted in a lack of opportunities at which residents were enabled to exercise autonomy. Assumption of decision-making rather than facilitation is an issue across the long-term care sector [23]. In addition, some HCA demonstrated a lack of confidence in communicating with residents to support decision-making, suggesting specific training is required. The nature and quality of communication and relational networks have been considered as important influences on the implementation of an intervention [24]. Thus, communication issues are likely to have impacted upon the consistent implementation of the interventions.

Neither home had a formal process for identifying residents with low fluid consumption. The relay of information between qualified and unqualified staff about residents' hydration care

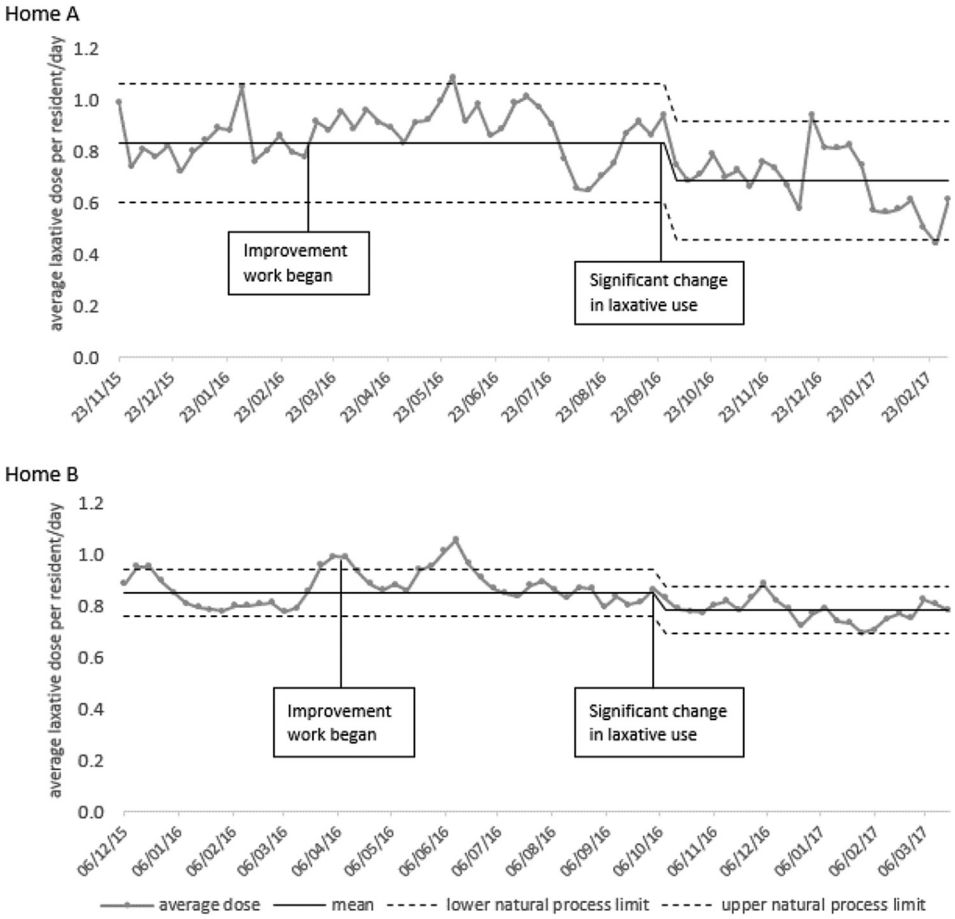

Fig. 4. An XmR chart illustrating average laxative dose per resident per day. Data aggregated weekly as mean daily dose per resident per day.

needs was informal and ad hoc. This, combined with a lack of defined responsibilities for specific residents in relation to hydration, meant that poor intakes went both unnoticed and unaddressed by both HCA and qualified staff. These problems have significant implications for quality of care and have been highlighted in other research [25,26]. This lack of information contributes to the low priority given to hydration in the routine of care delivery and the difficulty in achieving and sustaining optimal fluid intakes. In our study, monthly data on daily fluid intakes was captured by research staff but it was not feasible for one person to capture this data for more than 6 residents at any one time. Simple, accurate methods of monitoring fluid intakes of care home residents are required to support efforts to optimise hydration.

To embed and sustain practice that supports resident hydration, the role of the unit leader is critical. They need to be actively engaged with the HCA to assign, promote, supervise and monitor the relevant tasks to ensure effective hydration care. Role modelling good practice, for example demonstrating how to use the Drinks Menu and supporting the drinks round contributed to an effective PDT. Tyler and Parker [27] also found that teamwork was sustained where managers consistently modelled positive behaviours and attitudes. Presence of a unit manager facilitated the adoption of improvement initiatives as routine practice in Home B. In contrast at Home A, several changes in nurse leadership led to unclear communication of expectations and consequently interventions were not embedded into routine practice. Initiatives are rarely sustained if leadership at both a strategic and operational level is lacking [28]. Our study upholds the findings of previous work which suggests that good leadership at nurse manager level is key to service improvement [29,30].

Turnover of staff was a particular challenge in both units and maintaining a project team within each home required a significant contribution by the academic members of the project team to both execute PDSA cycles and collect data on outcomes. We identified other potential interventions, e.g. more accurate systems for monitoring fluid intake and triggering appropriate carer response together with practical approaches to training that address the knowledge and skills required to support residents' needs and preferences, however, we were not able to fully test these in the current study.

A limitation to this study was the measurement of hydration status of the residents. Since using blood biochemistry to assess dehydration would not be practical or ethical for an implementation study, we used fluid intakes as an indication of hydration status. We also attempted to collect data on the incidence of dehydration, but this was not reported accurately by the staff. Increased external temperature (e.g. summer time) could have been a potential confounder for increasing fluid intake of the residents. However, we found no evidence of the consistent relationship between climatic conditions and increase in fluid intakes. In fact, the highest intakes were observed at end of the project (October–December), which suggests that the increase was due to interventions rather than temperature changes. As this was a small scale study, the results may not be readily generalizable to other care homes or settings. Nonetheless, with local adaptation we were able to introduce these three interventions in two different care homes. Whilst we identified some factors that explained the success of the adoption, it was beyond the scope of this study to identify all possible factors. However, from previous research, it is

evident that care homes with similar resources and demand can provide vastly different experiences of care [31]. We were unable to monitor long-term compliance with the interventions beyond the study period, and thus observed improvements may weaken over time. Other researchers suggest that 'periodic audit and feedback might be necessary for some years to get a practice change established' [29].

This study is a rare example of the application of improvement science in care homes and indicates the flexibility required to design and deliver interventions in such settings. Interventions to optimise hydration that focus on extending opportunities and choice can be effective in increasing resident fluid intake to above the minimum recommended amount of 1500 ml per day. Although changes to standard approaches to care delivery are required to optimise resident fluid consumption, embedding what appear to be simple, essential care activities into routine practice is not easy. Using PDSA cycles to test small changes is an effective methodology to implement new interventions into existing practice. Sustainable change requires strong and effective leadership, with role modelling and mentoring of junior staff, as well as organisational support and teamwork. Our study demonstrates that systematic implementations of simple, inexpensive measures such as at least one PDT a day and a Drinks Menu, provide a pragmatic approach to optimising fluid intakes of care home residents without a significant increase in staff workload. In our analysis of the interventions in the Action Effect Diagram there are also a number of areas needing further research, in particular optimising the design of drinking vessels and monitoring residents at risk.

Statement of authorship

Conception and design of study: AB, ATi, HL, JW, RM.
Acquisition of data: AB, ATi, ATs, CG, DC, JW, HL.
Analysis and/or interpretation of data: AB, ATi, CG, JW, HL.
Drafting the manuscript: ATi, CG, JW.
Revising the manuscript critically for important intellectual content: AB, ATi, ATs, CG, DC, JW, HL, RM.
Approval of the version of the manuscript to be published (the names of all authors must be listed): AB, ATi, ATs, CG, DC, JW, HL, RM.

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Conflict of interest

Authors declare no conflict of interest.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.clnu.2018.07.020.

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