Improving hydration of care home residents by addressing institutional barriers to fluid consumption – an improvement project.

https://doi.org/10.36828/xvqy0488

Improving hydration of care home residents by addressing institutional barriers to fluid consumption – an improvement project.

Agnieszka Bak

A thesis submitted in partial fulfilment of the requirements of the University of West London for the degree of Doctor of Philosophy

Abstract

Background: Older people are at risk of dehydration due to a wide range of age-related physiological changes. Additional conditions such as dementia or physical frailty may contribute to low fluid intakes and further predispose the older people to dehydration. Care home residents are more likely to be admitted to hospital with dehydration, but there are few recent studies that evaluated the amount of fluids that residents consume or the barriers to hydration that they experience. Little is also known about the care they receive and how this may influence their fluid intakes.

Objectives: To assess current hydration care in care homes, identify barriers to drinking adequate amounts and develop strategies to optimise fluid intakes in the older care home residents.

Method: This study was conducted in one care home in London, which provides care to a multi-ethnic population of residents. The exploratory phase used observations, focus groups and questionnaires to determine how drinks were provided and to explore attitudes of staff and residents towards hydration care. The intervention phase used Model for Improvement framework to identify and test strategies to improve hydration for the residents.

Results: Observations revealed that most residents consumed less than the recommended minimum of 1500ml of fluids. Hydration was not seen as a priority, and this resulted in several barriers that prevented staff to provide sufficient fluids, and the residents to consume them. Interventions were designed to overcome these issues and included: increasing the number of drink opportunities, improving preference compliance and introducing a new drinking equipment. During the testing, most interventions resulted in the residents consuming more fluids, but sustaining these interventions was difficult. Barriers to sustainability included poor leadership and task-oriented work culture.

Conclusions: This study demonstrated that fluid intakes in care home residents are suboptimal. This is mostly due to insufficient number of opportunities for the residents to obtain drinks as well as not receiving adequate assistance and preferred drinks. Interventions which target these barriers have a potential to increase fluid intakes. Care homes need to implement appropriate strategies, but this requires organisational commitment with support from senior managers and strong leadership at operational level.

Key words:

Care homes, dehydration, fluid intakes, improvement science, older people

Acknowledgements

There are many people I would like to thank for all the support, guidance and patience that they have given me throughout this PhD.

Firstly, I would like to thank my research supervisors, Amalia Tsiami, Heather Loveday and Jennie Wilson. You have provided me with a continuous guidance and invaluable advice throughout the project. Heather, thank you for being a tremendous mentor and for all the opportunities you have given me to develop my academic persona. Jennie, thank you for your patience with the countless drafts I produced, I could never have finished without all your feedback. Amalia, you have been more than a supervisor, you have helped me to go through the worst with the feeling that this PhD will one day come to an end. I would also like to thank Andy for the help with statistics. I have learned a lot, but I must have tested your patience more than once.

Special thank you goes to the whole team in the Richard Wells Research Centre, especially Hannah, Carolynn and Ali who have double-checked data analysis and proofread my work so many times. Maddie, while you were not my supervisor, I think of you as my mentor who has provided enormous mental support and kept my morale up.

I would also like to thank my family and friends who have been such empathetic listeners over these last few years. I am particularly grateful to my partner Dave who had to deal with a lot of housework left undone and my not so pleasant moods at times, and my mother for all the enthusiastic encouragement she has given me. Alex and Allie, you have provided a listening ear when I needed someone to talk to, and Chris, for believing in me before this PhD even started. Finally, Sophie I am so grateful for you always being there.

A big thank you for all staff, residents and families in the Grange care home who opened their doors and hearts to me, and without whom this research would never have been possible. I am especially grateful to the residents who have devoted a lot of their time to make this work better.

Lastly, I would like to thank everyone at NIHR CLAHRC NWL for providing me with funding and the advice on leading improvement projects. The Improvement Leader Fellowship was as much fun as a valuable experience and I am grateful to be a part of it. University of West London has covered my student fees and bursary, for which I am also thankful.

Funding statement:

This study presents independent research partially commissioned by the National Institute for Health Research (NIHR) under the Collaborations for Leadership in Applied Health Research and Care (CLAHRC) programme North West London. The views expressed in this publication are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health.

A Bak received travel expenses and registration fee from Danone Nutricia Research to attend the 2017 Hydration for Health Scientific Conference.

Table of Contents

Definition of terms used in this thesis

Care home: this is an umbrella term that describes nursing and care homes. Other terms used outside UK include long-term facility and veteran's home. In this thesis a term 'care home' is used, except when discussing results of other studies.

Dehydration/underhydration: these terms are often used interchangeably to define the state of insufficient volume of water in the body. The term 'dehydration' is used clinically where the subject is formally assessed by validated tools. In this thesis, formal assessment was not conducted, hence the term 'underhydration' has been used.

Healthcare professional: refers to a person working in healthcare services. In this thesis this particularly concerns external healthcare professionals including allied health professionals such as dieticians, doctors and pharmacists.

Hydration care: for this thesis this is defined as any part of the care that helps residents consume fluids. This may include drink provision, assistance or asking if residents would like a drink.

Older person: concerns a person of 65 years or older. Other terms used in literature include terms: 'old', 'elderly', 'elder', 'geriatric' and 'senior citizen'. In this thesis, a term 'older person' is used.

Personal care: usually refers to any type of care that satisfies physiological needs of the person. In this thesis, the term includes any care except care related to eating and drinking.

Underhydration/dehydration: these terms are often used interchangeably to define the state of insufficient volume of water in the body. The term 'dehydration' is used clinically where the subject is formally assessed by validated tools. In this thesis, formal assessment was not conducted, hence the term 'underhydration' has been used to highlight that the subjects were likely to be underhydrated, but the dehydration was not clinically confirmed.

List of abbreviations

AC – Activity Coordinator

ADH – Antidiuretic Hormone

AED – Action-Effect Diagram

AKI – Acute Kidney Injury

ANP – Atrial Natriuretic Peptide

BIA – Bioelectrical Impedance Analysis

CF – Contributory Factor

CIHR – Canadian Institutes of Health Research

CH – Care Home

CKD – Chronic Kidney Disease

CLAHRC – Collaboration for Leadership in Applied Health Research and Care

CQC – Care Quality Commission

DBS – Disclosure and Barring Service

ECV – Extracellular Volume

GP – General Practitioner

HCA – Healthcare Assistant

HK - Housekeeper

HLE – Hydration Linked Event

ICV – Intracellular Volume

IS – Improvement Science

ITF – Interstitial Fluid

IVF – Intravascular Fluid

KT – Knowledge Translation

MUST – Malnutrition Universal Screening Tool

NHS – National Health Service

ONS – Oral Nutritional Supplement

PCV – Packed Cell Volume

PDSA – Plan-Do-Study-Act cycles

PDT – Protected Drinks Time

RCT – Randomised Controlled Trial

RN – Registered Nurse

SALT – Speech and Language Therapist

SPC – Statistical Process Control

TA – Thematic Analysis

TBW – Total Body Water

UK – United Kingdom

USA – United States of America

UTI – Urinary Tract Infection

List of tables

List of figures

Chapter 1. Introduction and background to the research

This thesis explores the issue of hydration in older care home residents. By taking a pragmatic approach, this research aimed to understand which barriers prevent older people residing in care homes from drinking, and to test the strategies which were designed to overcome these barriers to optimise hydration of this vulnerable population.

Dehydration in older people is common and occurs more frequently in care home residents than the older people in the community (Wolff et al, 2015). It is a precipitating risk factor for increased morbidity, mortality and hospital admissions and therefore imposes avoidable financial burden on healthcare providers such as the National Health Service (NHS). Dehydration is difficult to diagnose because signs and symptoms are often subtle and unspecific. By the time dehydration is suspected, it is often at a severe stage and other comorbidities are usually present. Hence preventing dehydration should be a principal approach to ensure the health and wellbeing of the residents.

Physiological changes associated with aging predispose older people to dehydration (Begum and Johnson, 2010). Poor physical and cognitive function can further hinder their ability to drink and they may require additional support to consume their fluids (Luckey and Parsa, 2003; Schols et al, 2009). Currently, a commonly held view maintains that hydrating older people in care homes is difficult because they experience diminished sensation of thirst and subsequently consume inadequate amounts of fluids (Begum and Johnson, 2020; Hooper, 2016). A number of interventions have been described where seemingly simple strategies were introduced and successfully improved the hydration status of the care home residents (Spangler et al, 1984; Simmons et al, 2001; Robinson and Rosher, 2002; Mentes and Culp, 2003). These studies provided evidence that optimising hydration in older care home residents was possible, but issues of sustainability made these interventions unfeasible for implementing into practice.

This thesis challenges the opinion expressed by experts that residents refuse to drink by providing the evidence that current daily routines in care homes focus on personal hygiene and therefore contribute to residents' low fluid intakes. Results obtained from participant observations, showed that hydration care was not adequate to meet the needs and preferences of the residents, while the results of the focus groups also demonstrated that staff were not aware how little fluid they provided. By using Improvement science (IS) methodology, a second part of this research attempted to address the problem of hydration by co-designing and testing feasible solutions that could be implemented in any care home. The results demonstrated that increasing fluid intakes was possible, but strong leadership, teamwork and a supportive environment were required to achieve sustainable change.

1.1 Regulation of hydration care in care homes

It has been estimated that there are approximately 11,300 care homes providing care for 410,000 older (over 65 or older) residents (CMA, 2017). For the majority of these residents the very reason that they are placed in in care homes suggests that they are no longer able to care for themselves. In general, this population tends to be sicker and more vulnerable than people of the similar age living in the community. One study reported that over 50% of the older residents have a cognitive impairment (Mentes, 2006a) and two independent studies estimated that 48-63% of residents were either dehydrated or had an impending dehydration (Stotts et al, 2009; Hooper et al, 2016). Being confined to care home premises means that even the most functional residents rely on staff to receive drinks.

Care homes are responsible for providing hydration care as regulated by the Care Quality Commission (CQC). To meet this regulation, care home managers must ensure that all residents are assessed to determine their needs and that sufficient drinks and support are provided to sustain their life and well-being (CQC, 2014). The CQC provides further guidance to the homes (CQC, 2010). However, this guidance is not built on the scientific evidence but is based on the observations of good practice and does not suggest specific interventions that should be put in place. For example, the guidance suggests that the facilities who met this requirement assessed the residents regularly and monitored fluid intakes of the residents at risk. However, what this guidance does not describe is how these residents should be assessed, who should be considered at risk and how the intakes should be monitored. Therefore, there is little information for the care home managers on how hydration care should be managed.

1.2 Overview of the care home sector

The vast majority (95%) of the homes are currently owned and operated by private companies or individual owners, while only a small proportion are run by local authorities (CMA, 2017). However, local authorities commission care from privately run homes for residents who are funded from the social care budget. There are also some privately-funded residents who enter the home without a referral from the local authority. The majority of the care homes are mixed homes, that is they provide care for the state-funded and private residents. The Competition and Markets Authority (CMA, 2017) estimated that approximately 59% of care home residents are state-funded, although some of these individuals pay a top-up fee from their state and private pension. However, the CMA profitability analysis demonstrated that the average fees paid to care homes by the local authorities are below the cost that is involved for caring for these residents (CMA, 2017). This means that for over a half of the individuals residing in care homes, the cost is not fully covered by the state. The majority of the cost is associated with increasing wages.

The quality of care in nursing homes has been under the scrutiny for decades (Werner and Konetzka, 2010). But while it is easy to pass judgement, having no guidance and little resources, these homes are striving to provide sufficient care. Dehydration in particular has been a focus of research and media attention (Hooper and Bunn, 2014) and the above mentioned data on dehydration rates (Wolff et al, 2015) certainly raises some concerns. Considering the lack of guidelines it is difficult to determine what may constitute good hydration care and what barriers influence this aspect of care.

1.3 Preliminary work in care homes

Prior to the research reported in this thesis, preliminary work was undertaken in two care homes, which at the time of data collection, consistently met or exceeded the standards of care as assessed by the CQC. The demographics of the individuals residing in these homes were similar to a typical home caring for older people. The majority were frail older people and approximately 70% of them also had a cognitive impairment. However, the homes differed from many in the sector because at the time of data collection, they were entirely funded by the NHS This meant that both homes had access to resources usually not available to private homes, such as infection control nurses, dieticians, pharmacists, speech and language therapists (SALT) and tissue viability nurses. Due to these unique resources, the care homes were regarded as champions in providing a good quality of care for all residents and were recognised for their high food and fluid provision standards. As reported by the manager in one of the homes, both sites were engaged in a range of improvement projects. Hydration was previously recognised to be a challenge in these care homes and the manager reported that the homes had actively engaged in improving this aspect of care in the recent past. The managers allowed the researcher to conduct two focus groups with the clinical staff to discuss how hydration care was delivered and what made them successful in keeping the residents hydrated.

The results of the focus groups suggested three themes which represented different aspects of hydration care:

- *Systems in place*: Staff recognised many systems were in place which regulated how hydration care was provided. Staff in both facilities reported using a range of assessment tools to identify residents at risk, these included calculating a MUST score, assessing fluid and food intakes from the charts and recording the interactions with the residents so they could reflect on their work. The staff noted that assessment started as soon as the resident first arrived at the care home and continued at regular intervals. There were routine times when drinks were offered to everyone, which ensured that the residents received a sufficient amount of fluids throughout the day. These included mealtimes where drinks were given by the nurses and HCAs, and the times between meals when a trolley with a selection of drinks was circulated around the unit by the housekeepers (early and mid-morning and the afternoon tea). Besides these scheduled times for fluid provision residents were encouraged to ask for drinks or, for more independent residents help themselves to drinks at any time. For the residents who were not able to communicate themselves, or those who were known not to consume enough fluids, more drinks were offered between the scheduled times. The staff also identified that they provided social occasions such as ‘posh tea’ or wine tasting to encourage residents to drink and that they always looked for the new ways to provide additional fluids.

- *Teamwork:* Teamwork in both care homes seemed to be essential to ensure adequate fluid provision. Staff and residents benefited from the in-house access to allied professionals. Dietician and other professional roles were integrated with care provision of nurses and Healthcare Assistants (HCAs). The multidisciplinary teams were seen as essential to daily routines. Participants mentioned that family members were also seen as a part of the team and were encouraged to be involved, especially in food and fluid provision. They also recognised that for the teams to come together, communication was essential.

- *Person centred care:* Participants also reported that meeting individual needs was essential for optimal fluid care. They indicated that the care homes were aimed to recreate an environment of the residents’ own homes and recognised that providing for individual requirements created that experience. This included providing the fluids and fluid rich foods that the residents liked and setting individual fluid intake goals for the residents. To aid the staff, mealtime cards were created; these listed the needs and preferences for the residents and helped the staff identify those who needed assistance with eating and drinking. The staff reported that while they appreciated the importance of understanding and providing for the individual needs and preferences, they also recognised that these could change over time and that it was important to observe the residents for any changes.

The leadership of the care home, although not always voiced emerged as an overarching theme which clearly influenced the way clinical staff provided these three aspects of care. Staff in both homes praised the support they received from managers and the institution as a whole. The manager’s role was not only providing the systems to ensure appropriate care was given, but also actively reminding the care staff about the importance of hydration.

Thus, the findings suggested that hydration care is a complex issue that relies on effective teamwork, communication and appropriate systems in place. To be able to provide a good hydration care, the homes must focus on person centred care meeting the residents' needs and preferences, as well as responding to changes occurring to them. To achieve this, effective leadership is also necessary. The limitation of the focus group is that it represents the opinions of the participants and may not necessarily represent what happens in practice. Additionally the care homes where these focus groups were conducted had access to the resources which are usually out of reach for a typical nursing home. However, these findings helped to inform the first phase of this study by evoking an idealised model of how things should be done. Some questions still remained unanswered, which concerned how the hydration care was provided in a typical care home, where the resources were limited in comparison to the NHS funded institution. These included:

- Do the homes provide care similar to that pictured in the focus groups?
- How do the care homes ensure that they provide sufficient fluids to the residents?
- What are the processes that ensure that the residents receive what they need and want?
- What do the different members of staff think about the hydration care they provide? Do they experience any barriers that prevent them from providing this care to a high standard?
- What do the residents think about the care they receive, and do they experience any barriers that prevent them from drinking?

As a result of the focus groups, the first phase of the study was proposed to answer these questions and enable the development of the next phase where the interventions for improving care could be identified.

1.4 A personal insight into the researcher's positionality

Research is a process which is shaped by the researcher and participants and therefore there is a need to reflect on how these influence the conduct and the outcomes of research projects (Bourke, 2014). A reflexive researcher reviews his/her actions and understands his/her role within the research during the preparation, conduct, analyses and reporting of the findings (Mason, 2002). The following section was written in first person narrative to allow the researcher to reflect on her stance in relation to the context of this thesis.

In the study presented in this thesis, I was the lead researcher under the supervision of my supervisors. My educational preparation included BSc Hons Human Nutrition and MSc Cancer Biology. Both fields are related in that they are positioned between of field of bioscience and biochemistry, the disciplines strongly underpinned by positivist paradigm driven by empiric experiments. I was naturally drawn to quantitative research methods and driven to make decisions based on objective numerical data. I have no professional clinical experience of being a nurse or a doctor, but I had worked in a hospital and several nursing homes as a healthcare assistant before the start of this study. I had some understanding of the challenges of the care homes and because of this, it could be said that I have an ‘insider view’ of working in this challenging setting. The interface between my research training to date and the reality of clinical care often made it challenging to understand the perspectives of the different stakeholders involved in this study.

With a background in nutritional science, I naturally had an inclination to believe that nutrition and hydration was the most important part of the care. My previous experience motivated me to undertake this research because I have frequently observed how this aspect of care was overlooked in a favour of other clinical tasks, and while nutrition was maintained because of the ‘protected mealtimes’ initiative, hydration was frequently not provided. I was also concerned that many healthcare professionals seemed to be unaware of this issue. My scientific background and insider view meant that I had to ‘suspend’ my own perspectives at times during this project in order to utilise IS methods effectively.

Additionally, my position in the care home was unique in comparison to a typical researcher entering the home. My previous experience of working in a care home setting meant that once I entered the study home, I found it relatively easy to navigate the rituals and the hierarchy which were similar to those I encountered before. Despite this, I found myself to be an outsider who was not a part of the team and at least initially was not trusted by care staff. In addition, I sometimes found myself being torn between the staff and the residents, who had conflicting views on how things should take place within the home

Another factor that influenced how the study was conducted was my participation in the Improvement Science Leader Fellowship awarded by the Collaboration for Leadership in Applied Health Research and Care (CLAHRC) in the region. The CLAHRCs aim to translate the results of the research, so the new knowledge can be quickly and efficiently embedded into practice. The collaboration uses the skills, knowledge and expertise of different professionals including researchers, clinicians, managers and service users, to conduct the locally driven improvement projects. The improvement fellowship aims to create future leaders to drive improvement within the NHS. While CLAHRC allows a great degree of flexibility in how the improvement projects are conducted, the use of IS is promoted, and the fellows are encouraged to apply the principles in their own projects. This also influenced the decision to conduct the research in one care home as I was considered a leader 'in training' who should be undertaking their role to learn how to become an effective leader.

Thus, my positionality influenced what I chose to investigate, how I decided to investigate it and which findings I considered the most important. Ultimately my positionality could have affected the conclusions I derived from this thesis. Acknowledging this, I kept a reflexive diary and have frequently shared my observations with my supervisors, the other improvement fellows and CLAHRC researchers while working on this project. In doing so, I believe my findings are a true reflection of what was observed and shared throughout the project.

1.5 Challenges with recruitment

Studies conducted in the care home setting previously reported challenges with participant recruitment (Mentes, 2002; Kayser-Jones, 2003). A major barrier contributing to this problem is that the people residing in care homes are often frail and vulnerable and need protection from a potential abuse (Mentes, 2002). The residents are in a unique position that even though they are 'at home', they have no control over who enters it, and this may make them feel exposed and insecure (Cook et al, 2006). For this reason, the care home managers usually act as gatekeepers who grant access to the home and people who reside in it. However, the care home managers usually have little experience of being involved in research (Brown-Wilson, 2011). Because of this, they may lack confidence evaluating whether the project is ethically conducted and, as a result, they may be reluctant to expose their residents to unnecessary risk. They may also fear that research will result in a disruption of care or in other unintended consequences (Mentes, 2002; Brown-Wilson, 2011). The managers may also be suspicious of researchers because of their fear of being exposed and labelled as inadequate (Kayser-Jones, 2003), therefore they may refuse to participate in order to protect not only their residents and staff but also the reputation of the entire organisation.

In line with this evidence, recruiting a care home for this improvement project was difficult, especially starting from a position of being an outsider. A number of care homes were approached before one was successfully recruited. This was despite following the advice devised by Kayser-Jones (2003) who suggested successful techniques for recruitment, including calling the managers in person to schedule a face-to-face meeting, providing research materials and reassuring them about maintaining the ethical conduct and anonymity. In recruiting for this improvement project, it was found that care home managers were initially interested in participating and saw the value of the project to improving the quality of care, but they either did not respond to further communication or subsequently refused to participate. While the reasons for non-participation were not provided, it is likely that the potential benefits of the improvement project were not sufficient to balance the managers' concerns. A frequent question asked by the care home managers was 'what's in it for us?' Participation in CLAHRC fellowship, which involved a small grant, allowed the researcher to negotiate the entry to a care home by providing a compensation for the time that care home staff spent being involved in the project.

The challenges concerned with recruitment also helped to influence the decision to limit the number of homes involved to one. With the limited human and financial resources as well as the time concerns, it would have been difficult to recruit another home and maintain sufficient level of researcher involvement to operate all the activities.

1.6 Research project aims and objectives

The research question of this thesis was:

> *Can hydration of older care home residents be optimised by determining and addressing barriers that prevent them from drinking?*

The aim of this thesis was to assess current hydration care in care homes, identify barriers to drinking adequate amounts and develop strategies to optimise fluid intakes in the older care home residents.

The literature review (described in more detail in Chapter 2) identified gaps in knowledge that needed to be addressed to achieve the aim of the thesis. These gaps underpinned the rationale for the exploratory phase of this thesis and were addressed by the following objectives:

Objective 1: To explore the staff and resident perceptions of hydration care and establish what barriers they face in providing hydration and consuming adequate fluids respectively

Objective 2: To map the patterns of current fluid provision and identify interventions to optimise fluid intakes in the residents

Objective 3: To test identified strategies for effectiveness and feasibility using IS methodology

Objective 4: To determine whether these strategies increased fluid intakes of the residents and influenced their health outcomes.

1.7 Value of research

This research has the potential to improve the health and quality of life of older people residing in the care home setting. Therefore, the results of this research provide implications for the care home managers and owners, commissioners of residential and nursing care and the organisations that provide or regulate the quality of care provided in this setting. Preventing dehydration and its associated morbidity can also reduce the costs of treatment and hospitalisation, an important outcome for healthcare organisations such as the NHS.

1.8 Thesis overview

The research presented in this thesis is arranged in the following order:

Chapter 2 provides a literature review related to this research. It describes what is currently known about the amounts of fluids consumed by older people and the rates of dehydration in this population. It further discusses the mechanism of water homeostasis, consequences of inappropriate fluid balance and the age-related changes that predispose older people to dehydration. It also provides the detailed description of assessment methods for hydration status and argues why none of them are adequate. The chapter concludes with description of the available intervention studies that intended to improve hydration in the residents.

Chapter 3 presents the theoretical framework for conducting research using IS methodology and the model for improvement framework and describes methods used to conduct and analyse all work included in this thesis.

Chapter 4 presents the results of the exploratory phase of the study, which aimed to establish the barriers to hydration, the type of residents at risk of consuming inadequate fluids and the residents' needs and preferences.

Chapter 5 provides the description of the intervention phase of the study, which aimed to address the contributory factors uncovered in exploratory phase (chapter 4). This chapter was written using SQUIRE reporting guidelines.

Chapter 6 describes the evaluation phase of this research, which intended to assess the effect the tested interventions on fluid intakes and health outcomes, and the consumption of the laxatives and antibiotics of the residents.

Chapter 7 provides an overall discussion of the research findings from chapters 4-6. Chapter 8 discusses is a conclusions chapter which offers recommendations for the care home managers, policy makers and scholars wishing to conduct research in this setting. The chapter also provides the discussion to this work's strengths and limitations, as well as suggestions for future research.

Chapter 2. Literature review

This chapter provides a detailed review of the literature in relation to hydration in older people, with focus on care home residents. It first outlines the importance of maintaining water homeostasis, describes disorders arising from fluid deficit, and provides reasons for inadequate fluid intakes in older people. A further literature review proposes that identification of dehydration in early stages is challenging and that ensuring adequate intakes is the only strategy to prevent the associated morbidity. The chapter concludes with the discussion of the problem of hydration in a care home setting and describes the intervention studies that aimed to address this issue up to date.

Methods for identifying the relevant articles

A systematic search was used to identify relevant studies for this chapter. This involved a three step strategy as recommended by the Joanna Briggs Institute for (JBI) guidelines for conducting systematic reviews: The initial search was conducted in Medline to identify keywords and MeSH terms. The initial terms included: hydration, fluid intake, fluid balance, elderly, older people, residents, geriatric, care home, care home and long-term facility. A second step involved systematically searching Medline, Embase, CINAHL and Cochrane Database for systematic reviews. The last step involved identifying the additional studies from the references of the included papers. The examples of the search strategies are included in Appendix 1. While the systematic search was used to identify the relevant articles, the studies were not intended for the conduct a systematic or a scoping review, therefore there were no inclusion and exclusion criteria applied and no formal methods were used to describe the available evidence.

2.1 Water functions in the body

Human body is mostly made of water. In the euhydrated healthy person the water content can reach as much as 73% of the body mass in new-borns (Guyton, 1976), and naturally decreases with age reaching 65% in young adults and as little as 45% in the older people (Sheehy *et al*, 1999).

Water plays an important part in maintaining homeostatic processes within the body. Intravascular fluid (IVF) is needed for metabolic processes within the cells (Iggulden,

1999) while extravascular fluid (ECF) is involved in transport of waste and nutrients, exchange of gasses and providing a suspending medium for the cells (Raman *et al,* 2004). Water is also important in joint lubrication (Zembrzuski, 1997), regulation of body temperature (Raman *et al*, 2004) and nerve conduction (Shanholtzer and Patterson, 2003).

2.2 Disturbances of water homeostasis in older people

Older people are a particularly vulnerable and predisposed to the risk of water and electrolyte imbalances. Many physiological changes that could affect fluid imbalance have been observed in apparently healthy older subjects. The problem may be further complicated by underlying disease that may accelerate the fluid losses or prevent individuals from obtaining fluids in amounts sufficient to restore water balance.

These sections discuss age related disturbances in water homeostasis. A detailed description of physiology of water homeostasis is described in Appendix 2.

2.2.1 Changes in kidney function

Human kidneys usually start deteriorating at the age of 30, which can result in up to 30-50% of the nephron loss (Begum and Johnson, 2010). The remaining nephrons perform less sufficiently, and their rate of filtration decreases by 10% every decade (Sheehy *et al*, 1999). These changes directly impact the ability to reabsorb solutes and water, resulting in insufficient urine concentration and excessive water and sodium loss (Rolls *et al*, 1990).

2.2.2 Hormonal changes

The diminished kidney results in a decrease in renin production. Renin has an important role of converting angiotensinogen into its active form, angiotensin. Consequently, both angiotensin and aldosterone levels are diminished (Erkert, 1988). Older people have also been found to have increased levels of antidiuretic hormone (ADH), although renal sensitivity to ADH seems to be impaired (Phillips *et al*, 1984). Additionally, there seems to be less ADH produced at night, which results in large amounts of urine production at this time (Asplund, 2004). Therefore, many older people feel more thirst at night, but avoid drinking to avoid toileting or incontinence (Donahue and Lowenthal, 1997; Rittig *et al*, 1989; Asplund, 1992).

However, this action has no effect on amount of urine produced (Asplund, 1991) hence they may unnecessarily put themselves at risk of dehydration.

2.2.3 Diminished thirst

Ability to restore water balance and the perception of thirst in the apparently healthy older people are diminished. A series of experiments showed that older people experience less thirst and subsequently drink smaller amounts of fluids than the younger controls (Phillips *et al*, 1984; Crowe *et al*, 1987; Miescher and Fortney, 1989; Phillips *et al*, 1991). The mechanism of depressed thirst sensation is still unknown but is most likely to occur due to changes in the central nervous system and possibly due to changes in receptors also associated with taste alterations (Rolls, 1990).

2.2.4 Changes in body composition

Ageing is also associated with changes in body composition. A normal trend observed is an increase in body weight and fat mass, following the decrease in weight and fat-free mass at the older age (Going *et al*, 1995), although these alterations occur even if the weight remains stable (St-Onge and Gallagher, 2010). Hence with time, the proportion of fat-free mass decreases while fat mass increases even in the healthy older subjects. The amount of water in muscle cells is much higher (Armstrong, 2005) to support metabolic processes, therefore increased proportion of fat mass results in decline in total body water by as much as 4-6 litres by the age of 80 (Gille, 2010). As a result, in the state of fluid deprivation, the aging body has fewer water reserves and is more likely to become dehydrated.

2.2.5 Other disabilities that impair fluid intakes and homeostasis

The apparent deterioration of homeostatic mechanisms may also be complicated by disease, polypharmacy and cognitive impairment often associated with aging. Some conditions such as Alzheimer’s disease or diabetes increase fluid loss (Miller, 1997; Luckey and Parsa, 2003; Chiasson *et al*, 2003). Other diseases such as kidney or heart failure may require fluid restriction (Ferry *et al*, 2005; Thomas *et al*, 2008; Perren *et al*, 2011). Additionally, many conditions associated with older age result in swallowing difficulties, visual impairment and decline of physical or cognitive status, which may also influence the ability to obtain the fluids and predispose to dehydration (Schols *et al*, 2009).

2.3 Fluid requirements and intakes in older people

It has been estimated that a healthy human body loses about 2500ml of water via urine each day (Ferry *et al,* 2005), further unavoidable losses also occur via faeces, sweat, respiration and evaporation through the skin (Scales and Pilsworth, 2008). This amount must be replenished daily to prevent adverse events. Most water is obtained from foods and fluids consumed, but a small amount is also produced from metabolism (Guyton, 1976). However, water requirements vary between individual people depending on personal characteristics such as the size of the person, the amount and quality of food consumed as well as activity level. Different methods for calculating individual fluid requirements exist based on a person's weight, body surface area, the number of calories or amount of protein consumed (Zeman, 1991), but these are time consuming and sometimes complex to calculate and therefore not suitable for general use. They also fail to take other factors such as ambient temperature and the acute disease state into account.

Experts have attempted to establish the minimum amount of fluids to be consumed daily for maintaining health. Different recommendations exist, but most agree on 1500ml as an absolute minimum (Kayser-Jones *et al*, 1999; Ferry *et al*, 2005). There is no evidence suggesting that the requirement for fluids changes with age, therefore same amounts are recommended for older adults (Benelam and Wyness, 2010).

While the evidence suggests that older people should drink the same amounts as the rest of the population, studies often report that the intakes are much less than those recommended. Only one study reported that free living older people can consume adequate fluid intakes if they have access to variety of beverages (Chernoff, 1994). Another study, which assessed fluid intakes in the older free-living subjects in European countries showed that the intakes varied greatly between the countries, but many consumed less than 1700ml/day (Haveman-Nies *et al*, 1997). It was also observed that females had lower fluid intakes than males and in some countries as many as 50-70% women did not drink the recommended amount. Ferry *et al* (2005) also stated that some community dwelling older people consumed less than 3 glasses of fluid per day. The earliest study documenting insufficient fluid intakes was undertaken by Norton *et al* (1963), who reported that of 18 older patients observed in geriatric unit in an English hospital, only one met the minimum of 1500ml. Similar results were obtained in the study that evaluated fluid intakes of the

US care home residents. The author noted that only three out of 67 residents met 100% of their individual target based on recommendation of 1600ml/m^2 of the body surface area, and that the fluid intakes varied greatly between 833ml and 2863ml/day (Gaspar, 1988). Another study reported that non-institutionalised older people had significantly higher fluid intakes (2115ml) than those residing in care homes (1507ml/day) (Adams, 1988). These figures seem relatively high to those observed in other studies. One explanation for this may be that the subjects were less functionally dependent and with high cognitive status and were reported to be eager to participate in the study, and that the intakes were reported by the subjects themselves. Other research from care homes reported daily fluid intake in care home residents to be 897ml/day (Kayser-Jones *et al*, 1999). Authors reported that the majority of the fluids were consumed at mealtimes and that although average fluids offered with meals were 1200ml, only 610ml was consumed. Authors reported only one resident who consumed more than 1500ml of fluids. Another study, which compared fluid intakes in patients from three different geriatric units (acute, psychogeriatric and long term), observed that the fluid intakes were similar and averaged just above 1000ml for all (Armstrong-Esther *et al*, 1996). The highest fluid intake observed in this study was only 1607ml.

2.4 Consequences of insufficient fluid intakes

This section will discuss different health effects associated with dehydration and/or consuming insufficient amounts of fluid either acutely or chronically.

2.4.1 Dehydration

Dehydration in the clinical setting is commonly described as a decline of total body water, which may or may not be accompanied by electrolyte losses (Thomas *et al*, 2008). Reduced fluid intakes result in an increased concentration of electrolytes and development of hypertonic dehydration (Thomas *et al*, 2008). The hallmark of hypertonic dehydration is a thirst sensation resulting from a high concentration of electrolytes (Mange *et al*, 1997), although this mechanism is diminished in older people. In clinical settings with patients of all ages, dehydration usually develops as a result of acute illness or poorly managed medication and is not usually associated with lack of access to fluids (Thomas *et al*, 2008). However, in older people, acute illness often exacerbates pre-existing chronic underhydration, which was previously undetected (Bennett *et al*, 2004). For some older people water deficits are so great that they suffer from severe dehydration in the absence of acute events. This type of dehydration is sometimes viewed as an indicator of neglect (Himmelstein *et al*, 1983; Hodgkinson *et al*, 2003; Campbell, 2011).

Dehydration is common in the older population. Early reports estimated the frequency of dehydration as 2.25% of all admissions to hospital in the United States of America (USA) (Himmelstein *et al*, 1983) and hypernatraemia as 1.1% of all admissions (Snyder *et al*, 1987). Warren *et al* (1994) reported this to be 6.7% just a decade later. In a recent study assessing older subjects admitted to hospital in the UK, the prevalence of hypernatraemia was 12% in the care home residents and 1.3% in older people living in their own homes (Wolff *et al*, 2015). Another UK study, which screened 200 older subjects admitted to hospital for dehydration (El-Sharkawy *et al*, 2015) reported that as many as 37% of the subjects had blood osmolality indicating hyperosmolar dehydration, but only 8% patients had a clinical diagnosis of dehydration. This study demonstrates that dehydration may be much more common than previously thought and that clinical data may not be reliable. The fact that dehydration is under-recognized amongst hospitalized older subjects has been recognised previously (Vivanti *et al*, 2008). Another study reported that 20% of older patients admitted to hospital displayed symptoms of dehydration (Wallace and Schwartz, 1997); while Mentes *et al* (1999) reported the prevalence to be 33% for those in long term healthcare facilities. Dehydration is also one of the most common reasons older people come to the emergency department (Gross *et al*, 1992).

2.4.2 Disorders of urinary tract

Dehydration is often cited as a risk factor for urinary tract infections (UTI), although the definitive relationship between these two conditions has not been established (Beetz, 2003). Additionally, UTI itself can precipitate dehydration due to presence of fever, sweating and confusion, which could accelerate fluid loss or reduce fluid intakes (Arinzon *et al*, 2005; Matthews and Lancaster, 2011). A few epidemiological studies provide the evidence of the link between fluid intakes and UTI, although most of these studies focused on younger populations and results were confounded by other factors such as poor toileting habits (Wang, *et al,* 2002; Mazzola *et al*, 2003; Stauffer *et al*, 2004; Rudaitis *et al*, 2009). Only two studies focused on reducing UTI in older care home residents. One small randomised controlled trial (RCT) conducted in care homes reported a reduction in the incidence of UTI (Mentes and Culp, 2003), while a small before-after study in similar setting reported no significant change (Robinson and Rosher, 2002). Both studies aimed to encourage the residents to drink more fluids by providing preferable drinks and assistance.

Chronic underhydration, insufficient fluid intakes or decreased urine volume have demonstrated a link between other conditions of urinary tract including kidney stones (Borghi *et al,* 1996; Manz and Wenz, 2005), bladder cancer (Altieri *et al*; Zeegers *et al*, 2004; Manz and Wenz, 2005; Lotan *et al*, 2013), Chronic Kidney Disease (Hebert *et al*, 2003; Torres, 2009; Strippoli *et al*, 2011; Clark *et al*, 2011) and Acute Kidney Injury (Badr and Ichikawa, 1988; Stewart *et al*, 2009; Basile *et al*, 2012). However, these studies were conducted in general populations not limited to older people.

2.4.3 Respiratory tract infections

Respiratory tract infections are common in care homes and often precipitate hospital admissions (Kruse *et al*, 2004). Many of these are also common in subjects diagnosed with dehydration. One study reported that of 23 older patients with dehydration, seventeen presented with at least one infection, and 12 of these were pneumonia (Mahowald and Himmelstein, 1981). A similar study by the same team revealed that 82% of older patients with dehydration had concomitant infection and more than a half of them had pneumonia (Himmelstein *et al*, 1983). Same trends were observed by Warren *et al* (1994) who reported 28.2% prevalence of respiratory infection in the dehydrated older patients. Neither of the authors attempted to identify whether dehydration or infections developed first. Another study also suggested that fluid intake may increase the risk of death due to lower respiratory tract infections in the care home residents regardless of antibiotic use (Szafara *et al*, 2012). Furthermore, in the study of tube-fed patients with persistent vegetative state it was observed that low fluid intake was a significant risk factor for development of pneumonia (Lin *et al* 2007). It therefore seems likely that dehydration is a possible precipitant to respiratory infections and further influences the risk of mortality, especially in vulnerable populations.

2.4.4 Delirium and disorders of central nervous system

It is generally accepted that dehydration is a risk factor for delirium (Thomas *et al*, 2008). It has been estimated that small changes to the central nervous system, often unnoticeable to an untrained eye appear with 1% of fluid loss and become more evident at 5% (Lieberman, 2007). These effects may be more pronounced in those with poor regulation of fluid balance such as children and older populations (Masento *et al*, 2014); although some argue that the link between delirium and dehydration in older people is still elusive (George and Rockwood, 2004). Delirium is a syndrome, commonly precipitated by more than one factor and sometimes influencing fluid intake (George and Rockwood 2004). Studies reported that inadequate fluid intakes were associated with acute confusion in older residents of long-term facilities (Mentes *et al*, 1999) and that those who drank at least four 8oz (about 225ml) glasses of water were less likely to develop acute confusion than those who consumed less than this amount (Culp *et al*, 1997). Voyer *et al* (2009) reported similar findings and concluded that insufficient fluid intake with subsequent dehydration is an independent risk factor for development of delirium in older people in long term care facilities. However, it has been reported that changes in consciousness often remain undiagnosed, especially in those in a hypoactive state or when the person has been previously diagnosed with dementia (Voyer *et al*, 2007).

2.4.5 Constipation

Water adds bulk to faeces and may therefore decrease transit time for excretion. Increasing fluid intake is often a recommended first line treatment for constipation (Popkin *et al*, 2010). Decreased fluid intakes were associated with increased constipation in the older care home residents (Robson *et al*, 2000) but not in free living community dwelling older people (Lindeman *et al*, 2000). However, increasing fluid intakes may only prevent constipation in those in hypohydrated state. For those with chronic constipation and sufficient intakes, increasing fluids has no benefit (Manz and Wenz, 2005; Manz, 2007; Popkin *et al*, 2010).

2.4.6 Falls

Severe hypertonic dehydration may cause hypotension, but a less severe isotonic water loss may have a similar effect. Dehydration may be a reason for hypotension, which itself is a reason for falls (Niemann, 2001), however dehydration may cause other problems such as confusion and muscle weakness, which could be precipitants for falls as well. These three risk factors were significantly associated with risk of falls in older cancer patients (Boler *et al*, 2007), but this association has not been established in other older populations.

Some studies showed that increasing fluid intakes may positively influence the incidence of falls in older populations. In a small before-after study of 51 care home residents, the incidence of falls reduced significantly (Robinson and Rosher, 2002). The Anglian Water project (2009), conducted in two care homes also reported that one of the homes achieved 50% reduction of falls, but this was based on anecdotal evidence provided by staff during the interviews and no attempt was made to measure any of the health-related outcomes.

2.4.7 Death

There is a substantial evidence suggesting that dehydration increases the risk of death in older people, and the mortality may be as high as 40-70% (Kayser-Jones *et al*, 1999). One UK study evaluating outcomes of 200 older people admitted to hospital reported that out of 14 participants who died in hospital, 11 (79%) were dehydrated at admission (El-Sharkawy *et al*, 2015). The study also reported that dehydrated older patients were six times more likely to die in hospital than those who were euhydrated (El-Sharkawy *et al*, 2015). The risk seems to have a long-term effect, as the study also showed that 30-day mortality for dehydrated older patients was significantly higher when compared to those who were not, while another study showed the elevated risk persisted 180 days after the discharge (Wakefield *et al*, 2009). These findings were previously reported by Warren *et al* (1994), who demonstrated that almost 50% of the older people died within a year of being diagnosed with dehydration and almost 20% did so within 30 days of admission.

Concomitant diseases also seem to increase the mortality rate. One study showed that 82% of residents who died due to febrile illness also had underlying hypernatraemia suggesting severe dehydration (Arinzon *et al*, 2005). Similar findings were previously reported in an older study by Mahowald and Himmelstein (1981) who showed that the degree of dehydration was not related to mortality, but the presence of infection increased a risk of death.

2.4.8 Challenges linking dehydration with health conditions

Conducting research linking hydration and other diseases poses a lot of difficulties. Currently, most of the studies are observational in nature and therefore lacking rigour of good quality Randomised Controlled Trials (RCT). On the other hand, conducting well designed RCTs or even observational cohort studies would require at least a proportion of the participants to remain dehydrated. This approach would be unethical, but alternatives limit the options available for research.

Arguably, one of the biggest challenges of establishing the relationship between hydration and the health outcomes is the elusive aetiology of the diseases. Many conditions described above are multifactorial and not necessarily associated with fluid intakes. By the time dehydration is diagnosed, it is frequently present with concomitant conditions and it is not easy to establish which developed first. Another factor is a lack of appropriate measures for hydration status (described in Section 2.6). Many experts believe that there is no gold standard to measuring hydration status (Shirreffs and Maughan, 1998; Kavouras, 2002; Manz and Wenz, 2003; Armstrong, 2007). This poses a dilemma that if hydration status cannot be assessed reliably, associating it with any disease would be even more challenging.

2.5 Measuring hydration status in older people

Measuring hydration status is challenging because of complex dynamics associated with fluid regulation. Water balance is a continuous process of water losses from kidneys, lungs and skin and occasional uptake through oral intakes. Many assessment methods exist, and these were established for different purposes and circumstances such as clinical, academic or industrial settings. There have been numerous attempts to establish the most reliable assessment method that could be used for different settings and for different population groups (Shirreffs and Maughan, 1998; Oppliger and Bartok, 2002; Kavouras, 2002; Shirreffs, 2003; Manz and Wenz, 2003, Cheuvront and Sawka, 2005; Armstrong, 2005), but so far the superiority of any one of these has not been established (Armstrong, 2007).

This section describes the assessment methods which may be potentially useful for identifying underhydration in care home setting. A full description of the assessment methods is provided in Appendix 3.

2.5.1 Bioelectrical Impedance Analysis (BIA)

This method estimates the amount of body water by assessing a conduction of an electrical current sent through the body. The technique has been widely used in the nutrition field to estimate body composition (Shanholzer and Patterson, 2003). It utilizes a mild electrical current that travels between electrodes placed on hands and feet, where resistance of its flow is measured. The higher resistance is expected in the less conductive tissues such as fat, and less resistance in tissues where the current travels easily, e.g. blood and muscles. The obtained resistance is used to calculate water volume.

The technique is cheap, non-invasive and widely available across different settings, but it is not reliable to detect the changes smaller than 1000ml. It has also been shown to be affected by some physiological factors such as dehydration or sweating (NIH, 1994; Armstrong, 2007). The technique however may be more reliable in monitoring the changes in hydration status if used repeatedly on the same individuals in short time intervals (Armstrong, 2007).

2.5.2 Changes in body weight

Daily fluctuations in body weight are almost exclusively attributed to the changes in hydration status because the body has limited ability to utilise adipose tissue for energy (Whitney and Rolfes, 2002). Therefore, day to day change in weight is directly proportional to the amount of water gained or lost. Since one litre equals one kilogram of water, quick calculation of the amount or proportion of TBW changes can be calculated and may provide a quick assessment of hydration status (Dimant, 2001; Nightingale and Woodward, 2006; Lunn and Foxen, 2008). Severe dehydration should be considered if the body weight rapidly decreases by 3% (Hodgkinson *et al*, 2003). However, this method is only reliable for short periods of time during which the potential amount of adipose tissue loss would be insignificant (Armstrong, 2007). Since the body weight is also immediately influenced by the weight of foods consumed, this assessment method needs to ensure that the measurements are taken at the same times during the day, preferably after the first urine voiding and before breakfast, and wearing as little clothing as possible. This method also relies on adequately calibrated equipment, especially if more than one scale is in use. Another limitation for care home setting would be the time consumption required to weigh all residents every day.

2.5.3 Haematological Indices

Many haematological parameters have been used to describe hydration status. Since they are relatively easy to obtain, and require equipment and expertise widely available in hospitals, these are often used in clinical setting. Different haematological indices have been described in relation to hydration and include plasma osmolality, concentration of sodium, urea or albumin and the packed cell volume.

One of the greatest limitations of haematological indices is their poor ability to detect a mild or impending dehydration. This method may be reliable for severe hypertonic dehydration, where reduced fluid volume would result in high concentration of other blood components. However, since the body relies on adequate blood flow to allow for delivery of nutrients and removal of waste products, the body draws fluid from other organs to maintain the vascular tree (Thomas *et al*, 2008). Hence haemoconcentration may not be apparent until dehydration is severe. Additionally, if water losses were accompanied by the losses of salt, this assessment method would not be reliable.

This method of assessment requires trained professionals to perform venepuncture and draw a blood sample; a technique that is seldom used in care home settings. In chronic dehydration, haematological values may climb very slowly as hydration deteriorates, therefore this method of assessment could be used in care homes to monitor residents over long periods of time if routine tests were possible to be performed in this setting (Zembrzuski, 1997).

2.5.4 Urinary Indices

The amount of urine excretion is roughly proportional to the amount of fluid consumed (Armstrong, 2007). In healthy subjects, diluted and concentrated urine is expected with increased and decreased water intakes respectively. This assumption is considered when assessing hydration status using urine parameters, such as urine osmolality, specific gravity or colour. Urine osmolality requires specialist equipment, which is not available in care homes. Dipsticks, which measure specific gravity are easily obtainable, but these are less precise and can be affected by certain disease states as well as the temperature of the environment. Urine colour can also be used, and a urine chart has been developed to aid the assessment of hydration status (Armstrong, 2017). One study that evaluated a urine colour chart in care home residents concluded that this assessment method may be accurate (Mentes *et al,* 2006). Since the toileting is a major component of care delivered in care homes the authors hypothesised that this should also be easy to use, however they found many confounding factors that limited the usefulness of this method, for example certain medications (e.g. B vitamins) and foods could influence the urine colour. Hence, the authors recommended obtaining a few baseline readings of urine for each resident, and when possible taking the urine specimens from the first or second voiding of the day. The authors also reported difficulty in obtaining the specimens from incontinent residents; the limitation that was also described in the study by Rowat *et al* (2011) who reported that despite great efforts to obtain urine from incontinent stroke patients (e.g. squeezing out pads and bedding), many samples were lost.

Additionally, an assumption that the volume and concentration of urine is proportional to the amount ingested may not always be correct, because upon ingestion of large bulk of fluid, the body will attempt to excrete the water overload to reduce the chance of overhydration, even if the body is dehydrated (Armstrong, 2007).

2.5.5 Clinical signs and symptoms

Many signs and symptoms are used in clinical settings to identify people with dehydration. Since they require no equipment and little time, these can be performed routinely in any setting especially since no specialist skills are required. They provide additional benefit of being less invasive than other assessment methods. Commonly used signs and symptoms are provided in Table 2.1.

Physiological and physical signs and symptoms usually have very poor sensitivity and specificity (McGee *et al*, 1999; Thomas *et al*, 2008) and differ between the age groups (Ferry, *et al* 2005; Smith, 2007; Rikkert *et al*, 2009). While clinical signs and symptoms may not be a reliable method to assess hydration status, they may be to suspect water and electrolyte disturbances and prompt clinical investigations for confirmation (Vivanti *et al*, 2008). These could be used for monitoring in conjunction with a series of biochemical data to assess deterioration of hydration status (Zembrzuski, 1997). The greatest limitation associated with assessment of signs and symptoms is that most are subjective and there are usually no ‘normal’ ranges associated with them. They may also be associated with other diseases or normal physiological states.

Table 2.1 Signs and symptoms commonly used to assess hydration status

System affected	Signs and symptoms	Limitations
	Thirst	May be absent or person may not be able to communicate it
Changes in nervous system	Confusion, headache, lethargy, speech difficulty	Often unrecognised or mistaken for symptoms of dementia
Decreased production of bodily fluids	Dry oral mucosa, dry tongue, tongue furrows, small saliva pool,	Medical conditions, medications and breathing through the mouth may result in similar symptoms
Skin	Reduction of axillary sweat, reduced skin turgor (thigh, forearm, clavicle, sternum), sunken eyes	Skin turgor reduced in older people
Cardiovascular system	Tachycardia, hypotension, postural hypotension, decreased capillary refill	Can be affected by other medical conditions
Muscular system	Muscle weakness	Common in older people, even in well hydrated

2.5.6 Fluid charts

Fluid charts capture fluid intakes of the individuals. These are mostly used in settings where hydration care is provided by healthcare workers and are usually applied to the individuals recognised to be at risk of underhydration.

Fluid intakes have also been reported to be inaccurately measured (Callum *et al*, 1999; Mentes, 2006a). Fluid intake measurements are usually imprecise because it takes a great amount of time and commitment of all people involved in fluid provision; these include the subjects themselves, nurses and nursing assistants and often the housekeeping staff and family. One study reported that nurses did not know the volumes of the standard cup or glass (Armstrong-Esther *et al,* 1996) while another showed that staff tended to guess the amounts consumed and often assumed that empty contents meant consumption of the entire drink (Iggulden, 1999). Similar findings were confirmed by Simmons *et al* (2001) who reported that the food and fluid intakes in care home residents were significantly over reported. This is in line with another study performed by Jimoh *et al* (2015) who found no correlation between observed and documented fluid intakes in residential care homes and demonstrated a potential of some residents to complete their own drink diaries. Armstrong-Esther *et al* (1996) also reported that the staff did not think the fluid balance charts were useful in assessing hydration status as they thought they were inaccurate. It is unlikely that the staff would take time to fill the charts appropriately if they believed they were not a reliable tool. While fluid charts have a potential to monitor hydration status; they need a careful consideration of the above limitations. These charts also need to be reviewed regularly if they are to be reliable in identifying people at risk of dehydration; and this task has been often found neglected due to time constraints (Watkins *et al*, 1997; Callum *et al*, 1999).

2.5.7 Challenges to measuring hydration status

As of now, there are no reliable tools to determine hydration status. From a physiological point of view, direct measurement of fluid compartments may be the only reliable method, but it is time consuming, costly and unsafe (Armstrong, 2007). Clinically, dehydration is often diagnosed based on haematological and urinary markers supported by physical signs and symptoms (Thomas *et al*, 2003). The question remains if these are appropriate tools. A recent diagnostic review of 24 studies comparing non-invasive methods of fluid assessment status in older people concluded that neither was reliable when compared to serum osmolality (Hooper *et al*, 2015). However, Armstrong (2007) argues that blood indices do not reflect changes in fluid status either, and that urine markers may be more suitable. It may be so that different markers may be more appropriate for different cohorts of subjects as they reflect different types of dehydration.

Dehydration may appear in a course of days or even hours and a person may quickly develop subsequent life-threatening conditions. The condition is often overlooked in a picture of other issues, often seen by healthcare workers as more important than fundamental need of hydration care. In the light of the evidence that hydration status is not easy to assess, this part of care needs to be taken more seriously and appropriate action to prevent dehydration is required. Preventing dehydration should to be particularly important in settings caring for vulnerable populations such as older people residing in care homes.

2.6 Challenges to providing hydration in care homes

Fluid intakes in care home residents were found to be inadequate in a number of studies (Hart and Adamek, 1984; Gaspar, 1988; Adams, 1988; Armstrong-Ester *et al*, 1996; Kayser-Jones *et al*, 1999). Some reported that up to 99% of the residents were not meeting the minimum recommended amount of 1500ml (Kayser-Jones *et al*, 1999) and most residents were consuming less than 1000ml (Robinson and Rosher, 2002). Kayser-Jones *et al* (1999) reported the mean fluid intake was 897ml/day and that 62.5% residents displayed conditions that could be related to dehydration.

A small observational study performed by Armstrong-Esther *et al* (1994) in psycho-geriatric, long-term-care and geriatric admission units, found that the nurses did not have sufficient knowledge to appreciate the importance of hydration care. Consequently, the older people were consuming much less than the amounts recommended and those who consumed the least were dependent, cognitively impaired or incontinent. Similar issues have been observed in the care home environment. The most comprehensive picture has been obtained by the series of qualitative studies of US care homes by one team (Kayser-Jones *et al*, 1999 Kayser-Jones, 2002, Kayser-Jones, 2009). During the years of research, the authors reported many failures in basic care of hydration and nutrition leading to a national enquiry and changes in legislature. Many issues were still reported to be unsolved (Kayser-Jones, 2009). The main author stated that the issues contributing to inadequate hydration care were poor training, inadequate staffing and lack of supervision (Kayser-Jones *et al*, 1999). She also highlighted the importance of individual care in maintaining adequate hydration and nutrition status (Kayser-Jones, 2002). As of now there is little epidemiological data on dehydration or fluid intakes in the older people in the UK. Qualitative work on hydration care in UK care homes is also currently lacking, but the concerns have been raised (Szczepura, 2008).

Older people residing in care homes are sicker and older than the rest of the population. It could be argued that care home residents are more difficult to hydrate, and many will never meet the recommended amount. The difficulty for some residents to obtain fluids has been recognised before. Transition into a care home is a life-changing event and many people suffer not only from physical or cognitive disabilities that may restrict fluid intake, but also from depression (Weinberg, 1995).

One study also reported that some residents may actively restrict their food and fluid intakes in hope that they would guilt the families to visit more often (Mentes et al, 2006a). These observations prompted another study (Mentes, 2006b), which described seven types of the residents based on their ability and desire to obtain fluids. These roughly fall into three broad categories of those who '*can drink*' but do not obtain enough because of cognitive impairment or because they do not feel thirsty, '*can't drink*' due to physical disability or swallowing difficulties, '*won't drink*' because they fear incontinence or never drunk much and '*end of life*' category. The authors also described the most common characteristics associated with each typology and developed strategies to increase fluid intakes for each type of the resident.

There is a substantial amount of evidence suggesting that the care is less than optimal to ensure hydration of care home residents. Some factors identified so far include little fluid offered between the meals and lack of fluid of choice (Simmons *et al*, 2001), very little water offered with medication (Godfrey *et al*, 2012) and very little time spending helping the residents to eat and drink, especially those with dementia (Hu *et al*, 1986).

2.7 Strategies to increase fluid intakes in care homes

Some studies reported that appropriate fluid management techniques may be a simple and effective way to prevent dehydration as well as associated morbidity in the older population.

Simmons *et al* (2001) reported results of a 32-week study where the intervention consisted of prompting between mealtimes. They demonstrated that 78% of residents increased their fluid intakes by receiving prompts during the day, reliable toileting assistance and social gatherings. Further 21% also increased fluid intakes following the introduction of preferred drinks. It was also noted by the authors that the subjects in the latter group were less cognitively impaired. The improvement in hydration status was apparent with accompanying improvement of hydration markers as well. Research staff actively participated in fluid provision by offering a range of drinks as well as assistance with drinking.

An 8-week randomised controlled study performed in care home residents (Mentes and Culp, 2003) has shown that increasing fluid intake influenced infection rates. The strategies, including 180ml fluid intake with medication twice a day and 'teatime' social events twice a week, were successful in preventing hydration-linked urinary and respiratory infections as well as acute confusion. Despite the baseline characteristics of the intervention group to be less favourable than that of the control group, the infection rates following the intervention were lower in the latter, although not significant. The greatest limitation of this study was a sample size, which did not have enough power for the analysis to be significant. Research staff actively participated in fluid management of the residents as well as in data collection.

A study performed by Robinson and Rosher (2002) concluded that as little as five minutes a day per resident is enough time to ensure appropriate hydration care. The strategies included employing trained assistants to distribute a wide choice of drinks that were visually appealing and created memorable experiences. In this study, the fluid intakes increased, with 53% of the residents meeting the fluid intake goal of 1500ml/day consistently, regardless of cognitive status. The number of residents with TBW lower than normal (as calculated by BIA) decreased from 47% to 6% during the nine weeks of intervention. The remaining 6% of the residents were reported to have a late stage dementia with severe swallowing impairment. The authors also reported significant increase in bowel movement and decreases in the use of laxatives and incidence of falls. However, it was also reported that hydration status started declining following the completion of the study. The authors reported that the drinks were given by hydration assistant whose sole role was hydrating the residents; they also provided cost analysis of employing such an assistant suggesting that the intervention required an additional member of staff to be present.

Another study reported that a simple strategy of providing a choice of fluids frequently together with toileting assistance was effective in improving hydration status as well as reducing urinary incontinence in care home residents (Spangler *et al*, 1984). The intervention consisted of loading a cart with a range of fluids and toileting equipment and visiting each resident’s room at least every 1.5 hour allowing for at least eleven contact episodes during the waking hours (6am to 9pm). At each contact, the aide offered a drink and toileting assistance. Authors reported significant improvement of hydration status as assessed by urine SG as well as decreased incidence of incontinence. However, it was reported that the intervention was supported by the aides from the research team and that care home staff provided this care independently only for the last ten days of the intervention; although authors stated that four months after the project ended the procedures were still in place and hydration status did not decline (data not provided).

These four studies were included in the systematic review by Oates and Price (2017) who concluded that the provision of extra drinking opportunities may be a modifiable factor in hydration care. This suggests this seemingly simple solution coupled with preference compliance and assistance in toileting is effective in increasing fluid intakes of the residents. However, there appears to be a concern regarding sustainability of such interventions. All four studies seemed to rely on employing supernumerary staff to carry out the tasks set by the protocols. This poses an argument whether these interventions can be feasibly implemented in care home setting known to be lacking financial resources. Testing for practicality and acceptability of these interventions in care home environment with the number of staff routinely available is therefore necessary to further assess the feasibility of these interventions.

2.8 Conclusions

Water homeostasis is vital to maintaining optimal health. Older people should consume the same amounts of fluids as recommended for the younger populations, but they experience lack of thirst and their ability to maintain fluid homeostasis is very limited. Therefore, it becomes increasingly difficult for the aged body to maintain the adequate fluid balance. Considering age as well as physical and cognitive impairments are the most important risk factors for dehydration, people residing in care homes are particularly vulnerable. Current methods for fluid assessment in this population are generally not reliable and those that could provide some use are not available in care home setting. Hence there is a need to provide the best possible hydration care to ensure dehydration is prevented. However, evidence suggests that providing this fundamental need is challenging for many care homes. Some strategies to increase fluid intakes in care home residents have been shown effective, but the feasibility of such interventions remains uncertain and therefore research should focus on implementing the best hydration care in practice.

Chapter 3. Methods and study design

The literature review suggested that older people in care homes do not drink enough. This may be due to the combination of physiological changes associated with age, cognitive and physical disabilities, and insufficient hydration care provided by the care homes. Intervention studies demonstrated that increasing fluid intakes is possible, and that change can be achieved using strategies such as increasing opportunities to obtain fluids, preference compliance, and providing assistance with drinking and toileting. However, some studies reported that sustaining these strategies was difficult and this suggests that translating and embedding the interventions into practice requires further exploration.

This chapter situates the research in a pragmatist paradigm and provides a rationale for the use of IS as the framework for the design of the study. The setting for the study, ethical considerations and detailed methods of data collection and analysis for each of the three phases of the study are discussed.

3.1 Pragmatism

Paradigms influence the way one understands and experiences the world and is often referred to as a 'world view' or ontology (Morgan, 2007). Kuhn (2012) defines a paradigm as a set of theories and practices that situate the scientific discipline at a specific period of time and can be viewed as a set of beliefs that underpin epistemology or how knowledge is generated and guide a researcher's actions (Guba, 1990; Guba and Lincoln, 1994). A paradigm therefore frames research questions, and guides the researcher in the choice of methodology, data collection and the analysis and interpretation of the results to reach appropriate conclusions.

The three predominant research paradigms are the scientific paradigm, the interpretivist and the critical paradigms (Scotland, 2012). The scientific paradigm is often referred to as positivism; the ontological assumptions are realist and it proposes that there is one truth that can be verified through empirical examination. This paradigm underpins research in the medical and social sciences (Guba, 1990; Feilzer, 2010). The researcher's role in the inquiry is limited to data collection and interpretation through objective approach and the truth is objective and independent of the researcher who conducts it. This requires the researcher to maintain minimal interaction with the study participants, which may at times be difficult to achieve. Additionally, the obtained results may lack invaluable information as to why the events occur. Factors such as time and space are also independent of empirical inquiry and therefore strip the obtained results from the valuable context.

The interpretivist paradigm, in which the ontological assumptions are relativist suggests that knowledge is subjective and differs from individual to individual; people construct their views of the world based on their experiences and the lessons learnt from them (Guba and Lincoln, 1994). As such, there is no single, objective truth and that every truth expressed by the person is valid and is context dependent (Morgan, 2007). This paradigm underpins qualitative research in the health and social sciences that is concerned with how people experience phenomena.

The critical paradigm has an ontology of historical realism; this world view is that reality is shaped by a range of values that include political, social, cultural and economic phenomena and that these result in power relations that are framed by language and its use. The epistemology underpinning critical realism is subjectivism which suggests that knowledge is socially constructed and influenced by the power structures within society. Research that is framed by the critical paradigm is largely focused on challenging the status quo and changing or empowering individuals or groups.

Due to conflicting ontological stances, there has been a polarised view such that each has been regarded as mutually exclusive (Feilzer, 2010) and the methodologies and methods used in each were usually utilised by scholars from discrete disciplines (Cupchik, 2001). This divide between the paradigm and the resulting separation of the methods has been termed the ‘paradigm wars’, in which the protagonists of each sought to make the case for being the dominant research paradigm (Tashakkori and Teddlie, 1998; Hall, 2012). However, it has been recognised that the knowledge that arises from these paradigms complement each other (Cupchik, 2001) and may, in circumstances where research questions are ‘mixed’ in nature, lead to an emerging world view of pragmatism (Creswell, 2003; Johnson *et al*, 2007).

Pragmatism is fundamentally linked to both the positivist and constructivist approach. It was born as an alternative that bridges the paradigms and enables the researchers to combine methodological approaches (Creswell, 2003; Johnson *et al*, 2007). Pragmatism focuses on the 'practical problems of the real world' (Creswell, 2003; Feilzer, 2010) and is less concerned with the nature of the knowledge itself (Hall, 2012). This paradigm views knowledge as derived from the reality of the world a person lives in and encompasses not only the knowledge deriving from the past, but also what knowledge can be created in the future (Maxcy, 2003; Johnson and Onwuegbuzie, 2004; Morgan, 2007; Nowell, 2015). The knowledge a person has, and how much the person believes this knowledge to be true depends on person's experience and interests (Nowell, 2015). This therefore means that in complex settings, knowing may have different perspectives and as a result, the knowledge may vary between different groups and sometimes may even be contradictory (Morgan, 2010). Pragmatism underpins mixed methods research, which uses multiple methods of data collection to investigate phenomena and arrive at and make conclusions that inform how and why interventions work in context. Mixed-methods research is not without its criticisms; Morgan (2007) argues that a mixed methods approach did not fully utilise the philosophical bases of pragmatism and that this stance is only used to allow for using both qualitative and quantitative data collection methods in a research study. Morgan further argued that the researchers should not only be concerned with 'what' they do, but also 'how' and 'why' they do it. Since research does not occur in a closed environment, it will always have influence on context, and this also needs to be explored.

Healthcare is an example of a complex setting, where service users, clinicians and managers have diverse experiences and perspectives of care and treatment and their opinions on how this care should be provided may differ. Acknowledging all types of truth is the key to understanding a larger, more complex truth, which is a key element of the social interaction within the complex setting (Morgan, 2007; Morgan, 2010). An additional benefit of the pragmatism is its transferability of the findings into other contexts. This differs from the quantitative approach, which produces knowledge that is universal but generic and therefore requires consideration as to how this can be translated to other settings, and the qualitative approach, where knowledge is specific but context dependent and may therefore be not applicable in another setting. Thus, a pragmatic approach is concerned with how useful the generated knowledge would be if it was applied to another context (Morgan, 2007).

This research is underpinned by pragmatism and aims to explore how the interventions identified in the literature review can be successfully embedded into practice in a residential care home setting.

3.2 Rationale for using Improvement Science

Knowledge translation (KT) is necessary to move what has been learnt in research into the context of the setting by adapting the findings into the existing environment (Gibbons, 2008). The KT framework aims to include all the research steps from the inception of the project to its application at the population level (Stratton Johnson, 2005), meaning that the generation of the knowledge and its implementation are not conducted separately. As a result, KT itself helps to define research questions, choose appropriate methodologies, interpret the findings and contextualise them to the real-life problems (Sudsawad, 2007). Thus, by using KT framework, the knowledge that is created addresses the complex problems of the real-life settings, an approach that is underpinned by the pragmatic paradigm. While KT provides a theoretical framework on how knowledge should be generated, it is not concerned with how this knowledge can be utilised to improve care. Improvement Science, which arose from the need to fit the knowledge into practice, addresses this gap by providing methodology that facilitates the translation of the evidence to drive the improvement (Damschroder and Hagedorn, 2011).

Improvement Science takes its approach mostly from the manufacturing industry and aims to reduce poor performance in healthcare (Davidoff et al, 2015). This implies improving health outcomes for the patients, but also being able to manage the capacity and increasing the efficiency of services provided (Koczwara et al, 2018). The specific methods used in IS guide the researcher on how to improve and how to make the necessary changes as efficiently as possible. A number of theories have been identified which focus on what works in healthcare, how to best measure the outcomes and how to disseminate the findings to ensure a positive change (The Health Foundation, 2011). These can be used as stand-alone tools or more commonly are combined to address different issues encountered in improvement. These can include theories that explain the problems, reasoning for development of particular interventions and why they were expected to work, the process of implementing changes and their evaluation. The IS also considers important aspects of the setting before making changes, these include the context, the structure of the organisation, the stakeholders involved and the processes which require change, because it is evident that these factors can help or hinder the implementation of the interventions. (Koczwara et al, 2018). Recently, the IS moved on to encourage the researcher to acknowledge and embrace these complexities and as a result shifted the focus from optimising the outcomes to maximising the learning from the improvement. Subsequently, a set of components were derived which help the researcher explore these complexities and apply them to facilitate the improvement (The Health Foundation, 2011).

Improvement Science was chosen for the research in this thesis because it offers a methodology that guides the researcher though the complexity of the clinical setting. In contrary to the traditional research, it embraces rather than controls the variation, therefore provides real-life solutions to the problems. Additionally, IS allows testing of the interventions on a small scale before they are escalated to the wider context. This allows for the early recognition of which interventions work, allowing for making better decisions and avoiding the waste of resources. This may be especially important to care homes, which often struggle financially and are understaffed. Another benefit is that data collected using IS allows for making conclusions not only about what works, but also about the barriers and facilitators for making it work. This enables the researchers to disseminate the findings and provide solutions to the problems that others can face when conducting improvement projects. A few of the components of the IS have been used to guide the development of the improvement project reported in this thesis.

Model for Improvement

Early improvement research was mostly driven by outcomes and rarely provided the theoretical framework underpinning the work. As a result, most of the studies did not report justification for the interventions and the theory used (Davies *et al*, 2010). Without understanding the theoretical framework, it is difficult to determine how and why interventions fail or succeed, therefore a lack of underpinning theory hinders their dissemination into the wider context. As with other types of research, projects that aim to change practice need to adhere to a theoretical framework, which provides the structure and the systematic approach (Dawda and Raymond, 2016).

The framework chosen for this research is the Model for Improvement (MfI), which has been specifically developed to facilitate the improvement activities into any healthcare setting. The strength of this framework is that it is widely used throughout healthcare and allows for the engagement, education and evaluation. Its underpinning viewpoint is that change is required to make an improvement, but that change does not always result in improvement (Walsche, 2007). This implies that a careful consideration is required to regarding what should be changed and how this change will affect the system. A benefit of using this approach in care homes is that it allows to 'start small' therefore reduces the risk of wasting resources or the end users experiencing adverse events. It also encourages planning and because the principles are relatively simple, it implies that even the individuals with little knowledge of IS can use this approach (Figure 3.1). The model consists of two parts, which are equally important. The first part, which is the 'planning phase' consists of three fundamental questions that represent the aims, measurement and interventions and are known as Nolan Questions or Nolan Approach (Langley, 1996):

- The first question 'What are we trying to achieve?' encourages the users to examine the current processes and focus their action on one identified aim. In this thesis, the aim is to improve fluid intakes and hydration related health outcomes of the residents.
- The second question 'How will we know that the change is an improvement?' links to the measurement and helps to define the outcome, process and balancing measures, which can be captured to monitor the progress for both, beneficial and potential negative effects of interventions. The measures that are relevant to this thesis are fluid intakes of the residents, incidence of dehydration, admissions to hospitals and the incidence of events that could be linked to a poor hydration of the residents. Hence, by increasing fluid intakes and reducing the health outcomes one can anticipate that the changes resulted in improvement.
- The third question 'What change can be made?' concerns the specific interventions that can be designed to directly or indirectly influence the overall

aim. This links to the Process Map and AED diagram discussed in a previous section. One helps identifying the barriers that result in inadequate consumption of fluid intakes and another one helps define these strategies by finding potential solutions to address these barriers.

The second part of the framework enables the execution of the improvement activities using small tests of change, also known as Plan-Do-Study-Act (PDSA) cycles, described in more detail in a section 3.3.2 (Langley, 1996).

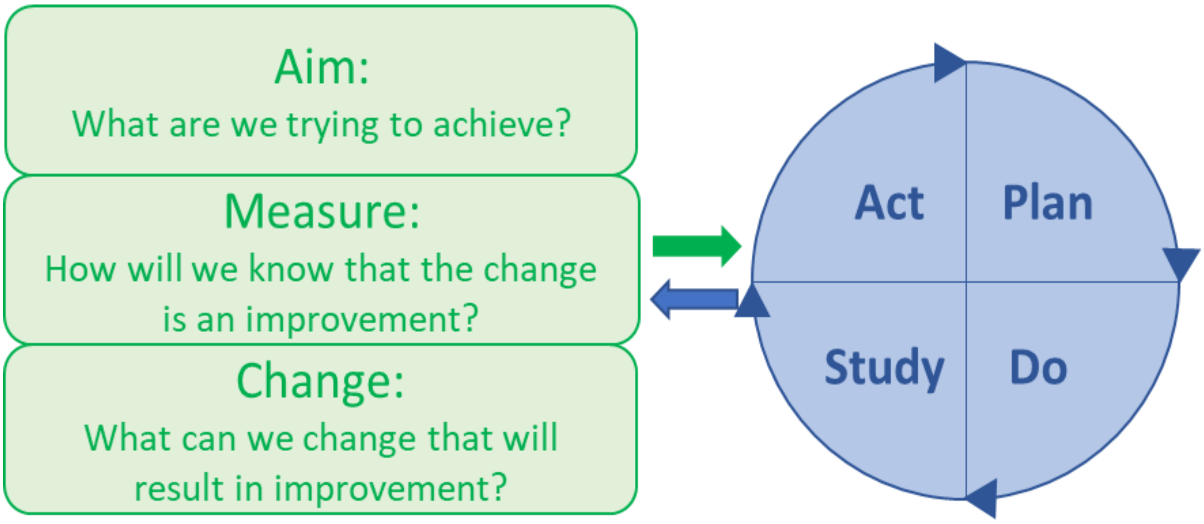


Figure 3.1: *The Model for Improvement framework (Adapted from Langley et al, 1996).*

There are alternative frameworks which are used in healthcare setting. The early improvement work in healthcare setting mostly used the methodologies used in manufacturing industry, which aimed to optimise the outcomes (usually monetary) by improving the quality of the goods provided at the lowest possible cost of production (Boaden et al, 2008). Some of these methods were used as stand-alone tools although sometimes the improvement embraced a whole framework. The most common methodologies adopted by healthcare were derived from the Lean Manufacturing and Six Sigma models (Boaden et al, 2008). Lean Manufacturing principles focus on reduction of waste, defined broadly as any process that does not add value to the end product (Ackerman and Cowan, 2011), while the aim of Six Sigma is to identify and eliminate the roots of special cause variation and achieve a stable performance with variation deriving only from the common causes (Liberatore, 2013). Both frameworks have been used in healthcare and some reports have been positive (Chadha and Kalra, 2012; Medeiros et al, 2008; Jacobsen et al, 2008). However, one systematic review assessing application of either Lean or Six Sigma in a surgical setting reported that the literature is still limited, and the authors could not make recommendations whether the use of these approaches could be justified in healthcare setting (Mason et al, 2015). A particular problem identified by this review was the lack of long-term outcomes of the introduced interventions. The authors reported that only a small proportion of the included studies attempted to assess sustainability. Additionally, neither Lean which focuses on waste reduction, nor Six Sigma with an emphasis on stabilising performance, help in achieving the aims of this project which were translating research findings into practice.

A few healthcare-specific frameworks have also been developed and these aim to improve care. The examples include FOCUS-PDCA, MUSIQ, or FADE (Fathima, 2016). These however were not extensively researched, and their usefulness remains unclear (Fathima, 2016).

Process Mapping

Process mapping is a tool used to describe how specific processes occur (Needy *et al*, 2008). The method was first introduced in industrial engineering and used in the manufacturing industry (Needy et *al, 2*008). The use of process maps in healthcare has been popularised in the last two decades, where it has been recommended as an alternative to audit (Taylor and Randall, 2007; Trebble *et al*, 2010; de Bucourt *et al*, 2012). A simplified example of the process map is shown in Figure 3.2.

Research suggests that process mapping can be useful in improving care by facilitating better communication within the multidisciplinary team (de Bucourt *et al*, 2012), identifying team members' responsibilities (de Bucourt *et al*, 2012), identifying barriers and facilitators (Johnson *et al,* 2012; Hong, 2013) and identifying improvement activities (de Bucourt *et al*, 2012; Johnson *et al,* 2012; Hong, 2013).

The benefit of process mapping is that it aims to seek the input from all stakeholders, so that an accurate representation is obtained of how things 'really are'. In resource limited environments, process mapping offers results in a short session, which provides time and money saving if used as an alternative to observations. However, the results highly depend on the group dynamics during discussion. As with any group work, choosing an appropriate sample for the activity will yield more accurate results. Failing to include some important stakeholders may result in some information being missed and the map not being truly representative of the process. Similarly, including both, the junior and senior members of staff may result in some staff unwilling to share some important information in fear of being criticised. This could result in the staff reporting what they think the process should be or what the senior staff would want it to be like (Trebble *et al*, 2010).

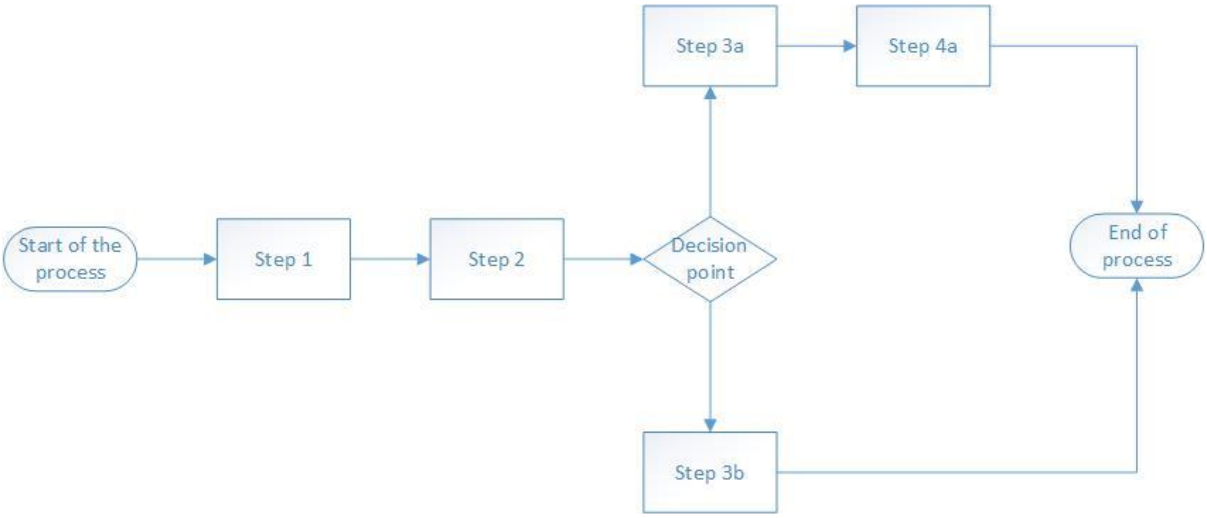


Figure 3.2: *The basic process map diagram. The map is constructed using universally recognisable symbols: oval for start/finish of the process, rectangle for task or activity, diamond for decision point (Phillips and Simmonds, 2013). All blocks are joined by thin arrows representing the process flow.*

It was thought that process mapping would be beneficial to this project for four reasons. Firstly, since the researcher was an outsider to the setting, it was expected that this activity would facilitate building connections with staff and identify those who were particularly interested in improving hydration. It was also thought that constructing the process maps would offer a communication tool for the researcher to interact with staff and residents and brief them about the project. Thirdly, it was hoped that identifying the problems within the processes would encourage the staff to open and discuss the difficulties they faced when providing hydration care to the residents. Lastly, since the process mapping would represent the views of the different stakeholders, it would be less susceptible to the researcher's observation bias. The conventional process mapping is a whole team activity, where all stakeholders discuss the processes and barriers they face (Taylor and Randall, 2007; du Bucourt *et al*, 2012). For analysing, the team can study the process maps and ask questions which will help to understand these processes. These could include:

- Why does this process occur?
- How often dos this process occur?
- How long does the process take?
- What do you do before/after the process?
- Are there any exceptions?
- Do you see how these processes could be changed?

This helps the team identify barriers and facilitators, unnecessary steps in the processes and other issues that the team may not be aware of.

Driver Diagram

Driver diagrams are a tool that help to understand what factors may influence improvement in a given context, therefore help define the interventions (Fathima, 2016). The diagram shows a relationship between the aim of the project and the factors that influence it; hence it enables the project team to consider interventions and plan to test as part of their improvement activities (Muething *et al*, 2012). It helps the project team to stay focused and on course when used regularly during the improvement work (Fathima, 2016).

There are several advantages to using driver diagrams. By constructing the diagram, team members can determine necessary changes as well as possible barriers to achieve them (Fathima, 2016). Once the interventions are identified, the team can recognise the drivers that need to be prioritised or the drivers that could be changed relatively easy and help keep the team motivated (IHI, 2012). The diagram can be used to clearly illustrate the rationale between the actions and the aim of the project as well as making decisions about which action to take up next. The diagram can also help with defining the measures to monitor the progress (CMS, 2013).

A driver diagram was used in this research because, like process mapping, it encourages team building and involves all team members in decision making. As a result, it was hoped that the team would feel more empowered and engaged and therefore would be more receptive to making a change. Additionally, it was hoped that the staff who knew the residents and the context of the care home would have some innovative ideas for the interventions, which could be used later.

A variant of the driver diagram, an Action-Effect Diagram (AED), was used in this study. This method adds further components such as the process and outcome measures and indicates which interventions were previously reported as effective. The AED diagram links to process mapping because many contributing factors as well as the barriers to specific interventions can be identified through this step (Reed et al, 2014). This method was thought preferred to a traditional driver diagram because it helps the team to establish the outcome measures and allows complex concepts to be represented in a one simple diagram (Reed et al, 2014).

It is recommended to construct the diagram early in the project and involve all stakeholders in creating the AED. In this study, the AED session was conducted shortly after the process maps were finished. The stakeholders were identified and invited to participate. An organised session was scheduled for two hours and was supported by an experienced facilitator. The conduct of running the session and constructing the diagram were planned to follow the recommendations described by Reed et al, (2014). The following components were agreed by all the stakeholders, as recommended by Bennett and Provost (2015):

- *Shared aim*: this represents an ultimate goal that the team wants to achieve. This is usually placed on the left of the diagram to encourage readers to start at this point. When read from the left, it answers one of the Nolan questions (Model for Improvement section) “what changes can we make?”; when read from the right it answers the first Nolan question “what are we trying to achieve?”.
- *Contributory factors*: These are factors that directly influence the aim. Some of the contributory factors may be evidence based, while others may be identified through process maps. The purpose of contributory factors is to organise work into themes and identify possible process measures. The

process measures link the AED to the remaining Nolan question: "how will we know if the change is an improvement?". The contributory factors are placed in the middle column.

- *Interventions*: These represent the specific changes that could be made to change the processes. It is hypothesised that these changes influence the contributory factors and subsequently have an effect on the shared aim. The interventions are positioned in the last column on the right
- *Cause effect-chains*: These are the arrows connecting improvement activities, contributory factors and the aim and represent the rationale of using the specific interventions.

There is no need to analyse the diagram, but it is necessary to determine which interventions are the most urgent to test. To be truly effective an AED needs to be revised as the work progresses. This demonstrates the dynamics of environment where resources, cultures and attitudes are various and unpredictable (Bennett and Provost, 2015). Following the learning, any changes such as new ideas, modifications or removal of the ones that did not show a desired effect should be made (Svoronos and Mate, 2011).

Plan-Do-Study-Act (PDSA) cycles

The PDSA cycle was first used by Edward Deming (Bennett and Provost, 2014) as a concept for testing changes to continuously improve quality in industrial settings. It has later been adopted for use in healthcare setting, particularly since the introduction of the Model for Improvement framework (Curnock *et al*, 2012). This methodology has been extensively studied and often recommended for making changes in the healthcare setting (Taylor *et al*, 2014; Bennett and Provost, 2015).

In IS, small tests of change which are done using PDSA cycles are used because it starts by testing ideas on a small scale (such as one staff member, for a short period of time, etc.). This allows experimentation without the risk of disruption and requires little financial input (Hallett and Hewison, 2012). The iterative nature of PDSA cycles allows for adapting the interventions to specific setting. If problems are identified in one cycle, these can be accounted for in the next. This flexibility is important in complex settings such as healthcare (Reed and Card, 2015). As a result, the chain of PDSA cycles allows for introduction of the fit-for-purpose intervention making it more likely to be embedded in practice and sustained over time (Curnock *et al,* 2012). Different interventions can be introduced at the same time and it has been shown that many improvement projects successfully used multiple cycles for making change (Byrne *et al*, 2015). This approach is useful when conducting an improvement project because it does not impose an intervention on staff but engages and seeks their input in its design (Powell *et al*, 2009). Due to the nature of the PDSA cycles, the amount of data collected is usually very small, hence a limitation of this method is the inability to draw inferences on the effectiveness of the interventions. However, this may not be important to the project as the improvement activities are likely to be derived from the existing evidence.

The PDSA method was chosen because it fits with the Model for Improvement framework. Because of its learning through small, iterative cycles, PDSA provided an attractive alternative to a traditional large-scale approach. Since the majority of the identified interventions were reported in previous studies on improving hydration in the care homes, their effectiveness was not needed to be established. Instead, it was thought that the focus needed to address how these strategies could be adapted to fit the context of this care home. To achieve this, there is no alternative to PDSA cycles. Additionally, the cycles provided a greater level of engagement with the front-line staff and it was hoped that by doing so, the PDSA testing would help to establish sustainable changes.

A complete PDSA cycle resembles the scientific method, by formulating hypothesis, conducting a test, analysing data and drawing conclusions. The purpose is to learn as quickly as possible and to make adjustments based on that learning (Reed and Card, 2016). The cycle consists of four stages, which can be repeated for as long as necessary (Speroff and O’Connor, 2004). In this thesis these were conducted as follows:

Plan: The change to be tested was described in this stage. This required a careful consideration of how the change was going to be introduced, such as when and where the change would take place, how long it would last and who was responsible for certain tasks. This also involved a prediction of what might happen during the test. The prediction included the benefits as well as potential barriers and negative outcomes. This was important because it allowed the team to anticipate and plan strategies to overcome the barriers during the testing. To be able to evaluate the effectiveness and feasibility of the change being tested, the plan also included what type of measurement data was going to be collected. This phase, despite being time consuming is one of the most important of all because it influenced how the tests would be carried out. For example, poor consideration of the measures would limit the amount that could be learnt from the cycle or not assigning people to their roles would result in the test not being carried out at all. This would contribute to a waste of time and resources.

Do: This was the execution stage, which involved testing and collection of the data as planned in a previous cycle. As opposed to the traditional experiments, PDSAs test the changes in an uncontrolled setting and even the best predictions may not be accurate. Therefore, a detailed description of what happened during the test was included in data collection.

Study: This stage focused on an evaluation of the previous step. Data were analysed, compared to predictions and to the baseline data. Feedback was collected from staff, residents and family members to seek opinions on the acceptability and practicality of the interventions. Any deviations from the plan were studied for potential barriers to determine the feasibility of the intervention.

Act: This stage focused on drawing conclusions and moving forward. If the data showed that there was no improvement or the intervention was not well accepted, the existing process remained unchanged and the cycle was abandoned. If the data showed the potential for improvement, it initiated another PDSA cycle, to either escalate the intervention into a wider context or to make necessary adjustments. If the intervention was successful on a large scale, it was implemented as a routine. The next *Plan* stage closed the loop of the PDSA cycle.

Stakeholder engagement

Stakeholder engagement is a process of involving people who can be affected by, or those who could influence the improvement project (Bowen et al, 2017). The need for this process arose from acknowledging that the stakeholders have different views and priorities, which can influence the decisions and therefore may determine the success of the improvement project (Concannon et al, 2012). The stakeholders are usually divided into those who have influence and therefore can either facilitate or hinder the improvement activities, or those who have interest hence those who are affected by these activities (Bourne and Walker, 2005). The terms are not mutually exclusive, i.e. there may be some stakeholders who have high influence and high interests at the same time, similarly there may be stakeholders with little influence and interest or anything in between. The principal aim of the stakeholder engagement is that all stakeholders have a chance to influence the decision making of the improvement project (Concannon et al, 2012). This makes the engagement different to a traditional communication which aims to send the message about the decisions after they have been made.

The process of stakeholder identification, known as mapping, involves creating a list of all people who fit the criteria of a stakeholder. These can then be categorised based on their level of influence and interest (Bourne and Walker, 2005). These categories determine how these stakeholders should be handled. This is done in a process known as stakeholder analysis where the needs and concerns of the stakeholder groups are identified (Bourne and Walker, 2005). This then helps the team to plan how the stakeholders can be engaged. This also helps to determine the stakeholder management, which takes steps to change the stakeholders' attitudes and actions if necessary (Bourne and Walker, 2005).

Stakeholder engagement was used in all phases of this research project, although the greatest input was sought during the intervention phase when the stakeholder input was sought for planning the interventions and seeking feedback after they were tested.

Public involvement

Patient and Public Involvement (PPI) in research has become an important activity. Research funders often recommend and sometimes require PPI in all stages of the research from the design until dissemination (Boivin et al, 2018). The NIHR INVOLVE (2019) defines PPI as research being conducted in collaboration 'with' rather than 'to' the members of public. They encourage researchers to actively involve lay members of public in the design of materials, recruitment of participants and data collection. The reasons for including the public is because they offer a different perspective in shaping how the care should be delivered to improve the outcomes and experience of the service users. Some benefits of PPI include better recruitment of the participants to the studies (Crocker et al, 2018), improvement in dissemination of the findings (Froggatt et al, 2016) and even some cost benefits (Wicks et al, 2018). Also, arguably, the most important benefit of PPI is that the created research is relevant and aligned with public priorities (Wicks et al, 2018), which also resonates with the principles of KT.

In the line with the standards of PPI, this research involved a lay member of the public, who volunteered to oversee the project and help with the engagement of the residents and families. Additionally, the lay person was involved in reviewing of the prepared research materials and discussing research findings from the exploratory phase and contributed towards the development of the interventions. While it was not possible for the lay person to visit the home regularly, efforts were also made to ensure the residents and their families were actively involved in the project.

Measurement for Improvement

This method is used to monitor the progress of the improvement over time. These examine the process, outcome and balancing measures that are likely to be influenced by the improvement activities. Process measures relate to the performance and efficiency of the system, which are thought to affect the outcomes. These may include staff compliance or other factors that may make processes more or less efficient. Outcome measures reflect the impact of these processes on the residents. In IS, both the process and outcome measures are important to evaluate impact (McQuillan *et al*, 2016; Dawda and Raymond, 2017). This is because of the pragmatic approach of improvement activities, which aim to evaluate not what works but also how and why. Without the process measures, it would be impossible to determine if the resulting changes were due to the changes in the processes. On the other hand, without the outcome measures, it would be impossible to establish if the changes in processes truly resulted in improvement (Solberg *et al*, 1997). Balancing measures aim to determine undesired outcomes. These are also necessary to ensure that while the improvements are made, there is no deterioration to other important processes and that the improvement itself has no negative outcomes on participants (Dawda and Raymond, 2017).

Measurement for improvement aims to understand the reasons for variation in the data and helps to determine if the changes are sustainable (Perla *et al*, 2011). This method also provides an insight to not only what happens before and after the project but allows the changes to be monitored over time. This can help when learning from the data to make important decisions about processes (Solberg *et al*, 1997; Perla *et al*, 2011). Measurement for improvement was used in the evaluation phase to assess the overall effect of the interventions on fluid intakes and health outcomes.

Statistical power

The term ‘power’ in statistics is the probability of the statistical test to detect an effect, assuming that one exists. It ensures that the probability of not detecting type II error (when one supposes that there is no effect in population when one actually exists) is low. Statistical power can be calculated from the sample size, the probability level at which one accepts that the results are statistically significant (p-value, usually set at 0.05) and the effect. Hence, assuming one knows or expects a certain effect (usually derived from a previous research) and setting the statistical power (usually at 0.8) and the probability level (p=0.05), the required sample size can be calculated. By doing this, the researchers can ensure they recruited sufficient number of participants to detect a significant effect.

Because of the pragmatic approach of this project, the fact that it was conducted in one care home, as well as the time constraints associated with the CLAHRC fellowship, it was thought that it would not be possible to recruit sufficient number of residents to ensure a detection of a statistically significant effect. As a result, the sample size was not calculated. Instead, the majority of the data were presented descriptively. Where feasible, the p-value (considered significant if 0.05 or lower) was calculated but this was interpreted with caution, i.e. when this value was lower than 0.05 it was assumed there was an effect, but when it was above 0.05 it was not known whether this was because there was no effect or whether the sample size was too low to detect it.

3.3 Overview of the research approach

This research was divided into three phases (exploratory, intervention and evaluation), which aimed to meet the objectives outlined in the introduction (Section 1.6). The summary of research phases, their objectives and the methodological approaches used to answer them are shown in Figure 3.3.

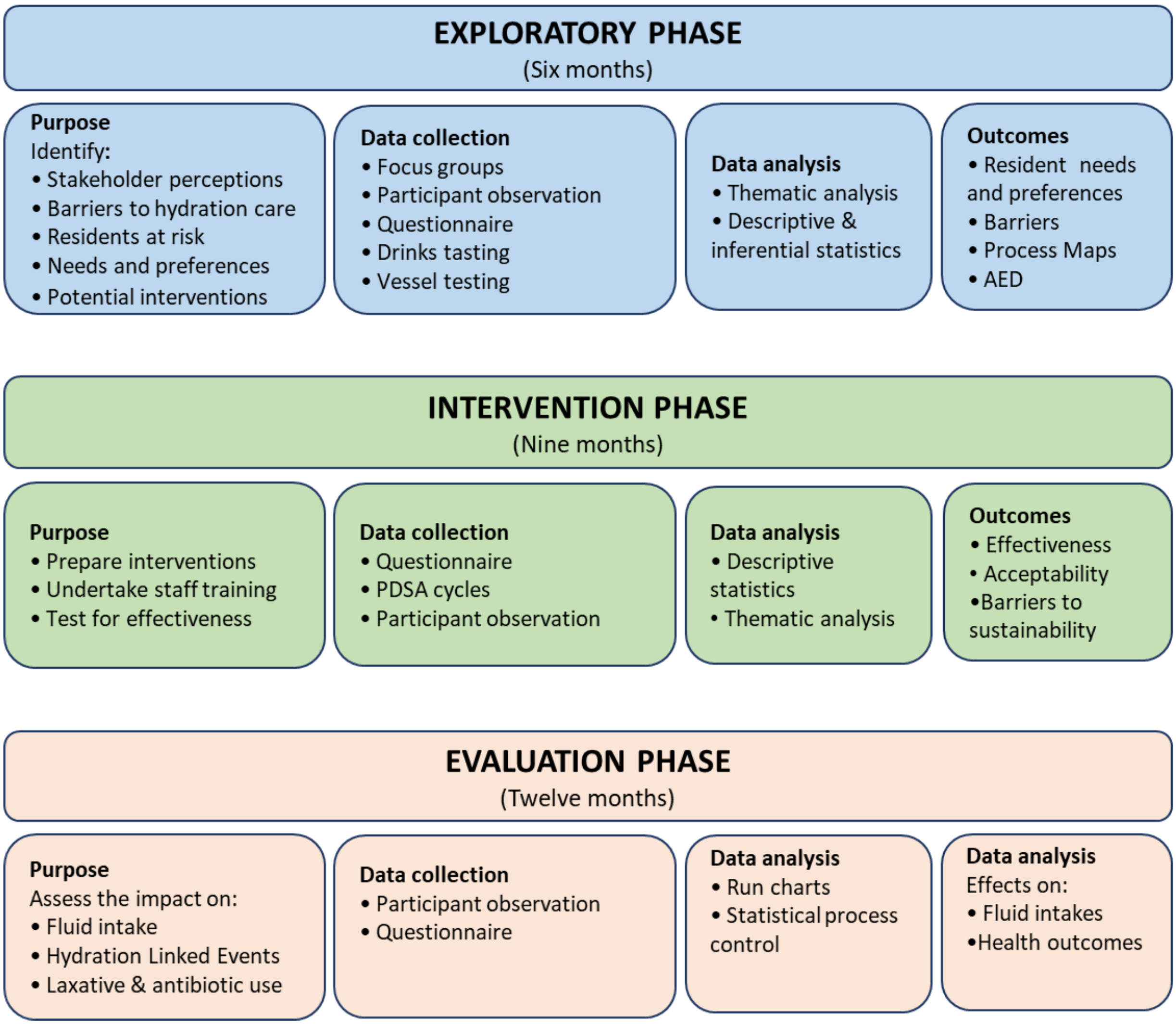


Figure 3.3: *Summary of research phases*

Setting

The research presented in this thesis was conducted in one private care home, which provides accommodation for 160 residents of different levels and types of disability. The home provides 24-hr nursing care and has specialist units for residents with dementia, frail older people and young people with disabilities. The home has eight units specialising in care for different types of residents. The units are spread over three floors with three units on each the ground and first floor, as well as two units, the kitchen and the laundry facilities situated on the second floor. Each unit is equipped with a kitchenette containing a sink, a microwave a refrigerator and a small storage space. The communal areas available to the residents on each unit include two lounges and the dining room. Other facilities outside the units, which are available to all the residents include the café, the activity room and the sensory room. At the time of data collection this care home was given a Care Quality Commission (CQC) performance rating ‘Good’.

Study data were collected on units A (22 beds) and B (25 beds), although occasionally residents and staff from other units were also asked to participate. Both units were situated on the ground floor and both specialised in providing care for frail older people. Occasionally, some residents with mild to severe dementia were also admitted to these units. Since the units were situated on the ground floor, both also have a direct access to the garden. Each unit had two day-time staff teams, who worked according to the schedule alternating weekly. During the day (8am-8pm) the teams consisted of four HCAs and one nurse on unit A and five Healthcare Assistants (HCAs) and a nurse on unit B. During the night both units were staffed with two HCAs and the nurse, all contracted to work only the night shifts. If the unit was short staffed, it was usually supplied with a team member from other areas or occasionally by the agency staff. According to the deputy manager in the care home, there was a high staff turnover and all units were frequently short-staffed.

Unit B served as a main study unit, where most of the research activities took place. Unit A was a pilot site where most of the data collected informed the development of data collection tools, however some qualitative and quantitative data were also obtained and used in this thesis. This unit was also used in the latest stages of the intervention phase with an objective to test the feasibility of implementing the interventions into a wider setting.

3.3.1 Exploratory phase

The purpose of this phase was to address the Objective 1 “*to explore the staff and resident perceptions of hydration care and establish what barriers they face in providing hydration and consuming adequate fluids respectively*” and the Objective 2 “*To map the patterns of current fluid provision and identify interventions to optimise fluid intakes in the residents*”. The summary of the exploratory phase is provided in Figure 3.4. The research was designed to capture the perceptions of different stakeholders, identify residents’ needs and preferences and determine how hydration care was delivered. This helped identifying the barriers that the staff and the residents faced to provide appropriate care and drink adequate amount of fluids respectively. These in turn resulted in creation of Process Maps and Action-Effect-Diagram which informed the design of the interventions. The following sections provide the description of the methods used.

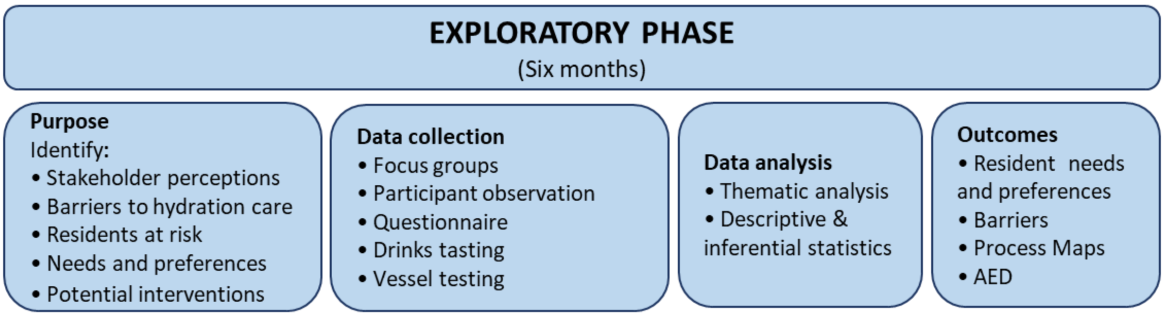


***Figure 3.4**: Summary of the exploratory phase.*

Participant observations

This data collection method aims to gain a holistic overview of phenomenon for a specific setting or group of individuals (Kawulich, 2005). Participant observations derived from the ethnographic work of anthropologists, who used this method to study customs of non-western societies and usually involved living with the group to be studied, learning the language and participating in their customs (deWalt and DeWalt, 1998; Kawulich, 2005). This method was later used and refined for the use by social scientists (Kawulich, 2005). The most beneficial use of participant observations is for the preliminary stages of exploring a new topic. In these situations, it is difficult to find alternative methods to observations. As opposed to focus groups or interviews, participant observations offer invaluable opportunity to discover what really happens, rather than gaining information from the insiders who may be unable to provide such insights or may be more inclined to express what should happen (Dahlke *et al,* 2015). Focus groups and interviews may also be more time consuming, especially if a lot of different participants are interviewed. Additionally, some findings may never be discovered because the researcher would know to ask about them and the participants would not think them important to share. Participant observations can also be used when the knowledge already exists, for example they may provide additional information supporting quantitative knowledge or when discrepancies occur.

The level of researcher’s involvement can be adjusted to the purpose of the research and may range from passive-participation where the researcher is a bystander to the complete participation where the researcher is a part of the group before the study begins (deWalt and DeWalt, 1998). The level of involvement determines the objectivity of the researcher. This needs to be balanced as both the high and low level of participation equally bear the risk of bias. High level participation leads to the loss of objectivity, but for the lowest level of participation the participants are likely to alter their behaviours to reflect what they think the researcher would like to see (McCurdy and Uldam, 2014). The lowest level of participation also does not allow for interaction between the researcher and the study group, such as asking questions or requesting other types of information, which may lead to important knowledge being undiscovered. Another benefit of participant observations is that they allow for a degree of flexibility by using a wide range of research tools such as direct observations, participation in activities, informal interviews, examination of personal data or objects, note taking and reflexivity journals (deWalt and DeWalt, 1998). These tools can be adapted to fit with the aims of the study (Savage, 2000).

In this study, participant observations were used in all phases, although their aims and the level of participation were different in each phase. Participant observations were chosen for several reasons. Firstly, conducting focus groups or interviews only provided the data on opinions and perceptions of those interviewed. With the objective to identify the barriers for the residents to consume adequate fluids, it was necessary to use the observation technique to explore the experiences of residents, which would answer the ‘why’ and ‘how’ questions more accurately. Secondly, because there was little evidence in the literature on how hydration care was delivered. Two studies relied on the information from the staff (Mentes et al, 2006a; Godfrey et al, 2012) while a series of studies by Kayser-Jones et al (1999, 2003, 2009) used observations but only provided qualitative data and captured the care delivery from resident perspective. Thirdly, while focus groups were appropriate for exploring staff perceptions of hydration care, the staff mentioned that the residents may not willing to participate. The residents who were approached for the interviews declined to participate in ‘formal’ recorded interviews, but agreed to share their opinions via short and informal conversations. It is not possible to determine the reason for the resident refusal, but it is possible that considering the various power relationships in the home they were concerned that their care could be compromised. Additionally, the short conversations allowed participation for some residents, such as those with cognitive impairment or with some level of physical difficulty who would not be able to attend the focus groups or the interviews and whose views would otherwise be missed. Hence, the participant observations with a high level of researcher involvement were the best method of data collection for this vulnerable group.

Participant observations were used throughout the entire duration of the exploratory phase, which lasted six months. Initial observations took approximately two months, the development and testing of the data collection tools took four months. Preliminary observations which were used as baseline data for the improvement work were conducted in three non-consecutive days.

Initial observations: Initially, the observations were carried out on unit A and the diary was used to capture the information without any particular order. Data collection took place at different locations and different times including nights and weekends. During this time, the investigator was actively engaged in providing hydration care for the residents on the unit. This approach allowed a close observation of the routines and enabled the investigator to freely converse with the residents and families. These initial observations took approximately two months. Anything that the researcher thought was important in relation to hydration care was noted. These initial observations helped to create other research tools used in the exploratory phase. Following the initial observations, the level of participation was reduced, but still involved some interaction with staff and residents.

Development of the observations tools: Initial field observations identified a need for more structured observations which could be used to capture the data in a more systematic way. The field notes suggested that factors such as the ability of the residents to drink and the location they stayed influenced the amount and type of drinks they drunk. They also identified that the entries on fluid intakes written in the fluid charts were not accurate, which necessitated the creation of the tool that enabled the data collection on individual fluid intakes. This subsequently led to the development of “Mealtime observations”, “Between meals observations”, both created to collect data on all residents and the “Individual observations” data collection tools which aimed to collect data on fluid intakes. The first drafts of the tools reflected the data from the initial field notes which identified potential ‘themes’, mainly issues that could prevent the residents drinking adequate fluids or the staff to provide a good quality of care to the residents. It was then decided how each of these tools could help to understand these issues. For example, to explore fluid preferences, the mealtime and between meals observation tools were designed to answer what type of fluid was provided and whether the residents were asked what they wanted to drink, while the individual drinks captured the data on whether these drinks were ultimately consumed. The testing was conducted on unit A. Using the observation schedules identified a need to collect more quantitative data, reducing the number of pages of each tool and reducing the number of the tools. The two tools collecting the data on all residents during either mealtime or between the meals were combined. The final tool (“Unit-level observations”, Appendix 5), was designed in a way that allowed a capture of information on each drink given before and during the observation, the type of drinks given to the residents, whether the residents were asked about their fluid preferences and what type of assistance they received. While this observation tool did not capture an in-depth information obtained from the previous tools, it provided an important quantitative data on fluid delivery patterns. The final version of the observation form designed for capturing data on fluid intakes of the residents (“Individual observations, Appendix 5) included information on the amount, time and type of fluids served and consumed, the type of assistance given to the resident and the data recorded in fluid intake charts by the staff. Following the completion of the tools, data collection commenced on unit B with no further revisions. To further avoid the risk of bias, triangulation was used, where more than one researcher was involved in observations to ensure consistency in data collection.

Preliminary observations: Following the development of the observation tools, the final stage of observations took place on unit B. The participant observations were still used, but the level of involvement was kept at minimum, i.e. the researcher was still in communication with those observed, but was not actively providing fluids or prompting the staff to do so. This enabled collection of data on patterns of fluid delivery and fluid intakes of the residents. The collection of the data was conducted over three non-consecutive days, with two investigators observing the residents in two shifts (6am-12pm and 12-9pm, because the initial observations demonstrated that no hydration care was provided outside these hours). Two types of observations were conducted. Unit wide observations captured data on all residents who were present in a particular location (e.g. in the dining room, sitting room or their own rooms) for the duration of the observation episode (e.g. throughout breakfast or in the evening). Individual observations captured a more detailed data on a smaller number of the residents. These involved observing individual residents to determine the amount of fluids (including fluid rich foods such as ice cream, jelly or soup) given to the residents, consumed and documented. For this stage of the observations, drinking vessels available on the unit were measured, so the amount served and consumed was estimated based on the volume of the vessel. The time, type and the amount of fluid given were documented when the drink was first served, and the amount consumed was regularly checked until the drink was consumed or removed. If the drink was present at the start of the observations, the amount left in the vessel was recorded as served. When the drink was unfinished at the end of the observation, the remaining amount was recorded as not consumed. Residents selected for these observations included individuals from different categories of hydration typology (Box 3.1) first described by Mentes (2006b) but simplified following the initial observations. The residents included those who stayed in their own room and those who spent their days in communal areas, such as the dining room and the lounge. It was predicted that no more than four residents could be feasibly observed throughout the day and due to time constraints, it was decided that eight residents would be selected for this observation. While this was a small sample, this represented a third of the residents on the unit. The residents were selected at random by the principal investigator, who was given the description of the residents by the nurse before the study commenced.

Qualitative data analysis: Qualitative data were analysed using Thematic Analysis (TA), which is widely used because it provides a rich description of obtained results (Patton, 2002; Taylor, 2014). The advantage of this method is its relative ease of use for researchers less familiar with the qualitative methods, because it provides a lot of flexibility into how it is applied (Thomas and Harden, 2008; Guest *et al*, 2012). The analysis aids organising the data set into patterns (themes) and allows the description of the findings in a rich detail (Taylor, 2014).

Box 3.1: Resident typology

- *Independent:* Can drink independently without support or encouragement
- *Needs Prompting:* Can drink independently but requires encouragement or reminders to consume their drink
- *Needs assistance:* Relies on staff for the provision and consumption of drinks

Since there was a relatively small number of qualitative studies describing hydration care, it was thought that analysing data using TA would be the most appropriate because it can be used for an inductive approach where no pre-existing knowledge is available (Braun and Clarke, 2006). The following six steps to performing thematic analysis were used as recommended by Braun and Clarke (2006):

Step 1 – Familiarisation with the data: This step involved reading and rereading of the data for identification of emerging patterns; comments were written in the document to record initial ideas for the coding. In this study, notes taken during the observations contributed to the initial coding. The document was read a few times before the coding started; at this stage further notes were also taken to aid the analysis and discussion.

Step 2 – Initial coding of the identified patterns: Initial stages involved highlighting the phrases in a word document and attaching the codes if already identified. The highlighted sections were copied into the Microsoft Excel document with a record linking to the initial document, any identified codes as well as comments generated in the first step were attached to the phrases. The remaining phrases were coded as appropriate at this stage.

Step 3 – Searching for themes: The list of codes was copied into a separate Microsoft Excel sheet. The search for the relationships between the codes enabled them to be collapsed into subthemes, and these were eventually categorised into themes.

Step 4 – Reviewing the themes: To ensure accuracy, an independent researcher who was familiar with the data set reviewed the themes and subthemes. Any discrepancies were discussed until agreement was reached. The thematic map was created in a form of table in another Microsoft Excel sheet.

Step 5 – Defining the themes and subthemes: At this stage the themes were named and put in the order they would be reported.

Step 6 - Producing a written report: The narrative description of the themes and subthemes was produced and supported by quotes extracted from the original transcript

Quantitative data analysis: This method is used to turn the numerical records into meaningful data set with the aim to either describe its most important features or establish the associations between the variables, known as descriptive and inferential statistics respectively. The tests widely used in descriptive statistics include measures of central tendency (e.g. mean, median or mode), associated statistical dispersion (e.g. range, standard deviation or variance) and proportions (e.g. percentage). Most of these tests have been used in this thesis to describe data as appropriate. Inferential statistics aim to establish the associations between the variables and to derive assumptions about the population based on a sample tested.

The inferential tools used in this research included:

Pearson Correlation Coefficient: which is a linear measure of the relationship between two continuous variables. The test is parametric, which implies that the data is assumed to be normally distributed (Emerson, 2015). This test was used to determine whether there was a relationship between the amount of fluids served and consumed by the residents.

Spearman's Rank Correlation Coefficient: as Pearson's Correlation, it tests a relationship between two variables, but it is distribution free, therefore is a non-parametric test often used as an alternative. This test can also be used when testing variables on ordinal scale (Spearman, 1904). Spearman's Rank Correlation Coefficient was used to analyse the relationship between different characteristics of the drinking vessels.

Student's Independent t-test: The test measures the means of two independent groups on one continuous variable. The test assumes that the outcome variable depends on the grouping variable with two categories, which means that they divide the sample into two distinctive groups. Since the test is parametric, the following assumptions are made: the data are normally distributed, there is homogeneity of variances, there are no significant outliers, and there is an independence of observations (i.e. one subject cannot fall into both categories) (David and Gunnink, 1997). This test was used to compare if there was a difference in the fluid consumption between the residents who needed assistance and those who did not.

One-Way ANOVA: The test is similar to the t-test but measures the difference in means for two or more independent groups. The test is also parametric and needs to meet the same assumptions (Hassall and Mead, 2018). One-way ANOVA was used to compare fluid intakes between the three different categories of the residents.

Pearson's Chi-Square: The test analyses the relationship between two variables, where the dependent variable is measured on a nominal scale. The data can be tested on two or more independent groups. The test is non-parametric, therefore does not require assumptions associated with other tests (Pearson, 1900). This test was used to compare the number of drinks given to the residents at different locations.

As mentioned above in section 3.2, improvement projects are not designed to achieve statistical significance. Because this improvement project was conducted on a small scale, the sample size was not calculated, and no attempt were made to achieve this. Instead, the majority of the data were presented descriptively. Where feasible, the p-value (considered significant if 0.05 or lower) was calculated but this was interpreted with caution, i.e. when this value was lower than 0.05 it was assumed there was an effect, but when it was above 0.05 it was accepted that it was not possible to draw inferences whether there was no effect or whether the sample size was too low to detect it.

Focus groups

A focus group is a group interview where participants are asked about their opinions, beliefs, knowledge or experiences. Focus groups facilitate the interaction between the participants that allows the researcher to explore the topic in great depth but act more as a bystander than a traditional interviewer (Bloor *et al*, 2001; Orvic, *et al,* 2013). The group work encourages a more natural way of communication in comparison to individual interviews because people behave closer to how they would in the everyday life such as telling jokes and anecdotes, sharing feelings, everyday jargon or the arguments (Powell and Single, 1981). It also allows the interviewees to learn from each other, which results not only in richer data for the researcher, but also an enhanced experience for the participants (Leung and Savithri, 2009).

Focus groups rather than individual interviews were chosen for this study because it was felt that the group discussion would provide the greater insight into the values, shared opinions and common knowledge, and would help in exploring the cultural contexts of hydration care. Capturing the data on culture and opinions was thought particularly important for this research as it was thought it could influence how hydration was provided. It was also thought that the one-to-one interaction could also have made the participants feel inhibited and less likely to share their opinions, although this possibly meant that the individual experiences of the participants were not captured during the focus group. It was also thought that recruiting into the focus groups would encourage more staff to participate, especially since they knew each other. The deputy manager of the care home also felt more comfortable promoting a scheduled, more organised session. The practical aspects of performing focus groups such as the relatively low cost, ease of organising and short time necessary for obtaining data (Reed and Payton, 1997; Beyea and Nicoll, 2000) were also seen as potential advantages for using this methodology.

Some limitations to using focus groups were considered. Firstly, it was thought that this method would feel inhibitory for some participants (Acocella, 2012). However, since the individual experiences were less important because the focus groups intended to explore the culture within the homes and the general attitudes of staff towards hydration care, the inhibition of some participants was not considered to be a major issue. Additionally, to prevent the staff from feeling inhibited, senior members of staff were not invited to join the focus group. Focus groups were used to collect data in the exploratory phase.

Development of the focus group schedule: the potential themes of questions were developed based on the data derived from focus groups described in Section 1.3. Further questions were obtained following the review of the literature and the notes from the initial observations. It was not possible to test these questions with the staff, but they were deiminated within the research team for feedback. The final questions included the following themes (the final version of the tool is available in Appendix 5):

- Current hydration care
- Importance of hydration comparing to other tasks
- Barriers to providing adequate hydration for the residents
- Strategies that help overcome these barriers

Data collection: Participants were the staff who had influence on hydration care of the residents either directly (e.g. HCAs and nurses who were expected to provide drinks and assistance to the residents), or indirectly (e.g. housekeeping and kitchen staff, who were responsible for delivering/clearing the drinks and supplies). All staff across the home who fit the inclusion criteria were eligible to participate. A deputy manager was asked to help with organising the sessions, which took place on the site in the training room during the day shift. Based on a previous experience conducting the focus groups in care homes (described in section 1.3), the intention was to conduct two focus groups lasting approximately one hour each. This was thought to be sufficient to obtain data from a large number of participants. Focus group was audio recorded and transcribed verbatim. Written consents were obtained from all participants, but no demographic data was collected.

Data analysis: Data were analysed using Thematic Analysis. In step one, initial notes were notes were also taken during the conduct of focus groups, which contributed to initial coding. Upon transcribing the recording verbatim, the document was read while listening to the recording and corrections were made as required. The additional notes taken during the focus group were then incorporated into the text.

The file with the transcript and the notes was combined with the file containing data from the participant observations and analysed as described above.

Questionnaires

These are a data collection method where questions are asked, and the answers are completed by either the subject or the facilitator. This research method gained its popularity in the mid-20th century, where it was widely used by researchers in many fields (Willem *et al*, 2014). Due to its ease and convenience of conduction, minimal effort for the data collector, and a potential to return many responses, it has been a preferred, although sometimes overused method for data collection (Boynton and Greenhalgh, 2004; Gillham, 2008; Willem *et al*, 2014). The questions can be open or closed ended depending on the needs of the research (Munn and Drever, 1990). Due to their popularity, most of the participants already have an experience in completing a questionnaire, which is of a benefit to researcher as participants may feel less anxious. Since the responses are usually anonymous, participants are more likely to respond honestly comparing to the face-to-face interviews (Wakley, 2005).

Questionnaires were chosen for this study because they allowed for an efficient way of capturing data from staff and residents. They were used to capture the data for all the stakeholders who were not able to attend the focus groups. These were used during the participant observations to capture the data from the informal conversations. It was thought that this method was easy for the staff because they could be asked to spend a few minutes of time answering questions when it was convenient for them. It was also thought that this methodology would feel less threatening to the residents than a participation in the interviews or focus groups. Hence, it was thought that while the data would be lacking the qualitative depth, this approach would be sufficient to obtain the information on what residents liked and required, and that they would discuss potential barriers that prevented them from drinking. Questionnaires were used throughout the entire project, although the aims and data collection tools were different for all three phases.

In the exploratory phase, questionnaires were used to capture the data from the staff to establish care delivery patterns and residents to capture the barriers they experienced as well as their needs and preferences.

Unit level staff ‘interviews’: The questionnaire captured data on daily routines and logistics of fluid delivery. The word ‘interviews’ is used loosely because these involved the informal conversations with the staff asking them about their routines and clarifying aspects of care that were difficult to observe (Appendix 5). For example, HCAs and nurses were asked about the times they served drinks to the residents, what drinks were given at different times, what happened when the residents wanted the drinks outside these times, how they ensured that the residents were given the drinks they wanted, and how they knew whether the residents were drinking sufficient amount of fluid during the day. Activity coordinators were asked about what type of activities they organised that involved drinking, the type of drinks they delivered, how they obtained these drinks, what happened if the residents were taken for a trip outside the care home and how they communicated what was consumed with the other staff. The catering manager was asked about the logistics of fluid delivery to the care home, how the drinks and supplies were distributed throughout the units and what happened if the residents had unusual needs or preferences. The necessity for the first tool emerged a few days after the commencement of the observations and was even more evident after the focus group. Not being able to navigate the complexities of the care home practices, there was a need to develop a questionnaire that would enquire about staff daily routines. After the initial observation period, the data from the field notes was used to identify potential ‘themes’, mainly asking the staff when they served the fluids, what times were the meals served, how the staff knew what the residents wanted and when they wanted the drinks. The testing of the questionnaire was conducted on unit A, which identified additional questions that needed to be included. It became apparent that to obtain a better picture, there was a need to obtain information from other staff groups, especially the kitchen manager and the activity coordinators. This was because the conversations with nurses and HCAs identified gaps in their knowledge about other people’s roles and because they were not always sure about the processes that existed outside their unit. For example, HCAs identified that drinks and supplies were delivered to the units once a day, but they were not clear on who was responsible for restocking the supplies, which drinks were restocked and when this was supposed to happen. Similarly, the staff on the unit were aware that activity coordinators provided drinks to the residents, but they were not sure whether this happened regularly. This prompted an addition of the set of questions for the catering manager and the activities coordinator. The final version included a set of questions related to the times when drinks were usually served, who was responsible for ensuring that residents received drinks, how the residents' fluid intakes were monitored, what happened to the residents who had special requirements, how the staff knew what the residents wanted to drink, how the drinks were delivered to the home and unit and what supplies and facilities existed to support staff with providing drinks to the residents. The final version of the "Unit-level staff questionnaire" is available in Appendix 5. Following the completion of the tools, data collection commenced on unit B. No further revisions were necessary. The questionnaire was constructed so that the open questions were used when possible. Verbal consent was provided by all staff who participated in this data collection.

Resident needs and preferences: The need for this questionnaire was identified following the early conversations with the residents and their families. It was observed that many residents were willing to discuss hydration care but were not willing or were not able to participate in formal interviews. The feedback from the staff also indicated that the residents were not likely to participate in focus groups or interviews. Thus, it was essential to develop a tool that would enable to systematically record the conversations with the residents and enable them to express their views. Additional benefit was also that different types of the residents, some of whom may not have been able to attend the formal interviews were able to participate. Initial conversations identified areas of hydration care that were important to the residents, for example the type and the quality of the drinks served and the issues that could prevent the residents drinking adequate fluids. The literature review and the focus groups described in chapter 1 also prompted questions about whether the residents' preferences changed depending on the occasion or the time of year and whether they were worried about toileting. Upon testing the questionnaires on unit A, conversations with the residents and their families identified that some residents did not always receive the drinks at the times they wanted and that they could not always handle the drinking vessels they were given and the question asking this was added to the final questionnaire (Appendix 5). The final version enquired about what the residents liked to drink, whether their preferences changed during the day or with different seasons, how the toileting and the fear of incontinence affected their fluid intakes, whether they enjoyed drinking and if their drinking habits changed since they have arrived in the care home. Following the completion of the tools, data collection commenced on unit B. No further revisions were necessary. Open questions were used for collecting these data, and the participants were prompted with the closed questions if they had any difficulty answering. Verbal consent was provided by all residents and family members who participated in this data collection.

Drink preference testing: This was undertaken following the observations and conversations with the residents, where it was evident that there was little information regarding fluid preferences. The literature review did not identify which drinks residents like to consume, although a few studies mentioned that older care home residents did not like drinking water. Additionally, no studies explored the fluid preferences of this population in a systematic way, hence it was thought it would be beneficial to conduct the drink tasting with the purpose of informing the care home about which drinks should be stocked, so the range of drinks available would be in line with residents' preferences. Since all residents expressed a strong desire to drink either coffee or tea, it seemed unnecessary to explore these preferences, but there was a need to explore cold drinks that could be provided to the residents to supplement the hot drinks. It was thought important because when the staff were busy with other tasks, they did not always have time to check on the residents and provide them with a hot drink. Drinks used in tasting were purchased in a local supermarket or obtained from the care home stock if already available. To increase the number of responses, the residents from the entire home were invited. Residents were asked if they were willing to participate every time the drink was offered. If the resident agreed, he/she was presented with 50ml of the test drink as well as 50ml of a control sample. Both samples were provided in identical plastic disposable cups. The control drink was a cold fluid commonly provided in a home that most closely resembled the test drink. The controls available were tap water, orange squash and blackcurrant squash at room temperature, and milk served cold. It was decided to provide them at these temperatures because this was how they would typically be served to the residents. Both samples were given at the same time and the residents were free to choose which they wanted to try first. The residents were not told what drinks were tested. The aim was to obtain a rating from twenty residents for each drink. The drink preference was measured on a five-point scale using a tool based on the methodology described by Pouyett *et al* (2015), which enables the communication with people with cognitive impairment (Figure 3.5). The tool prompted the first question, whether the resident liked a drink. Upon receiving the response, the second question enquired how much they liked (or disliked) the drink. If the resident seemed undecided, the answer marked "neither" was written and the follow up question was not necessary. These questionnaires were designed to collect a numerical response, but if the resident made a comment this was also captured and recorded in the diary.

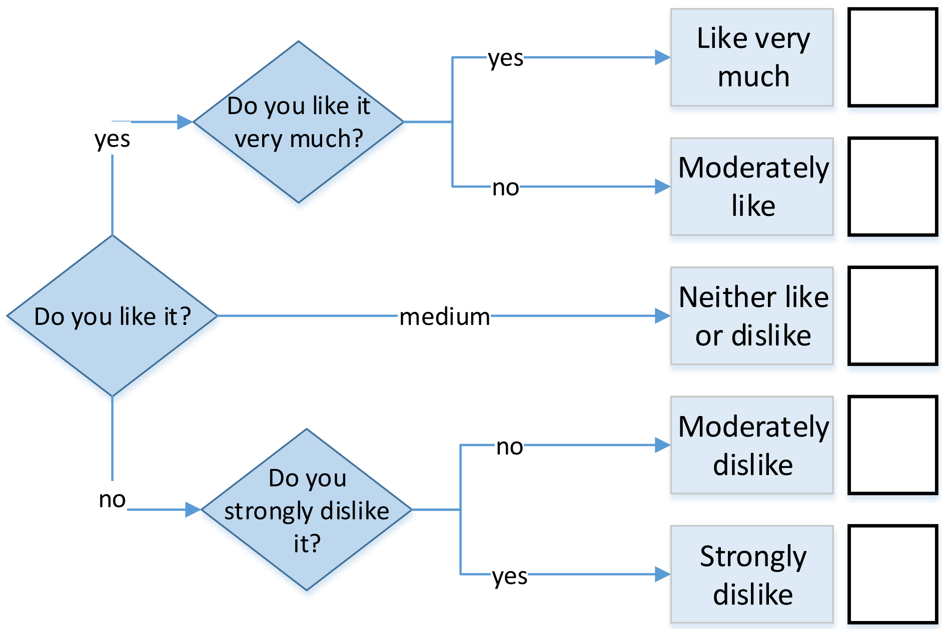


Figure 3.5*: Communication tool that facilitated data collection on fluid preferences.*

Drinking vessel testing: This work was also identified as necessary following the observations and feedback from the residents. As with fluid preferences, the search of existing literature did not identify studies that looked at the importance of adequate drinking equipment, although one study mentioned the potential for using assistive devices (Godfrey *et al*, 2012), while another reported that the use of visually appealing drinking vessels attracted the residents to consume more fluids (Robinson and Rosher, 2002). The purpose of this work was to test different types of cups, glasses and assistive drinking devices to aid independent drinking for the residents. The original list of assistive vessels was produced by surveying three mobility aid websites. The list was created and presented to staff who were asked to choose the ones they thought would be the most suitable for the residents. The researcher and the lay representative have identified a few additional items. The cups chosen for testing represented a range of beakers, double handled cups and mugs and devices that helped to overcome specific problems for the residents (e.g. swallowing difficulty or difficulty tipping the head backwards). The ordinary mugs were purchased from the local stores using the criteria obtained from initial resident feedback, which indicated that the mugs should be relatively light and have a larger handle. Cups and mugs provided in a care home were also included in testing. These included the equipment routinely provided for serving drinks on the unit as well as additional items that were either purchased for the other units by the catering manager or were provided by the family to fit the specific needs of the residents.

To obtain the most reliable results from the appropriate resident groups, the cups were matched based on their potential suitability to the residents' needs, e.g. those residents who did not have much difficulty drinking from the standard equipment were offered the range of cups and mugs, while those with physical impairment were offered a range of beakers and other assistive devices. The cups were introduced to the residents at different points during the day. The resident was asked about the fluid preference suitable to the type of cup offered. Two identical drinks made according to the resident's preference were presented in the test cup as well as the standard cup available in a home. After allowing the resident to have a drink from both vessels (about 15 min), the residents were asked to rate both. To aid data collection for those with cognitive impairment, the questions were asked using the tool inspired by the framework previously adapted for drink tasting. Based on the initial feedback from the residents it was decided that the vessels needed to be assessed on four features, including the ease of handling the cup, the volume, the ease and pleasantness of drinking from it as well as the appearance (Table 3.1). Any additional feedback provided by the resident was also noted. The questions were modelled to fit the data collection by Pouyett et al previously described above. The plan was to test each vessel on at last ten residents. Verbal consent was obtained from the resident each time the vessel was tested. As with the drinks tasting, these questionnaires were designed to collect the quantitative, but if the residents were encouraged to provide an additional qualitative feedback which was recorded in the diary.

Data analysis: Data obtained from the questionnaires were handwritten during the conversations and testing later entered into Microsoft Word and Excel. Qualitative data were combined with the files from observations and focus groups and were analysed using thematic analysis. The quantitative data were analysed and presented using descriptive statistics.

Table 3.1: *Testing the drinking vessels using four features related to handling, feel, volume and appeal.*

How easy do you find to lift/handle the vessel?	**Do you like how the vessels feels when you drink from it?**	**What do you think of the volume of this vessel?**	**How do you like the look of this vessel?**
1 very difficult 2 difficult 3 neither difficult nor easy 4 easy 5 very easy	1 dislike very much 2 moderately dislike 3 neither like nor dislike 4 moderately like 5 like very much	1 much too small 2 a bit too small 3 just right 4 a bit too big 5 much too big	1 dislike very much 2 moderately dislike 3 neither like nor dislike 4 moderately like 5 like very much

Data synthesis

Analysing both qualitative and quantitative data requires a systematic approach to data synthesis. Some of the proposed methodologies for analysing mixed data include data merging (i.e. transforming one type of data into another so it could be analysed either qualitatively or quantitatively), data connection (where one data set prompts the collection of more data in multi-phase projects) and embedding the data (where one set of data is considered to be the primary source and the second set is embedded in the first one to provide additional evidence) (Onwuegbuzie and Teddlie, 2003). In this thesis, the embedding of the data was used. The approach was to report data on fluid intakes first, followed by the explanation of the barriers to hydration by presenting themes obtained from qualitative data and embedding quantitative data where available.

Summary of findings: Process mapping and AED

These were used to summarize the findings from the exploratory phase and guide the planning of the interventions for testing in the next phase.

Process maps: These were constructed by the researcher following the data analysis from the observations, focus groups and the questionnaires. Three process maps were created based on the data available (Appendix 7):

- A general one describing the opportunities to obtain drinks at different points of the day for different locations
- A process of offering and providing a drink at mealtimes
- A process of offering and providing a drink between the meals

Two additional maps were created for mealtimes and between the meals to demonstrate the 'ideal' process for fluid provision. These two maps were intended to be used as a reference when AED was constructed, and interventions were designed. After the maps were prepared, staff, residents and family were approached individually, were guided through the maps and were asked for their views.

Action-Effect Diagram: In line with the recommendations of Reed et al (2014), an organised session took place in the care home. The session intended to involve all stakeholders including managers, clinical staff, kitchen and domestic staff, residents and family, as well as the research team, however no residents or family volunteered to participate. The session was scheduled for two hours with a support from an experienced staff member from CLAHRC.

3.3.2 Intervention phase

The purpose of this phase was to address Objective 3 *"To test identified strategies for effectiveness and feasibility using IS methodology".* The summary of the intervention phase is provided in Figure 3.6. This phase was designed to co-design the identified interventions with the stakeholders, test for their effectiveness and practicality, and identify the barriers that could have prevented their implementation and sustainability. The following sections provide the descriptions of the methods used.

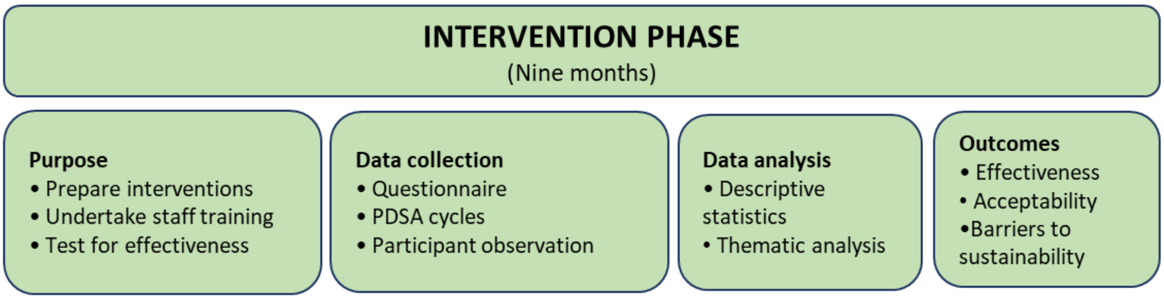


Figure 3.6: *Summary of the intervention phase*

Plan-Do-Study-Act (PDSA) cycles

The PDSA methodology was used for all the improvement activities identified in the AED and tested in the implementation phase. A planning template was designed, which was easy for all to understand for all stakeholders (Appendix 8). The interventions were co-designed with the staff, while the residents, their family and the lay member were asked for feedback. All interventions were tested on unit B, although there was also a brief period when these interventions were disseminated to unit A as a bundle. Hydration posters were introduced across the units in a home to promote the improvement project (Appendix 9). The conduct and the data analysis of the interventions is further described in Chapter 5.

Participant observations

During the testing of different types of interventions, participant observations were used to collect data on fluid intakes during the conduct of the PDSA cycles. These were conducted before and during the *'Do'* phase, which allowed the comparison of the data throughout the cycles. The approach and the type of data differed depending on the purpose and conduct of the specific PDSA cycles, but typically included number of residents, number or type of drinks served and the amount served and consumed. As part of the observations during this phase, the staff, residents and the family were asked for feedback which was studied together with the effects.

Data analysis: Qualitative and quantitative data were analysed using thematic analysis and descriptive statistics respectively. These were previously described in section 3.3.1.

3.3.3 Evaluation phase

The purpose of the evaluation phase was to address Objective 4 "*To determine whether these strategies increased fluid intakes of the residents and influenced their health outcomes"*. The summary of this phase is provided in Figure 3.7. The research was designed to assess whether the introduced interventions had an impact on daily fluid intakes and health outcomes of the residents. In line with the IS principles. The intention was to systematically collect data on fluid intakes and potential markers of hydration status to determine whether introduced changes resulted in sustained improvement. Improvement projects usually aim to derive their measures from data routinely collected in practice, but due to the limitations of the fluid intake charts this was not possible in this project. Data on health outcomes was recorded in the individual care plans and nursing notes making it difficult to retrieve and monitor for all residents. Laxative and antibiotic consumption was the only information readily available from medication charts. Hence, it was necessary to find alternative methods for collecting the relevant data.

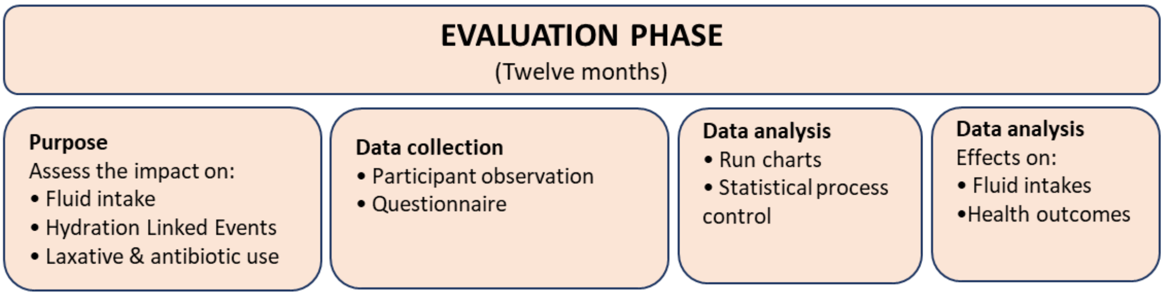


Figure 3.7: *Summary of the evaluation phase*

The list of measures collected throughout the project and the rationale for using them is described in Table 3.2. The following sections describe methods for data collection and analysis associated with each measure. All measurements were collected on unit B, where most of the improvement activity took place.

Table 3.2: Measures used for evaluating the intervention phase

Measure	Rationale	Data collection	Analysis
Fluids served to the residents	To evaluate if the implemented activities resulted in staff offering more fluids to the residents	Participant observations	Run chart
Fluid intakes	To evaluate if the implemented activities resulted in an increase in the fluid intakes of the residents	Participant observations	Run chart
Hydration Linked Events	To determine impact of interventions on health outcomes (UTI, respiratory infections, falls, constipation, delirium and hospital admission)	Questionnaire	Run charts
Laxative use	To evaluate if the interventions prevented episodes of constipation and hence decreased the need for laxative use	Questionnaire	XmR chart
Antibiotic use	To evaluate if the interventions prevented infections and hence decreased the need for prescribing antibacterial therapy	Questionnaire	Run chart
Overhydration	To evaluate if increasing fluid intakes had a negative effect on the residents' health	Questionnaire	-*

** No episodes of overhydration were reported, hence this data is not presented in this thesis. Overhydration was mentioned in this section to evidence that the potential negative outcomes were considered.*

Participant observations

These were carried throughout the project with the approximate frequency of one per four weeks. These were used to obtain data on fluids served to and consumed by the residents. Data were collected using the tools and methods for individual observations in the exploratory phase described above (Section 3.3.1). The only difference was how the residents were selected. Approximately 2 to 5 days before each observation episode, all room numbers were entered into a random number generator (https://www.random.org/), and six residents were chosen. In the morning of the observation day, the investigator had an opportunity to change the room numbers if it was not possible to observe a resident (e.g. in hospital), or if the resident was not suitable for observations (e.g. was exclusively fed by PEG tube or was identified as approaching the end of life). In these situations, an adjacent room with a higher number was chosen. In the event when the resident was not observed throughout the entire day (e.g. the resident was taken to the hospital as an emergency), the resident was excluded from the analysis. Data collected included the typology of the resident, time, type and volume of drink offered, volume consumed, assistance provided, and the volume recorded in fluid intake charts.

Data analysis: In line with the IS methodology, the process, outcome and balancing measures were used to monitor changes in resident fluid intakes. Due to a relatively small number of observation episodes, run charts were used to analyse the data on the amount of fluids served and consumed. Run charts allow visual presentation of the data over time, with x-axis representing the timeline and y-axis representing the quality indicator. The advantage of this method over the traditional before-after tests is that run charts preserve the time order of the data and therefore inform whether the change is sustained over time (Perla *et al*, 2011). Run charts were analysed for significant changes using the following rules:

- Shift – six consecutive points either below or above the median,
- Trend – five or more consecutive points going up or down,
- Run – eight or more points on one side of the median and
- Astronomical point – which indicates an extreme outlier (Langley *et al*, 2009).

Questionnaires

These were created to capture the data on health outcomes of the residents. Two types of questionnaires were designed.

Incidence of Hydration-Linked Events (HLE): Data on urinary and respiratory infections, falls, delirium, constipation, diagnoses of dehydration and the hospital admissions were collectively named HLE. The term was first used by Mentes and Culp (2003) to describe the outcome measures after the intervention. In this his study HLE included incidence of UTI, respiratory infections and delirium. Literature review (Chapter 2) identified that constipation and hospital admissions were also associated with insufficient fluid intakes and it was decided that these should also be defined as HLE. Diagnosis of dehydration was included as it was hypothesised that improved hydration care and subsequent increases in fluid intakes would naturally result in in the residents less likely to become dehydrated. Data were collected weekly using a collection tool specifically designed to capture the incidence of each HLE (Appendix 13). The nurse on duty was asked to recall if the residents had experienced any HLE in the last seven days. While this method was sensitive to recall bias, in the absence of other reliable methods to collect this data, it provided the best alternative.

Laxative and antibiotic use: Data on laxative consumption and antibiotic prescription were collected from the drug charts of the residents. The care home had a system for documenting medication given to the residents on four-weekly charts and these were reviewed at the end of each period. Data collected included the number of doses of laxatives given to each resident daily and the number of courses of antibiotic therapy for each day during the four-week period.

Data analysis: Run charts were used for analysing data on HLE and antibiotic use. Statistical Process Control (SPC) charts were used to analyse the data on laxative consumption. These charts plot data over time in a similar way to run charts and are preferable if they are possible to use. The only issue with these is that they require a data set with a considerably large number of observation episodes, which was not possible to obtain for the data sets other than laxative consumption. The SPC charts use an average (mean or median) but also use control limits, which are set depending on the type of chart is used (Poots and Woodcock, 2012). The type of the chart used for analysing data in this study was the Individuals and Moving Range Chart (ImR or XmR) chart, which is used on continuous data collected at each point in time (Mohammed and Worthington, 2013). As opposed to other types of charts, the XmR chart does not need to satisfy any assumptions (Poots and Woodcock, 2012). Data are analysed to determine whether variation seen on a chart is considered common cause or affected by special causes (Mohammed and Worthington, 2013). The common causes of variation indicated that the data were within the control limits. When special causes were observed, the average and control limits were recalculated to better represent the new process. The special causes, which signalled improvement, were determined using the following rules:

- Any point falling outside the control limits (3 lengths of standard deviation)
- Two out of three consecutive points fall outside the 2 lengths of standard deviation
- Four out of five consecutive points fall outside the 1 length of standard deviation

- Eight consecutive points fall on the same side of the mean line (Mohammed and Worthington, 2013)

3.4 Ethical considerations

Research that involves human subjects always raises ethical issues that usually concern the research participants but may also extend to researchers and others involved. Ethics are traditionally focused on experimental research where a new intervention or technology poses an obvious physical threat or suffering to participants. In non-experimental research ethical issues are different as they extend to emotional well-being of the subjects. The investigator has a responsibility of ensuring that no harm arises to any individuals participating in the study as well as themselves. Potential ethical issues identified in this study included safeguarding, freedom to participate and the right to privacy. The ethical responsibilities in this thesis extended to the vulnerable residents in the home, their families and the participating staff. The evidence of maintaining the ethical conduct is provided in Appendix 4.

Freedom from harm

Freedom from harm concerns any physical and emotional harm that the research can cause to participants, as well as any potential discomfort that could arise from it (Rogers, 1987). It is the researchers' responsibility to minimise the risks and maximise the benefits of all involved. Since most of the interventions described in this study were evidence based and the negative outcomes not anticipated, the potential harm was limited to a potential discomfort in participating. To reduce this, the investigator complied with the freedom to participate.

Freedom to participate

Participants have a right to choose to participate in the study. To ensure the freedom to participate, gatekeeper consent was obtained from care home manager. This was to ensure that the gatekeeper responsible for well-being of residents and staff made an informed decision to allow the researcher to conduct the study and was aware of its aims. Additionally, frequent feedback ensured that the manager was aware of the activities taking place in a care home as well as the future plans. To ensure voluntary participation, the staff involved in the focus groups in this study were requested to provide a written consent, which provided a brief description of the study. Verbal consent was also obtained immediately prior to commencement of the focus groups. Subjects of informal interviews performed as a part of participant observations and PDSA cycles were asked to provide a verbal consent. Since the project was categorised as an improvement work, the observations were part of the evaluation of the current systems, and as such the individual consent was not required. However, the residents and staff were informed of the activities and when observed, the residents were asked the permission to do so.

Safeguarding

The researcher has a responsibility to safeguard vulnerable participants. To comply with the national requirements for safeguarding, the Disclosure Barring Service (DBS) check was obtained and presented to the care home manager. To support the best interest of the vulnerable residents, the investigator has also undertaken safeguarding training and complied with the care home's Safeguarding Policy throughout the entire project.

Right to privacy

The researcher also has an obligation to maintain the subjects' right to privacy. This is usually achieved by assuring anonymity and confidentiality. Anonymity ensures that the individual responses are not linked to the identity of the participant, which at times may be impossible to achieve (e.g. when conducting interviews). In this case, participants' right to confidentiality must be preserved.

To ensure anonymity, no identifiable data were recorded. For the focus groups, participants were requested to provide the nickname that they wanted to use for the duration of the interview. Written consent forms contained no source of information other than the name and signature of the participant and were kept in a locked filing cabinet at the university. All participants were assured that the responses would be kept confidential. Considering that the topics did not explore any sensitive issues and no identifiers were taken, it was not necessary to take any further precautions. Data from participant observations and PDSA cycles were only collected in a written format. At times, data collection required some identifying information to enable the linkage of the data. For this purpose, the residents were given codes which were stored electronically in a password-protected file on the university premises. All participants were reminded that any information shared would be kept confidential and no identifiers were taken when recording the data.

Improvement projects are often thought to pose no ethical issues to participants involved in the programme, although they may still contain a certain degree of a risk. For this reason, the freedom to participate should never be withdrawn (Lynn *et al*, 2007). Furthermore, it should be respected that despite the benefits, some people have a right to refuse a new intervention in the same way the patient has a right to refuse a well-established treatment. To ensure the ethical conduct, the investigator sought the approval from appropriate body. The approval from Integrated Research Approval System was not required since the study was defined as service evaluation project; instead the ethical approval was obtained from the College of Nursing, Midwifery and Healthcare Ethics Committee in the University of West London (CRSEC15).

3.5 Conclusions

This chapter discussed the theoretical approach underpinning the work undertaken in this research. It also provided a rationale and description of the method used for data collection and analysis used. The need for knowledge translation of available evidence on the topic of hydration mostly influenced the decision to use the pragmatic approach of this research. Benefits and limitations of each method were considered. In line with pragmatic paradigm, the rationale for using these methods was based on the research objectives as well as the feasibility of using them in the care home setting. The following three chapters (4, 5 and 6) outline the results of exploratory, intervention and evaluation phases.

Chapter 4. Exploratory phase

The literature review presented in Chapter 2 indicated that older adults experienced diminished thirst, which together with other physiological changes and morbidity may predispose them to dehydration. It also identified that providing adequate support had the potential to increase fluid intakes in this population, although some studies also reported that care homes did not provide appropriate hydration care. There is little evidence regarding how hydration care is currently delivered and whether it meets residents' needs. There is also very little information about what the residents want to drink and what kind of support they require with limited literature exploring the barriers to providing good hydration care as experienced by the care home staff. Hence, there remains a gap in the literature about how these important stakeholders view current hydration care and how this care can be improved. The results in this section are presented using the data connection approach as described in section 3.3.1.

4.1 Objectives and methods

The purpose of this phase of the study was to determine how hydration was perceived by the staff and residents, identify what barriers they faced to provide and consume fluids respectively, as well as to map the current practice to establish how it influenced the hydration care of the residents. The summary of the exploratory phase is shown in Figure 4.1. This led to the identification of improvement activities further tested in intervention phase. The methods used to collect the data in the exploratory phase were previously described in Section 3.3.1.

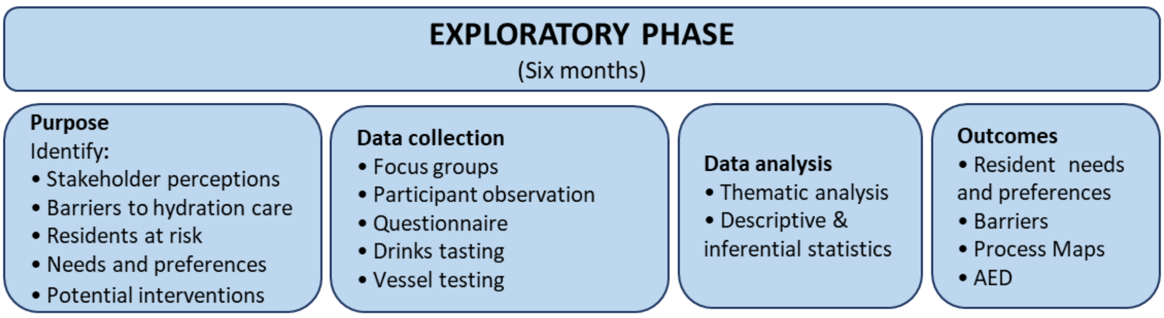


Figure 4.1: *Summary of the exploratory phase.*

4.2 Results

4.2.1 Participant characteristics

Stakeholder engagement

The results of stakeholder mapping are shown in Figure 4.2. The stakeholders were those who were working in a care home as well as those outside. The most important stakeholder was a care home manager, who has a high influence and high interest and would need to provide the support for the staff and research team to undertake the activities. The motivators for the manager to be involved included improving quality of care and outcomes for residents, increasing the reputation of the care home and potential for recognition in research outputs. The actions required by the research team included obtaining written agreement from the care home manager to start improvement work, agreeing on a start date and keeping the manager informed of project progress.

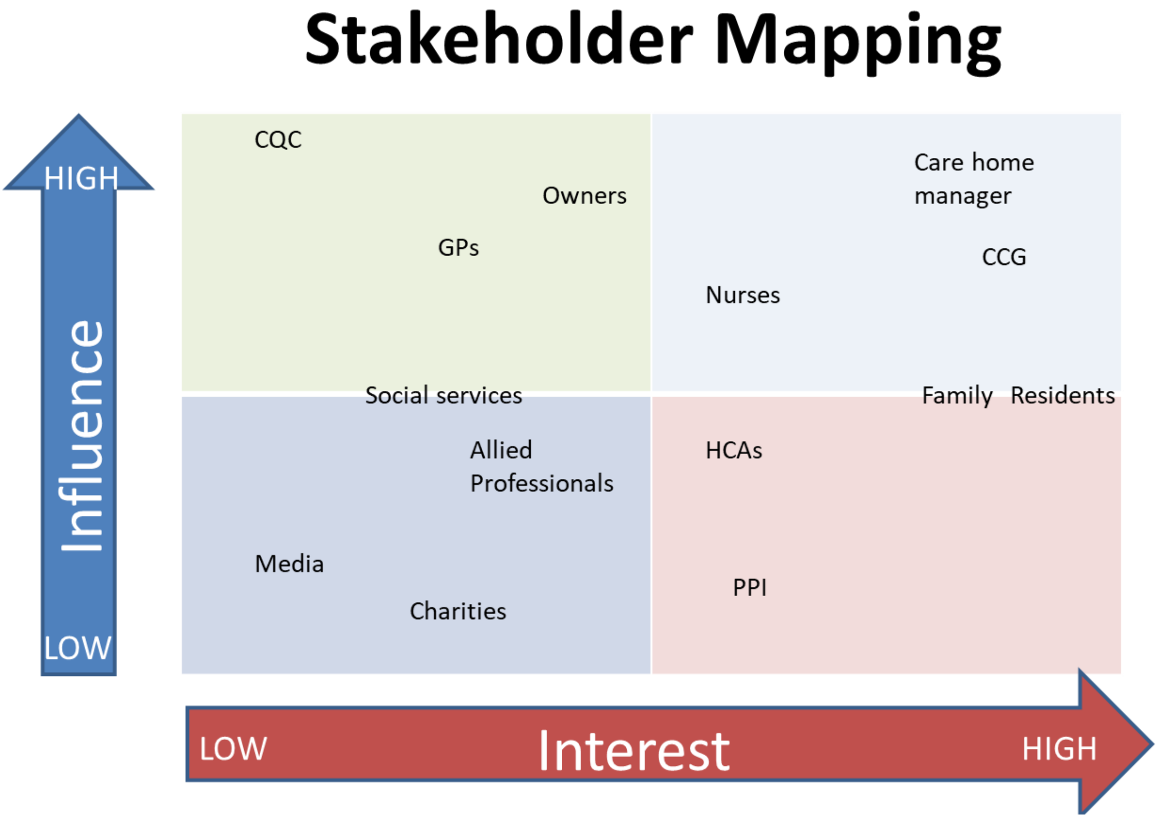


Figure 4.2: *Stakeholder map*

Other stakeholders with high influence included the owners, GPs, CCG and CQC. It was thought that these stakeholders could influence the decisions of the care home manager, therefore their support in a project should be sought. Nurses were also considered the stakeholders with high influence, but this would be more on operational level with an influence on HCAs and residents. The CCG was also thought to have a high interest, while they may be less interested in the project itself, their interest would be research outputs that would help them make decisions when commissioning care. The stakeholders who were thought to have a high interest were residents, families, PPI and HCAs. These stakeholders would hold little influence over decisions that would normally take place in a home, but they were thought to be affected the most, therefore their opinions were considered very important for the conduct of the project.

Participant observations

A total of 98 hours of participant observations were conducted on units A and B. On unit A, the initial data were collected over a two-and-a-half-month period in summer and another three and a half months were spent on testing the tools and obtaining more qualitative data. The research diary was used throughout this entire period. The last three (non-consecutive) days of the observations were used to collect the quantitative data using the observation tools as planned. On the first day of observations all residents in the communal areas were observed and four of the selected eight who stayed in these areas had their fluid intakes recorded. During this time residents were observed in the dining room for breakfast, lunch and dinner and in the lounge between the meals. On the second day observations took place in residents' rooms and the remaining four of the eight residents had their fluid intakes recorded. On the third day the observations took place in the lounge and no residents had their fluid intakes recorded.

Focus groups

Participants were the staff who were thought to have some influence on hydration care. Initially the plan was to run two focus groups lasting approximately an hour and to include the staff who worked on unit A and B only. However, there was little interest from staff to participate in the focus groups, thus, the invitation to join extended to all staff from different departments across the home and only one focus group was conducted. This also influenced the decision to obtain more data via unit level staff interviews. The participating staff members included three HCAs (HCA 1-3), three nurses (RN 1-3), one AC (AC 1) and one housekeeper (HK 1). Focus group was audio recorded as previously planned.

Questionnaires

Two questionnaires were used as planned. For the ‘unit level staff interviews’, the participants were the staff on unit A and B. A total of seven staff members participated, including three HCAs from unit A and B (HCA 4-6), two nurses (unit A and B, RN 4-5), one AC (AC 2) and the catering manager (CM1). For the resident questionnaires, a total of seven residents from unit A (BR 1-7) and thirteen from unit B (DR 1-13) participated. This was a convenience sample, but the residents represented different types, of which some were independent drinkers whereas others needed assistance or special drinking vessels. The residents also had different levels of cognitive abilities. Three residents (all on unit B) were also supported by the family during these conversations, two had severe dementia and one had dysarthria due to their progressive disease.

Drink tasting

Drink tasting was conducted over four month period and involved mostly the residents from unit A and B, although some residents from other units were asked to participate. This was usually because they were present on the unit at the time drinks tasting was taking place and expressed an interest to participate. Twenty-four test drinks and four control drinks were included in tasting sessions and these were tested with 47 residents. The number of drinks each resident tested varied from 1 to 22.

Drinking vessel testing

A total of 37 residents participated, these were mostly the residents from unit A and B, but sometimes the residents from the other units were included to increase the response rate. While the initial plan was to test the cups on at least ten residents, there was no need to continue testing for some as they proved impractical from the staff perspective. For example, one type of beaker was made of the material that broke easily, but also made it very difficult to fit and remove the lid. Additionally, some cups were broken during the testing and were not replaced due to the low initial ratings. Some cups were added to the initial list as they appeared in the care home or were suggested by the resident feedback. A total of 496 tests were conducted on 31 different vessel designs. The number of vessels tested by the residents varied from 1 to 23.

4.2.2 Resident fluid intakes

Results of the individual observations conducted over three days in eight residents demonstrated that fluid intakes were low (Table 4.1). There was only one resident who consumed the minimum recommended 1500ml of fluid, while three residents (38%, 3/8) consumed less than 1000ml. The one resident who consumed the recommended minimum amount of fluid was supported by the family, who provided 1275ml of the 1500ml consumed. Fluid intakes compared to the requirement calculated from the body surface area were low and on average met 30.3% of the target (min-max 15.1% to 57.2%).

***Table 4.1**: Fluids consumed by different types of residents and different locations. [1]Resident with swallowing difficulty, [2]Resident given 1275ml by family member, [3]Two residents in this group had a swallowing difficulty and consumed 1190ml and 1200ml.*

Type of resident	Own room		Dining room/lounge		Own/dining room combined	
	no of residents	mean fluid intake	no of residents	mean fluid intake	no of residents	mean fluid intake
Independent	2	960	3[3]	1150	5	**1072**
Needs prompting	1[2]	1500	1	605	2	**1052**
Needs assistance	1[1]	450	0	-	1	**450**
Total	**4**	**965**	**4**	**1013**	**8**	**989**

4.2.3 Fluids served to the residents

The average fluid offered to the eight residents was 1461ml (Table 4.2), which is below the recommended minimum fluid intake. However, this amount varied greatly between the residents (min-max 600ml to 2425ml). Only three of the eight observed residents were offered fluids meeting or exceeding the minimum recommended 1500ml. The residents who received the highest amount of fluid (and also the one who consumed 1500ml) was given a half of this volume served by the family.

Table 4.2*: The mean amount of fluids served to the residents.*

Type of resident	Own room		Dining room/lounge		Total	
	No of residents	Fluid (ml) served	No of residents	Fluid (ml) served	No of residents	Fluid (ml) served*
Independent	2	1455	2	1228	4	1341
Needs prompting	1	2425[1]	1	1900	2	2162*
Needs assistance	1	600	1	1400	2	1000
Total	**4**	**1484**	**4**	**1439**	**7**	**1461**

[1] 1275ml of fluid was provided by the family

4.2.4 Reasons for inadequate fluids served and consumed

The following paragraphs illustrate the reasons why hydration care in the home was inadequate, and how due to the complexity of the care in this setting the staff were not aware that the problem existed.

Limited opportunities to obtain fluids

Through the focus groups and questionnaires, staff identified seven structured opportunities for providing fluids for residents (summarised in Table 4.3) and they were under an impression that all residents received drinks at these times. Staff also reported that besides these formal opportunities, residents could request drinks at any time. They also mentioned that all HCAs and nurses were responsible for distributing the drinks and refilling empty glasses at all times. Because of these arrangements, they were under an impression that drinks were always available and given at any time they were needed or requested by the residents.

> *"*(drinks) *they're just on-going whether they request or not…."* (HCA 1)
>
> *"And in the lounge is…the girls have always got the drinks out. There's always drinks poured out on the tables… so there's access to drink all the time"* (AC 1)

In contradiction to the staff perceptions, observations showed that the residents were not given drinks at all opportunities. Most drinks were given during mealtimes with 47/56 (83.9%) residents receiving a drink during the meal but only 25/76 (32.9%) residents received a drink between the meals; the results of the Chi-square test showed that this difference was significant X^2 (1, N = 132) = 33.87, p<0.0001). All residents were given drinks at breakfast (100%), but at other meals and between the mealtimes some residents did not receive the drinks (Table 4.4).

Table 4.3: *Description of drinking opportunities available to the residents throughout the day.*

Opportunity	Time	Description
Drinks with breakfast	From 9am	Breakfast started by a nurse (unit A) or an allocated staff member (unit B). One HCA responsible for serving and assisting the residents in dining room (and occasionally the lounge), the rest of HCAs responsible for residents in their own rooms. Nurses to support HCAs as needed. Foods available: cereals, porridge, cooked breakfast. Residents given juice, tea, coffee or milk served individually as food is given.
Mid-morning tea	Not specified	The time for this activity was not specified; neither was it clear who was responsible for this to occur. Residents given juices, tea, coffee and biscuits as requested.
Drinks with lunch	From 12.45pm	An allocated HCA responsible for assisting residents in the dining room while others deliver meal trays to those in their own rooms. Nurses to help if needed. Foods available: cooked meal, pudding of the day (or ice cream as an alternative). Drinks available juices, squash, water, tea and coffee; given to individuals as needed.
Mid-afternoon tea	3.00pm	This was a responsibility of the HCAs allocated to this task. Tea and coffee made and distributed using the trolley; starting with the residents in the lounge and finishing with those in their own rooms. Nurses did not have a role in this task.
Drinks with dinner	From 5.00pm	Allocated HCA responsible for the residents in dining room while others allocated to residents in their own rooms. Nurses to help as required. Foods available: sandwiches, soup and other meals; one dessert available. Drinks available: tea, coffee, juices, milk and squash given individually as needed.
Evening drinks	After 8.00pm	By this time all residents were in their own rooms. Night HCA responsible for loading the trolley and distributing sandwiches, biscuits and hot drinks to all residents. Nurses did not have a role in this task.

***Table 4.4**: Number of residents receiving drinks and the number of drinks per resident stratified into the period of observation and the location of the residents. Residents were most likely to receive drinks at mealtimes X^2 (1, N = 132) = 33.87, p<0.0001) and those in communal areas were more likely to get more than one drink X^2 (2, N = 132) = 15.27, p<0.0001).*

	Own room			**Lounge/dining room**			**Total**		
Period	**no of residents**	**no (%) of residents receiving drinks**	**no of drinks/ resident**	**no of residents**	**no (%) of residents receiving drinks**	**no of drinks/ resident**	**no of residents**	**no (%) of residents receiving drinks**	**no of drinks/ resident**
Early morning	8	0 (0%)	0.00	0	n/a	n/a	8	0 (0%)	0.00
Breakfast	5	5 (100%)	1.40	9	9 (100%)	1.67	14	14 (100%)	1.50
Mid-morning	15	0 (0%)	0.00	8	1 (12.5%)	0.13	23	1 (4%)	0.09
Lunch	10	6 (60%)	0.80	11	10 (91%)	1.27	21	16 (76%)	1.05
Mid-afternoon	15	8 (53%)	0.53	9	7 (78%)	1.22	24	15 (63%)	0.79
Dinner	11	10 (91%)	0.90	10	8 (80%)	1.00	21	18 (86%)	0.95
Evening	19	8 (42%)	0.53	2	1 (50%)	0.50	21	9 (43%)	0.52
Total:	**83**	**37 (45%)**	**0.52**	**49**	**36 (73%)**	**1.06**	**132**	**73 (55%)**	**0.72**

Field notes collected during the observations on unit A and B showed that drinks were not always available. In the morning, the residents were brought up to the lounge as early as 6am, some were also observed to be awake in their beds. Despite this, the residents rarely received drinks around this time and usually had to wait until breakfast. During the structured observations on unit B none of the residents were observed to receive drinks at this time, if the drinks were available, these were left over from the evening before. On one early morning (unit A), tea and coffee were served to the residents in the lounge by one resident who was self-caring. Afterwards she noted that she usually was not able to access the kitchenette around this time as the staff liked to keep it locked. It was also noted that staff were surprised to see the residents having drinks. A few residents mentioned that they liked a cup of tea when they first woke up in the morning, but they felt that these drinks were not always provided. While they also mentioned they wanted tea at other times such as with meals, afternoon tea or before they went to bed, they mentioned that the early morning tea was especially problematic because the staff were busy with washing and dressing others and they felt that the staff should not be disturbed around this time. As a result, despite wanting a drink they did not always get one and subsequently consumed less than they would have otherwise:

> *"I drink less than I used to (*when I was*) at home, you have to wait for your tea, you can't go make more"* (Resident, BR 2)

Breakfast was the only opportunity when the majority of the residents were offered a hot drink, and some were also offered a glass of juice. As opposed to other meals, it was noticed that trays taken to the residents' rooms contained hot drinks such as tea or coffee and most residents were given porridge or other cereal which their fluid intake.

After breakfast, the proportion of residents receiving the drinks declined with less drinks given to the residents as the day progressed. During the structured observations on unit B at lunch and dinner only 76% and 86% of residents were given drinks. Mid-morning, the time when the staff were still busy washing and dressing the residents only 4% of the residents received their drinks. The mid-morning tea round mentioned by the staff did not take place, although staff were observed to serve the mid-afternoon tea at 3pm. Despite this, about a third of the residents were observed not to receive the drinks around this time. Fluid rich foods that could further increase residents' fluid intakes were only observed to be given at mealtimes. This was observed in both units.

It has been observed on numerous occasions that the residents were sitting in the dining room half an hour or longer before the meals started. When this occurred, the residents were not given the drinks until the food was served or sometimes after it was consumed, on a few occasions it was noticed that the residents were not given a drink at all. Interestingly, many residents mentioned that they would welcome a hot drink before and after the meal, although many also said that while they had a preference to drink before or after the meal, they would accept these drinks at any time they were offered.

> *"I will drink my tea with the meal, but I really like it afterwards"* (Resident, DR 12)

It was also observed that the residents were sometimes taken to the toilet and transferred to the dining room even though the meal was not due to start for another hour (Unit A). On Unit B, residents usually stayed in the lounge and were transferred to the dining room shortly before the meals were served. However, they were still often observed to have no drinks available to them when they were in the lounge. Similar situations were observed in the lounge and the residents' rooms: hot drinks were not offered before or after the meals. As opposed to the residents who were moved to dining room and had to have a drink offered, the residents in a lounge and the bedrooms sat at the tables where the drink might have already been there for a long time. It seemed that staff thought that they did not need to offer another drink if one was already on the table, despite the fact that the residents might have preferred a different drink than the one they had in front of them.

Activity coordinators reported that the residents who attended activities in the morning or afternoon had an opportunity to obtain the drinks around these times. While the activities were not specifically designed to encourage the residents to drink, these were usually provided as According to ACs these were given to the residents individually as requested and the drinks available during activities were usually of the type provided by the care home. They mentioned that on occasions other drinks were purchased specifically for the activities, such as soft drinks for garden parties and barbeques. The ACs said that tea and coffee were usually served in the café and were given as requested by the residents. This indeed was confirmed during the observations in the café where it was noted that all residents who attended the activities obtained at least one drink. However, it was also noticed that there were only a few residents who regularly attended these activities.

Many residents were transferred to beds shortly after dinner. When drinks were served in the evening by the night staff, most residents were asleep, but nobody was woken up and those who required assistance were not offered any. As a result, only few residents benefited from the drink and snack around this time. Structured observations in the evening showed that only 43% of residents received a drinks at this time. This meant that many residents were not given any drinks between dinner and breakfast, a gap of about 15 hours.

Sometimes it was found that drinks were also actively restricted because staff hoped that doing this would result in residents eating their food, as recorded in field notes (unit A):

> *"I was helping the staff out in the dining room. I asked one resident (able to communicate and ask for anything) what drink she wanted. She asked me for a tea. I made a big pot and went around and offered tea to other residents (I also made a couple coffees for those who wanted this instead). I was approached by the nurse who said they usually didn't give people tea with lunch as this will prevent them to eat. Not sure I understand the rationale behind this, they are given squash – is it just better because it never gets drunk? The one resident she was particularly concerned about (I know, he frequently refuses food) had half a cup of that tea by the end of lunch and barely ate his food (the nurse said to me: 'I told you so…')"*

On this day at lunch, there was only one person who was drinking squash, which was usually the most prevalent drink on the tables in the dining room. It was not possible to determine whether this was because residents preferred the hot drinks or whether the staff decided not to offer any more fluids.

When requesting drinks, residents would generally be given what they wanted. However, many residents did not have an ability or opportunity to communicate their needs. Even when the residents requested the drinks, these would not be given straight away. On few occasions, the resident requested a drink, but the staff forgot to bring it. Sometimes it was also observed that staff were providing a drink to calm some residents down, therefore clearly recognizing that the drink was needed. As evidenced in field notes on two occasions:

> *"One resident was shouting for a long time, after a while she was given a drink. She drunk it quickly and wanted some more, but at this point all HCAs have left"* (Unit B)

> *"One resident given some drink after she's been making some noise for a while"* (unit B)

Based on the responses from the focus groups and staff questionnaires it was evident that staff were not aware that they did not provide a sufficient amount of drinks to the residents. In fact, they reported that they viewed these times as central to fluid provision:

> *"…that's a protected time for them not to be disturbed…"* (RN 2)

and:

> *"…we do know that during when they eat, they always* (get a drink)*…".* (RN 2)

Refills or additional drinks not provided

Once the residents were given drinks, they were not observed by staff to determine if they needed more. Receiving an additional drink or a refill occurred at only 15% (20/132) of the episodes when drinks were served. Therefore, even if a resident was offered a drink, and drank an amount of 200ml drink at each of the seven opportunities, they would still consume less than the recommended minimum of 1500ml fluid/day.

During the observations on both units, it was noted that at the end of the meal residents were asked if they were finished, plates were taken away, and residents were moved to the lounge. Typically, the additional hot drinks or the refills were not offered around this time, neither before nor after the move. Interestingly, the residents were usually placed in the same spots in a lounge as they were sitting before and if they had a drink leftover from before the meal, this was placed in front of them. Staff also had a routine of topping up the glasses of squash and water in the lounge shortly after the residents were transferred from the dining room. Since no refills or additional drinks were offered until the next mealtime, those who arrived late in the lounge missed their opportunity to obtain a drink for the next few hours. The residents who stayed in their own rooms usually had the drinks topped up only at mealtimes.

On occasions when refills were offered, these usually included only squash and water, and this was not offered systematically to everyone. In one instant it was observed that a nurse refilled a glass for one resident for whom she was giving some medication but did do this for other residents who finished their drinks and sat in front of the empty glasses (unit B). On another occasion (unit A), it was observed that one resident asked for a drink and the HCA brought it but did not acknowledge that six other residents also needed drinks.

It was also observed that staff sometimes missed the cues sent by the residents who could not communicate that they needed more drinks. For example, at one time it was apparent that the resident was thirsty as she was picking up her empty glass and trying to drink from it (Unit A). In this instance, the HCA who was working in the dining room did not notice the resident. On another occasion in Unit B, one resident was observed to try to drink from the jug of water standing on the table in the dining room. He has consumed the drink he was given at the start of the lunch, but his cup was not refilled throughout the entire meal. These cues could easily go unnoticed in a busy location such as a dining room, but some residents who were able to communicate were still not given a drink. In one instant a resident from Unit A asked the HCA for a cup of tea and this was acknowledged, however five minutes later she was taken to the lounge and the tea was not given. Another example was observed during breakfast in the lounge (Unit A), where the resident asked for another cup of tea, which the nurse acknowledged and promised the resident to bring, but she did not return. On this particular occasion the resident was agitated when the drink was not delivered after a few minutes and was persistently shouting for tea until it was given ten minutes later.

These findings contradict the staff perceptions who reported that drinks were 'on-going' whether initiated by the staff or the residents. On the other hand, the residents reported that the amount of drinks they received was not sufficient. A few residents said that despite obtaining a drink at some opportunities, they would happily accept another, but were not given an opportunity to request them. This was mentioned in relation to drinks during and between the meals. One resident mentioned that he requested drinks in plastic mugs because they contained more volume, even though he did not like drinking from plastic. Despite this, he still did not think he received as much as he wanted. Another resident also discussed how her fluid consumption habits had changed since she arrived at the care home, she also mentioned that she did not receive the drinks as frequently as she wished:

> *"…morning cup of tea; I do get one, but I would like more…".* (Resident, BR 7)

Another resident also mentioned that she was drinking less than she used to:

> *"The kettle used to be always on in my house. I don't get that much tea, but also I don't like it here".* (Resident, DR 12)

Location of the residents

Residents who consumed their meals in the dining room had more opportunities to obtain fluids than the residents who stayed in their own rooms or in the lounge (Table 4.4). It was observed that the reason for this was a lack of staff in these particular locations during the meals. During the meals, most of the residents were transferred to the dining room, and staff mostly attended to the residents there with only a satellite supervision of the residents who sat in the lounge. On one of the early days of observations on unit A, there were three residents who stayed in the lounge for lunch, and while they had their glasses refilled before meal with either water or squash, they were not provided with any other drinks afterwards and were not offered any additional drinks at dinner either. At both meals there were no staff present in the lounge apart from the times when the food was dropped off and dirty crockery was picked up. Similarly, there were usually a couple of HCAs assigned to help the residents in their bedrooms, but because their job was to feed the residents who needed assistance, they rarely had time to tend to hydration needs of others. Between the meals, the staff were busy tending to personal care and while they refilled the residents' glasses in the lounge after the meal, they did not monitor if the drinks were needed later. In their own rooms, residents had little contact with the staff between the meals and therefore did not have an opportunity to get drinks then.

Hence regardless whether it was mealtime or between meals, obtaining drinks was difficult for the residents who stayed in their bedrooms. Furthermore, since the majority of the drinks were not readily available in the individual rooms, the residents were usually offered whatever was in the jug on a table, hence most of the drinks they received were either squash or water. Hot drinks were generally offered either at breakfast, afternoon tea or the evening. However, if the residents were asleep around this time, they would miss their opportunity to obtain them. Interestingly, residents who were asleep in the chairs in the lounge would be woken up and offered a hot drink.

As a result, the residents who stayed in their own rooms received and consumed less fluids than the residents who stayed in the communal areas (Tables 4.1 and 4.2). the issue of location was not mentioned by either staff or the residents.

Resident typology

Staff participating in focus groups identified the residents as the primary barrier for them to provide optimal hydration.

> *"We can't force* (them) *to drink…"* (HCA 2)

> *"…we can't open the mouth…"* (HCA 1)

However, it was observed that the residents who required assistance were offered less drinks, received most of their fluids at mealtimes and a high proportion of their fluids was derived from the fluid rich foods. (Table 4.5). The reason for this was that these residents were frequently omitted when the drinks between the meals were served. Observations on both units showed that residents who required assistance were frequently not offered drinks at 3pm or with the evening snack. At these times, staff were often observed to distribute the drinks only to those residents who they knew were able to reach for the cups and consume fluids by themselves. During the meals, the more dependent residents were observed to be given a drink only after they have eaten. Occasionally, when they did not consume their foods, the drink was not given at all. Similarly, they often missed out on fluid rich foods such as soup and some desserts because the staff perceived them not to be able to consume a large amount of food.

Table 4.5: *Differences in the amounts of fluids offered and consumed stratified by different types of the residents. [1]One resident given 1250ml by the family.*

	Mean fluids (ml)		**Percentage of fluids**			
Type of resident	**Offered**	**Consumed**	**Consumed**	**From mealtimes**	**From food**	**No of drinks offered**
Independent (n=5)	1885	1072	57%	60%	27%	10
Needs prompting (n=2)[1]	1775	1052	59%	35%	10.8%	12
Needs assistance (n=1)	600	450	75%	83%	50%	4
Total (n=8)	**1461**	**989**	**68%**	**57%**	**26%**	**10**

Virtually all staff agreed that some the residents refused the drinks no matter how much was offered. In fact, they reported that persistent encouragement made some residents more resistant:

> *"But the more you try and force them, you see, they won't do it"* (HCA 2)

Many of the issues raised by the staff concerned the residents who had some degree of dementia, and they often mentioned behavioural issues.

> *"…they're changing from time to time. If they are happy now, then this time after a few minutes they're crying, and after crying they're laughing"* (HCA 2)

They also noticed that while some residents flatly refused a drink, there were many residents who were not able to communicate but for whom it was easy to pick up the non-verbal cues indicating these residents did not want to drink any more.

> *"It's just you gotta sit at a time that they'd always – sort of – move their heads like that to let you know that they've had enough. That's their way of telling you, 'right, I don't want no more'…"* (HCA 1)

In contradiction to what the staff said, residents were rarely observed to refuse drinks. At times it was noticed that the resident would not drink the water and squash they were given, but the tea or coffee were rarely refused. However, there was one type of the resident who repeatedly failed to consume the drinks offered. These residents tended to either forget to drink or would fall asleep before they finished their drinks. Because of this, they required frequent prompting. Residents who needed prompting received sufficient amount of fluids, comparable to the amount received by independent residents, but because they did not receive appropriate support, they consumed much less. This is because while staff were able to identify the residents who required assistance, those who required prompting were often unrecognised.

Furthermore, it was noticed that at times, the residents' ability to consume fluids independently varied from day to day. Due to their underlying illnesses some residents required more support on some days than other and sometimes the location the resident was in also determined whether they were able to consume the fluids independently. For example, one resident who frequently needed prompting sometimes also required full assistance to drink, especially at the end of the day when she was feeling tired. Another resident who suffered from a progressive condition affecting his motor skills was able to eat and drink independently when he was sitting at the dining room table but required full assistance when he was in bed. These small changes in residents' abilities were not always noticed or taken into account when drinks were served.

Swallowing difficulties and prescription of thickeners did not seem to influence how much fluids the residents were served or how much they consumed. Two residents who were on thickeners but were able to drink independently consumed over 1000ml each, both residents spent their days in communal areas. On the other hand, the resident who stayed in their own room and required full assistance was given only 600ml of fluids and consumed 450ml.

Staff discussed a few reasons the residents consumed inadequate amounts of fluids. Some indicated that those with dementia and at the end of life were tired or confused, and this made them particularly difficult to hydrate. One HCA noted that despite constant reminders, many residents were not able to comprehend the instructions given by the staff and that the information about the importance to drink was never retained.

> *“They don’t understand the importance of having something to drink, about keeping hydrated”* (HCA 2)

Some nurses and HCAs mentioned that medication, sore mouths or acute illness often influenced how much the residents were able to drink. A few remarked that some residents restricted their fluid intake to avoid incontinence or the need for toileting and it was difficult for staff to encourage them to consume more drinks. Being unable to hold a drinking vessel or having swallowing difficulties were also highlighted as reasons for some residents not drinking enough. Staff did not specify whether these residents refused to drink or had physical difficulties which predisposed them to drinking insufficient amounts.

Fluid restriction was another reason some residents were not able to consume enough fluids. Participants, especially the nurses voiced their concern about this type of the resident. They stressed the importance of ensuring that these residents were given fluids, but that the amount was limited to whatever was advised by the doctor.

> *“…we know that we have been told not to give one thousand…more than one thousand five hundred. So, we limit them”* (RN 3)

Interestingly, none of the residents mentioned that they were meant to be on fluid restriction and none of the residents from both units were identified as needing it.

Relationships between the staff and residents seemed important, with the staff recognising that some residents would only take fluids from a certain HCA. According to staff the team could purposefully send this HCA to the resident in the hope that they could persuade them to drink:

> *“Because sometimes the residents are…they like…let’s say they like – um – (HCA 1). And – uh – don’t like (HCA 2) to come to their room. So, the residents will drink from the (HCA 1), but he will not drink from the (HCA 2) … So then (HCA 1) go(es) in, then (HCA 2) going to different residents”* (HCA 3)

Staff also mentioned that some of these barriers could be overcome and that some residents needed different approaches. The most common strategy was leaving the drink with the resident and walking away. According to staff, many residents drunk in their own time and it was worth serving a drink, even if the resident said they did not want one.

> *"All we can do is just leave them on the table, and then when they're ready, you'll find that they just pick it up and start drinking anyway"* (HCA 2)

Some residents needed a little more help such as encouragement:

> *"…you just have to keep telling them… you have to drink"* (HCA 2)

…while for others distraction worked:

> *"…while she is talking, he doesn't realise that he is...taking the fluids"* (HCA 1)

Not meeting resident fluid preferences

Drinks provided to the residents did not always meet their preferences, despite this to be recognised by the staff and the residents as important part of fluid provision. Staff reported that the residents could choose from a selection of drinks available to them throughout the day. This included a range of hot drinks such as tea, coffee, hot chocolate, Horlicks and Ovaltine, a variety of juices (orange, cranberry, apple, pineapple and mango), milk, water, orange and blackcurrant squash. Activity coordinators also mentioned that sometimes they ordered food and drinks specifically for activities. According to the catering manager, additional food and drink items were provided for special occasions such as birthdays or holidays and foods/drinks which were not normally available in a care home could be ordered on request.

Residents mentioned that obtaining the drinks they enjoyed was important to them. They referred to a variety of drinks they liked to consume, with tea being a favourite drink mentioned by the majority of the residents (18/20, 90%) while a smaller proportion of them also mentioned coffee (7/20, 35%) or hot chocolate (2/10, 10%). For many residents hot drinks were most acceptable and they wanted to consume them throughout the day. Some residents also mentioned fruit juices, sodas and water, although these were mentioned less frequently. The majority of the drinks that the residents liked were already supplied by the care home, including tea, coffee, juices and hot chocolate. A few residents also mentioned that not receiving the drinks they liked diminished their experience and prevented them from drinking appropriate amounts, highlighting the need to account for individual preferences.

Staff also identified that meeting individual preferences was important.

> *"Some don't like cranberry juice. They'd rather have orange or pineapple – you know?! Some of them drink the cranberry juice every day mind"* (HCA 1)

Furthermore, staff were able to identify some residents who responded to one type of fluids, such as one resident who only wanted to drink tea:

> *"He thinks I'm the tea lady, 'you coming with a cuppa tea'? … He drinks tea all day long"* (HCA 2)

Only a small proportion of the residents mentioned they drunk the same beverages every day. Most said that they welcomed a variety of drink options to be offered, but that they were not always given an opportunity to make a choice for themselves. For example, one resident discussed how he did not like the tea on a particular occasion and asked the staff for hot chocolate. Since then he was often given hot chocolate without asking, although he usually prefers tea. Another resident said that she preferred sugar, but was always given a sweetener because she was diabetic, while another said she preferred coffee, but was sometimes was given tea:

> *"…because tea is better for you".* (Resident, DR 8)

Staff recognised that it was important to offer different types of drinks because the residents' tastes and preferences could change, although they seemed surprised that this would occur.

> *"…you know, it's funny how they change. They go off on one thing, and then they want something else"* (RN 2)

Despite the staff acknowledging the importance of fluid preferences, the residents discussed that they were not always given the drinks they liked. This impacted their fluid intakes as a few mentioned that they consumed less fluids and were drinking different types of beverages to those they used to drink at home. One resident stated:

> *"I am not always being given what I like"* (Resident, DR 10)

…while another mentioned they did not like squash but:

> *"…I have to drink it".* (Resident, DR 13)

It was also evident that the residents were not always aware of some type of fluids being available in a home.

> "…(I like) *hot chocolate, but I never had it here* (resident was surprised when told this was available)" (Resident, DR 11)

Another issue mentioned by the residents was the quality of the drinks they received. This again seemed to depend on the individual preferences, with different residents wanting their drinks at different temperatures, strength or sweetness. They indicated that as with the types of fluids, they were not asked about the preferences when the fluids were served. One resident discussed how they stopped drinking milk because it was not served at the temperature she liked:

> *"I like my milk cold, but they gave me a warm one once when I asked for it"* (Resident, DR 12)

According to staff, every resident was assessed prior to admission with information being collected from medical notes, family and residents themselves. This information was used to ensure the residents had their needs and preferences met from the moment they arrived at the home. Staff mentioned that these were written in the residents' care plans and stored in the nurses' office. According to nurses it was their responsibility to become familiar with each resident's needs and disseminate this information to the HCAs. Staff also mentioned that residents were observed for a few days upon arrival at the home to ensure they ate and drank well, and to establish their eating and drinking habits. The HCAs mentioned that they were all assigned a role of key worker to the residents and it was their responsibility to establish these habits and report any changes to the nurses, who could update the care plans monthly or as required. According to staff, this system ensured that the residents were given what they liked.

The catering manager mentioned that measures were also taken to ensure steady supplies of food and drink. Orders were placed two to three times a week and were delivered overnight. Staff also mentioned that every morning and afternoon if required, the kitchen assistant restocked the units with drinks and other supplies. They also stated that these items could also be requested from the kitchen as required. According to staff, this system allowed the residents to have access to their favourite drinks at any time.

The results of the drinks tasting (cold drinks only) demonstrated the residents' preference to strong flavoured, sweet, less acidic drinks such as apple, mango and pineapple juice. Clearly juices and milk based drinks were more popular than squashes, soft drinks and water, although individual preferences differed (Figure 4.3). Most of the preferred drinks were already available in a care home, but the observations showed that they were not frequently offered.

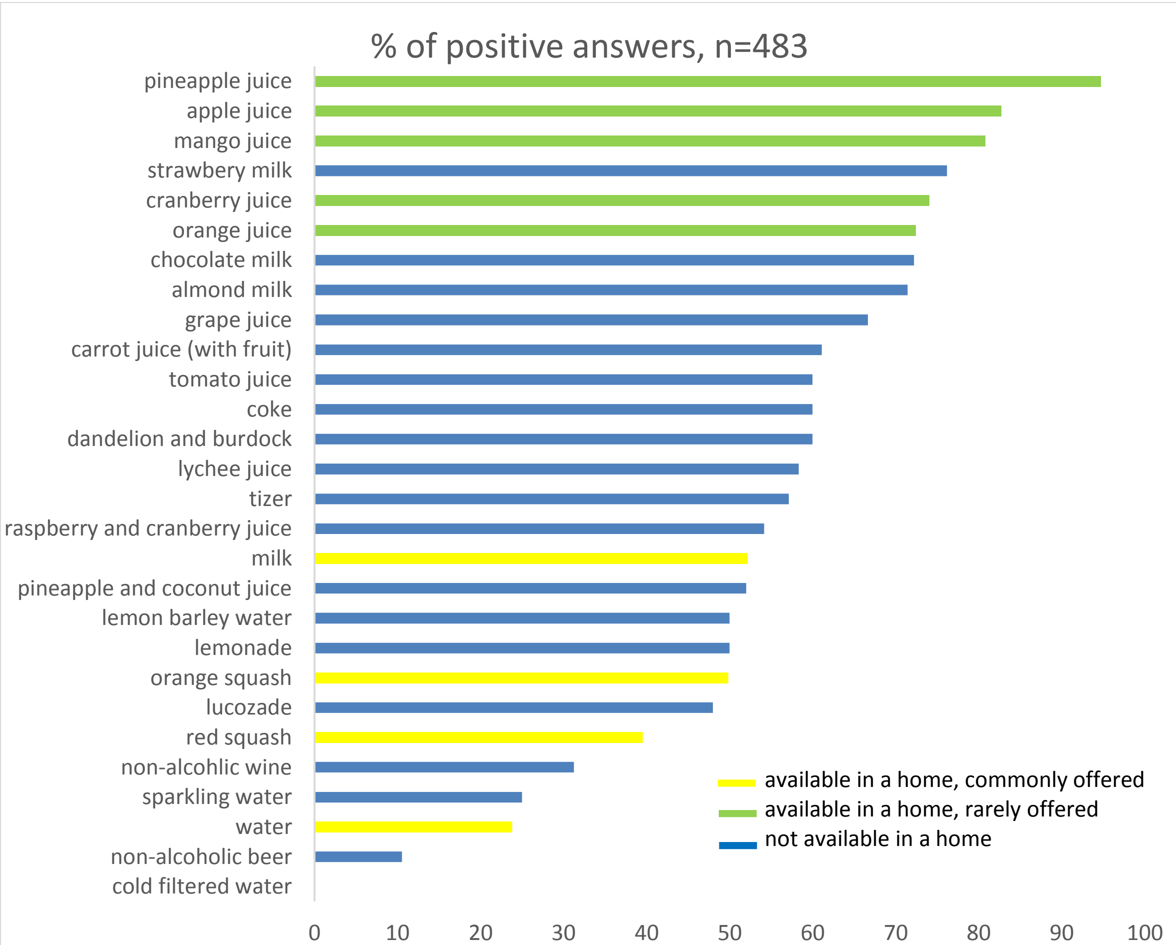


Figure 4.3: *Results of testing the preferences of different types of fluids.*

Data from the observations showed that besides the tea (not tested, offered 54.5%, 72/132 of times), the most commonly offered drinks were squash (29/132, 21.6%) and water (13/132, 9.8%). These drinks were not scored highly by the residents during the tasting. On the other hand, drinks which scored highly with the residents were offered less frequently. From the range of the drinks which were liked by the residents and were routinely available in the home, apple juice was offered twice (2/132, 1.5%), apple juice was offered once (1/132, 0.75%) while pineapple, cranberry and mango juice were not offered at all.

From the results of the tasting it seemed that individual preferences were influenced by cultural customs or the flavours that the person was familiar with in the past. For example, one resident liked mango juice because it reminded her of the childhood in Pakistan, while a British-born resident mentioned he liked apple juice because it was '*a safe choice*'. Two drinks, which scored highly, but were not routinely available in the home were chocolate and strawberry milk, although the kitchen supplied syrups to make them.

The unit wide observations showed that there was little communication between the staff and residents regarding their preferences. Of 51 resident episodes when it was possible to establish whether residents were given a choice, staff asked about fluid preferences 15 times (29.4%). All instances were at mealtimes and residents were asked 11/23 times (48%) in the dining room and 4/21 times (19.5%) in their own rooms. The results of the Chi-square analysis showed that this difference was significant X^2 (1, N=44) = 4.05, p=0.044). Most of the times, the residents were not given a choice with staff placing a drink in front of them without asking what they would prefer to drink. The type of drinks given to the residents differed depending on location, with the majority of drinks in the dining room being squash and tea (52% and 40% respectively) and tea (61%) in the other locations. There was no significant difference in the number of hot drinks and juices given in the dining room and the other locations, although this was probably due to small number of these drinks being offered. Overall, the most common drinks given at mealtimes were tea, squash and water (Figure 4.4). Squash and water, which were the most prevalent pre-observation drinks, were given less frequently than tea, but they were observed not to be drunk by the residents and were present for prolonged periods of time. Residents were more likely to be offered a choice of drinks when they were in a café. When the residents arrived, they were asked what they wanted to drink and how they liked it (e.g. sugar or milk) and virtually all residents were asked about the preference. However, there were many residents who were not able to visit the café and were not able to take advantage of these facilities.

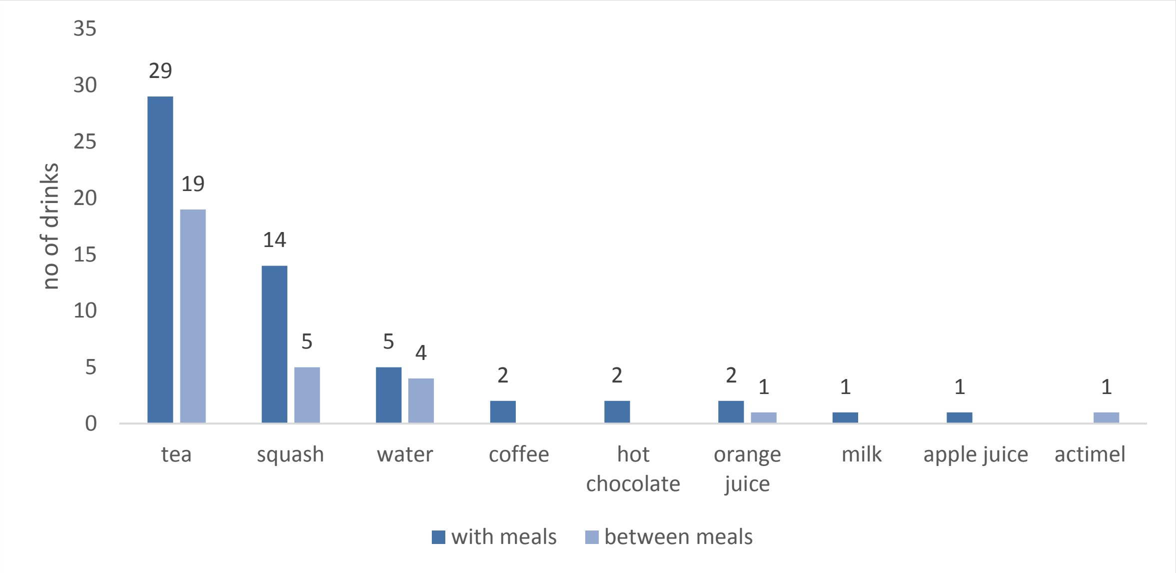


Figure 4.4: *Type and number of drinks given to the residents with and between the meals (n=56 and 76 respectively).*

The observations also showed that squash and water were usually provided because of their availability at hand's reach. Each table in dining room was set with either a jug of squash or water. Other drinks such as juices were available in an adjoining kitchenette, but required more effort to be served. As noted in the field notes:

> *"When staff provide the fluids, it is usually those that are at the moment most convenient to get, e.g. if a jug with red squash is on a table, people at this table will get red squash, those at the next table with water in a jug will get water. Preference is not taken into account".* (Unit A)

During the focus group, when queried about the juices, staff responded:

> *"They don't like juices, they find them too strong, squash is better…"* (HCA1)

Likewise, drinks provided to the residents in the lounge and their bedrooms were the ones most easily accessible. There were jugs of squash and water on the tables and they were usually served to residents. Staff did not ask the residents what they wanted to drink and refilled the glasses if they were empty.

When hot drinks were served, these were made individually in the kitchenette and delivered to the residents on a tray or one by one. This required more effort and therefore was limited to certain times of the day, such as breakfast, afternoon tea and the evening. Residents were given tea or coffee depending on what the staff perceived the residents to prefer.

> *"I am not sure if anybody actually got their choice of coffee or tea, I know at least one person who likes coffee, but got tea instead"* (Unit A)

> *"None of the residents were asked and just given tea, only one got coffee, I know at least two more residents that prefer coffee to tea"* (Unit A)

Staff had also varied opinions on the type of food and drink residents should consume. For example, during the focus group all staff agreed that water was the healthiest option and thought that all residents should drink it daily. Confusion with diabetic residents was also an issue identified during observations. Depending on the views of the individual staff members, certain drinks or food items were withheld for the diabetic residents, resulting in no systematic approach. Some staff were observed to give the residents cakes and sugary drinks, while others (usually nurses and more experienced HCAs) were observed to tell the junior staff not to offer any desserts, sweetened drinks and fruit to the diabetic residents. On few occasions it was observed that the residents would have their favourite drinks withheld only to be given a piece of cake later. The squash, which was a sugar free version was also withheld by some staff.

The lack of choice and being given less preferable drinks was probably a large factor that determined whether drinks were consumed by the residents. Drinks that were found to be entirely consumed were hot chocolate and apple juice, while 84.6% of the total volume of tea served was consumed. Interestingly, apple juice, was served by the family member, and the hot chocolate was requested by the resident. On the other hand, water which was endorsed by staff was not popular with residents and only 17% of the amount offered was consumed (Figure 4.5).

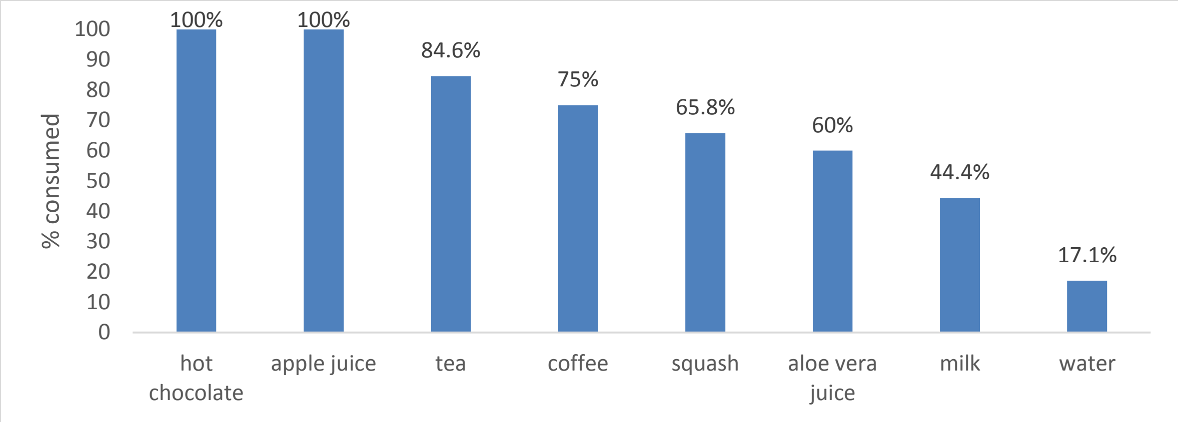


Figure 4.5: *Percentage of different types of drinks consumed by the residents.*

Provision of fluid rich foods

The results of the observations demonstrated that across the whole unit over three days, there were 49 fluid rich foods given to the residents, and all except one (yoghurt) were given at mealtimes. On average during mealtimes the proportion of residents who received fluid rich food was 67% (38/57) (Table 4.6). Fluid rich foods were mostly served at dinner when 90% (19/21) of the residents received at least one portion. At lunch and breakfast, the proportion of residents receiving fluid rich foods was less (57%, 12/21 and 50% 7/14 respectively). The proportion of residents receiving fluid rich foods was similar in own room and lounge/dining room. Residents did not usually receive more than one fluid rich food during each episode of hydration care, this occurred for 24% (9/38) of the episodes.

Table 4.6*: Fluid rich foods served at mealtimes*

	Own room			**Lounge/dining room**		
	No of residents	**No (%) of residents receiving fluid rich foods**	**Types of fluid rich foods served**	**No of residents**	**No (%) of residents receiving fluid rich foods**	**Types of fluid rich foods served**
Breakfast	5	2 (40%)	Porridge, cornflakes	9	5 (55%)	Porridge
Lunch	10	5 (50%)	Yoghurt, custard, curry with milk	11	7 (64%)	Custard, fruit, yoghurt
Dinner	11	11 (100%)	Yoghurt, soup, mousse	11	8 (80%)	Yoghurt, crème caramel, soup, fruit
Overall	**26**	**18 (69%)**		**31**	**20 (65%)**	

Fluid rich foods were discussed by the staff and the residents when the data for the questionnaires was obtained. Many residents stated that they enjoyed eating fluid rich foods, with ice cream and jelly being particularly popular. According to the responses by staff, fluid rich foods such as yoghurt, custard pots, fresh fruit and jelly pots were available on the unit, while other options such as tinned fruit and ice cream were also available from the kitchen. These were said to be available throughout the day and residents were able to request them any time. Additionally, staff noted that other fluid rich foods such as gravy, soup, fresh custard and porridge were offered at mealtimes and were sent from the kitchen together with other food items. They also stated that alternatives to the desserts were provided if the residents who did not like the items on the menu; these would be any desserts available throughout the day from the unit or the kitchen. Staff also reported that these fluid rich foods suited a range of special diets such as diabetic, vegetarian and modified consistency foods. According to the chef, the meals were provided as per a four-week schedule, which changed twice a year to accommodate seasonal items. Upon examination of the example menu provided by the chef (Appendix 6), it was discovered that fluid rich items were not always included on the menu and that the ice cream and jelly (most often mentioned as favourite by the residents) were only available once and three times respectively in a four-week period. The observations also demonstrated that the alternative desserts were not offered and that residents were not aware they could request other items. As a result, the favourite desserts (ice cream and jelly) were rarely given. Fresh fruit observed to be available on the units were oranges, apples, pears, bananas and grapes. These were delivered as whole to be prepared by the staff on the units. However, the chef also mentioned that sharp knives were not allowed on the units because they were considered a health and safety hazard to the residents. This meant that the staff were not able to chop the fruit, while many residents were found not being able to handle the whole pieces of fruit. As a result, it was frequently observed that the only fruit given to the residents were bananas and grapes.

The unit wide observations demonstrated that most common fluid rich foods offered were soup and yoghurt, which constituted 22% of fluid rich foods each (Figure 4.6). As with drinks, residents were not asked about preferences when these were served. Ice cream, which along with jelly was previously identified by the residents to be their favourite fluid rich foods was only served once to one resident, while jelly was not served at all.

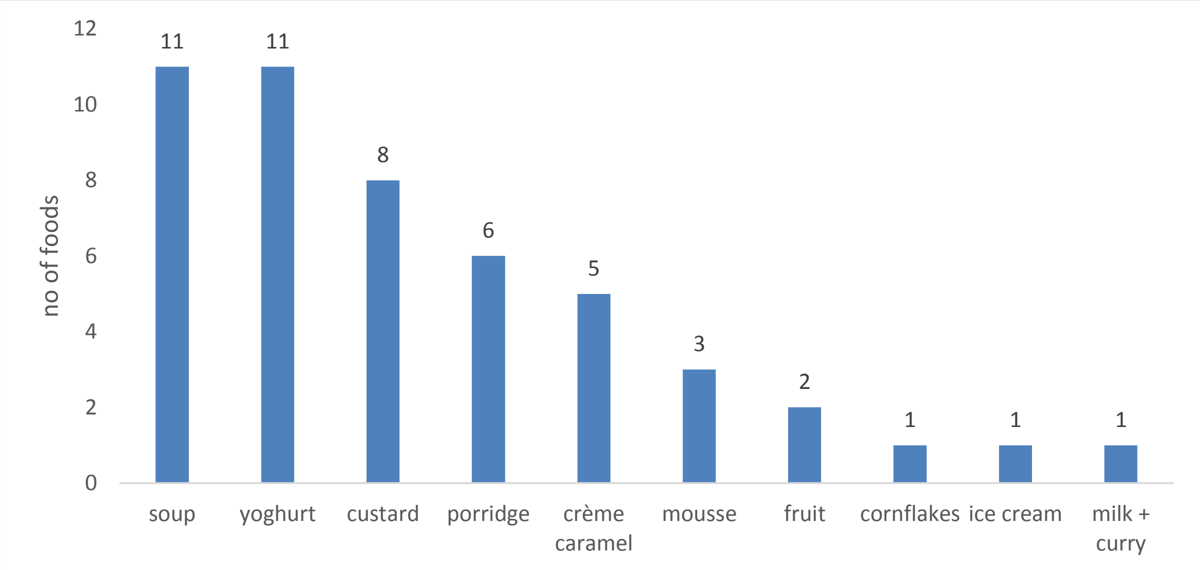


Figure 4.6: *Frequency of different of fluid rich foods given to the residents (n=48 at mealtimes and n=1 between meals).*

Drinks out of reach

At all times, jugs with squash and water were on tables for the residents, but many had empty glasses and could not refill them without assistance. Refilling drinks after mealtimes, which was a routine in the lounge, did not generally happen in resident rooms. Many residents had to wait until the next time a staff member walked into their room to have a drink. Some residents were only visited at meals, which meant they only had three opportunities for these drinks to be refilled. This meant that while in theory, the drinks were available, these were not accessible to the residents. Furthermore, it was frequently observed that the residents had the drinks, but they were out of their reach. This appeared to be particularly common in the bedrooms during early morning and in the evening.

Another problem identified during observations was that the drinks were sometimes on the tables, but the tables were pulled away from the beds and out of reach. On other occasions the tables were so low that the drinks were not visible to the residents. This could have been done accidentally as observed with a domestic staff who moved the tables during cleaning. It was also frequently noticed that the table with a drink was moved away from the resident's bed when the staff provided personal care and was not returned to the bedside upon completion of this task.

However for some cognitively impaired residents it was observed that the drinks were placed out of the reach to prevent spillage. Other items on the tables such as urine bottles obstructed the view and prevented the residents from reaching for their drinking vessels.

Insufficient assistance

Hydration care was depended on resident ability to drink and different types of the residents were faced with unique challenges that prevented them from drinking. Observations on both units demonstrated that independent residents were often found to have no drinks available to them, usually because they were not refilled or served on time, or because they were out of reach. Many independent residents also mentioned in questionnaires that they did not always receive the drink they wanted or that the volume of this drinks was not sufficient.

Individual observations on unit B showed that for the residents who needed full assistance, the opportunities for the drinks were limited. They were usually not provided a drink between the meals, which meant their only opportunities to drink were the three mealtimes. They frequently were missed afternoon tea, either because they were not provided with a drink at this time or because the staff did not spend enough time for them to be able to finish. Similarly, food was not always consumed by these residents, which impacted on their ability to obtain a dessert and hence the additional fluid from fluid rich foods. Additionally, observations on both units have demonstrated that these residents were usually given smaller food portions, and since it was assumed that they could not each much, the soup or dessert was usually not offered. This was particularly prevalent in the residents who had their meals in the lounge and their own rooms.

Some residents required prompting, although this was not always recognised or acted upon. These residents were viewed by the staff as independent drinkers and were given similar amounts of fluid; however they were often found to be asleep in front of the unfinished food and drink. Staff in focus groups and questionnaires mentioned that they provided prompting frequently, however the observations on both units have shown that this was inconsistent and was not provided to all residents who required it.

Residents who had their meals in their bedrooms were not supervised to eat and drink unless they required assistance. None of the residents were prepared for the meal until the food was brought. It was frequently observed on both units that the resident was woken up and the headrest was raised when the HCA brought a tray to the room. As a result, residents were not adequately positioned to eat and drink, which could have influenced the amounts of fluid and food consumed, but also could put some at risk of aspiration.

Another barrier to hydration for the residents in the communal areas was toileting. During the day, there were no scheduled opportunities for this to occur and the residents had to ask a staff member to be taken to the toilet or to be changed. Although the toileting and incontinence was not discussed in detail, staff recognised that this was an issue to some residents. They were able to identify a few individuals who refused drinks due to the fear of the frequent visits to the toilet or incontinence. They stated that it was particularly difficult to encourage these residents to drink:

> *"…and the problem is some of them don't like drinking too much 'cause then they keep going to the toilet"* (HCA 1)

On some occasions it was observed that the residents had to wait for a long time because there were no staff present to communicate this or the staff were busy and asked the residents to wait. Sometimes they would get busy and forget about the request. This was confirmed by the residents, majority of whom mentioned they enjoyed drinking (11/20, 55%), but that they were also worried about the incontinence and toileting.

> *"Sometimes I worry that they won't come and get me on time".* (Resident, BR 2)

While some of the residents wore pads for protection, many mentioned and were observed to be embarrassed by this and they wanted to use the toilet or a bedpan instead. As a result, many residents (10/20, 50%) also mentioned that they actively restricted their fluid intakes to avoid incontinence or the need to go to toilet.

Staff on both units were observed to rush through all the tasks throughout the day. The shift started at 8am and the HCA were trying to get as many residents washed and ready for breakfast as possible. Breakfast was sometimes delayed, and the staff rushed through, so they could finish washes before lunch. Afternoon was the time when the staff took their breaks and started changing incontinence pads. Many residents were put to beds around this time too. The remaining residents were put to beds shortly after dinner and when this task was finished, the staff started writing the nursing notes, fluid chart records and other documentation. It was observed that during and after documentation was completed, staff provided little care to the residents. Frequently HCAs were observed talking to each other, watching TV or checking their phones until the shift finished. It was also observed that if residents needed any care around this time, they had to wait for the night staff to provide it.

Unsuitable drinking equipment

Staff reported that the care home provided cups with saucers for hot drinks, glasses for cold drinks, and standard crockery such as plates and soup bowls for meals. For those unable to utilise standard equipment, the home also provided straws, plastic glasses, beakers, lipped plates and special cutlery. Nurses and HCAs mentioned that the residents and their families were also encouraged to bring their own equipment. From the observations on both units it was evident that as with drink preferences, drinking vessels were not always considered. Drinking vessels were laid on the tables in the dining rooms before meals started and were used for giving drinks to the residents regardless of their needs. The same equipment was provided in a lounge with small teacups being used for tea or coffee and glass tumblers for serving cold drinks in both locations. In own bedrooms, residents were provided either with a beaker or a plastic tumbler with other crockery being used less frequently. While some residents had their own mugs, these drinking vessels were not routinely used with an exception of two residents who had specialist dysphagia cups. Additionally, the crockery held only 150ml of fluid, which would require at least ten drinks to be offered throughout the day to reach the recommended 1500ml. This would involve providing at least one and sometimes more drinks at each opportunity throughout the day.

Staff in focus groups discussed the importance of providing an appropriate drinking equipment to the residents. They noted that some residents drank well, only if provided with the drinking utensil suitable to meet their needs:

> *"Someone may drink well, but not… in a glass… in a cup… use a beaker."* (RN 2)

> *"They will only…like with their drinking through a straw…"* (HCA 1)

The issue of unsuitable drinking equipment was mentioned frequently by the residents. The volume of the cup was identified as one of the barriers for the residents to drink adequate amounts, but more importantly they mentioned the difficulties they experienced when using standard cups and glasses. Many residents were not able to use the standard crockery because they found it heavy and difficult to handle. One of the problems they identified was a small handle of the teacup, which would only fit one finger. This made the cup awkward to hold because the entire drink was balanced on one finger. Glasses were also mentioned by a few residents who thought they were too heavy and slippery to hold.

> *"He finds a teacup too slippery, handle is too small, and it burns his fingers"* (Daughter, Resident DR 7)

On the other hand, they also discussed that they did not want to use the beakers and other assistive devices because they were self-conscious of how they were perceived by others and that they did not like drinking hot drinks from plastic. They emphasised the importance of preserving their dignity when choosing alternative equipment. Many residents were embarrassed using the beakers, and despite their difficulties were still were trying to use the standard cups.

> *"I spill a lot of drinks due to my condition, but I don't like beakers, I prefer 'normal' crockery"* (Resident DR 7)

Consequently, many residents felt that the range of the drinking vessels provided by the home did not offer adequate support to meet their needs. Feedback provided by some residents revealed that many would welcome china mugs instead, especially if they were light and had a big handle.

From the results of testing the vessels, it was evident that the residents tended to prefer a mug to a cup. The mugs in general had bigger handles and were found easier to lift. The mugs that were rated highly were made of bone china and were lighter than a standard cup. A large handle was most important, so the residents could comfortably fit four fingers in, and wide enough to provide enough grip even for those who had difficulty closing their fists. Preserving the ability to drink from ordinary cups as well as drinking independently were important factors for many residents to maintain their dignity. The cups provided by the care home were rated lower, with the residents stating that they were difficult to keep the balance and therefore easy to spill. One also remarked that:

> *"You have to watch your fingers not to burn them on a cup".*

For those who were not able to lift the standard vessels, a good alternative was provided by offering plastic mugs (with the big handle as described previously), double handed mugs or the beakers. The preference for the alternative depended on a personal choice of the resident and what they perceived as more dignifying for them. For example, one resident presented with a double handed mug remarked:

> *"It was just excellent, but I would be embarrassed to use it",*

…while the other one was not content with plastic stating:

> *"Tea tastes much better if drunk from china".*

When testing a vessel for cold drinks, the plastic tumbler was preferred to the glass. The residents did not mind consuming soft drinks from plastic, which provided the advantage of relative lightness and the ease of handling due to the horizontal ridges. Additional benefit was that the cup could be converted into a beaker, which meant some residents felt less conscious drinking from it". This was also the only vessel that was rated higher than the standard beaker, which some residents seemed to accept.

Two types of specialist devices were tested: a vessel with rotating handle to reduce spilling due to the tremors, and the beaker with inserted device that dispensed small amount of fluid to be consumed at each swallow for residents with dysphagia. While the effectiveness of these devices was beneficial for some residents, the practicality and acceptability of these devices made them unpopular between many. Some residents refused to test them based on the appearance, many also tried but could not follow the instructions to use the vessels. This was of a problem for the residents with some degree of dementia, but it was also observed that even those with no cognitive impairment found the instructions difficult to follow and felt frustrated with their inability to drink.

The preferred volume for the cups and mugs tended to be between 200-250ml, but it was observed that the residents based this preference on the features of the vessel. Spearman's Correlation assessing the relationship between the volume of the cup and the volume perceived by the resident was significant, but only moderately correlated r (N=496) = 0.43, $p<0.001$). Perceived volume was also weakly and negatively correlated with the ease of handling r (N=496) = -0.17, $p<0.001$) suggesting that the residents rated the volume of the vessel based on whether they were able to lift it rather than the amounts they consumed. There was no correlation between the volume and the ease of handling of the cup r (N=496) = -0.3, $p=0.58$); and a weak, negative correlation between the weight (with and without fluid) and the ease of handling r (N=496) =-0.19, $p<0.001$) and r (N=496) =-0.18, $p<0.001$) respectively. These findings demonstrate that the specific features of the vessels, which enabled easier handling, helped to overcome the barriers contributing to the difficulty of lifting them such as the weight or volume. It also became apparent that the most important feature of the cup for the residents was its ease of handling, followed by the feel to drink from it and the volume. Appearance seemed to be important if there was an issue of dignity or hygienic reasons (i.e. visibly clean), but not for the aesthetic reasons.

Inadequate monitoring

Inadequate monitoring impacted both the amounts served to and consumed by the residents. This arose from a few identified problems that when combined made it difficult for the staff to record fluids appropriately. Firstly, staff were not allocated to specific residents when they provided them with fluids. Instead, hydration care was considered a team activity where everyone was responsible for offering drinks to all the residents. Secondly, the daily routine was organised in such a way that the staff focused on other tasks and did not give hydration care enough attention. For example, mealtimes were dedicated to eating while the times between meals were scheduled to carry out personal hygiene. Even the afternoon tea, which intended to provide drinks was rushed so the staff could get their breaks or start the ‘pad rounds’. At all these times, staff assumed that even if they did not give a drink to the residents, somebody else will. As a result, staff were not aware that the residents frequently missed their opportunities to obtain fluids. In fact they did not know what drinks and how much of them were given to the particular residents, thus they did not realise that the amounts of fluids they offered were not adequate.

Another problem was that drinks were not recorded in real time. Sometimes residents’ intakes were documented during the day, but most commonly the fluid intake charts were completed for a whole day at the end of the shift. At one time, it was also observed that the drink was written in advance. Entries for individual residents were usually completed by HCA who was allocated to a resident for a day. However, since hydration was a team activity, the HCA did not attend to the allocated residents at all times, and there was no evidence of communication between the staff. The HCA was therefore not aware of the drinks that had been given and consumed during the day for a particular resident but was still required to complete a fluid chart. As a result, most of the entries in these documents were the types and volumes assumed by the staff to be provided. On few occasions it was observed that fluid charts were written by the nurse who was not around to witness hydration care throughout the day. Additionally, when drinks were recorded, they usually represented the amount given rather than consumed by the residents. Monitoring whether the residents consumed their fluids was not evident. The standard amount of fluid recorded in the charts was 200ml, which was most likely overestimated the amount of fluids consumed since the glasses and teacups contained only 150ml.

Fluid intake charts were in place for a small proportion of the residents who were considered at risk. Of the eight residents who were observed for fluid consumption on unit B, three had their fluids documented. The entries within the fluid charts did not correspond with the data obtained by the observations. Some drinks were not recorded, while different ones were added to the chart, often at incorrect times. For example, one resident had a tea recorded as given at 9am, but she was only woken up and given breakfast at 10am and was not offered a drink. For the other resident, a cup of tea was given with dinner, but this was not documented. For one resident, the amount of fluid was totalled incorrectly, overestimating fluid intakes by 450ml. In general, the mistakes were due to the amounts being over- and under- estimated, wrong drinks being recorded, drinks being given but not recorded or the drinks not given but recorded. Fluid rich foods were not documented as a part of the fluid chart. Recording of fluid intakes from day to day was also inconsistent as it was observed that some residents who were considered at risk did not always have the fluid intake chart recorded on some days. Additionally, while all staff were clear that fluid intakes should be recorded for the residents at risk, it was not clear how the risk was assessed. Considering the data on fluid intakes, it could be assumed that all residents should be seen as at risk as there was only one residents who has met the recommended minimum fluid intake of 1500ml.

Finally, fluid records were not used to monitor residents either throughout the day or over time. Fluid charts stayed in the resident files for a week before being placed in care plans. There was no system in place to review the records and identify the residents who did not consume adequate amounts. At times, fluid intake records were incomplete and showed only a small amount of fluid drunk for the day, but these small fluid intakes did not need trigger the need to provide the residents with more fluids.

Observing individual residents over the course of fifteen consecutive hours demonstrated that on many occasions a cold drink, which was present at the bedside from before 6am was not consumed or refilled throughout the day and was still present at the end of the day. This was evident for the residents who stayed in their rooms as well as those who spent their days in communal areas. Similar situation was observed for jugs of water and squash in the sitting and dining room; these were not changed or refilled, but often stayed full throughout the day. Unfortunately, the lack of monitoring prevented the staff to recognise this as a problem.

Paradoxically one of the concerns that staff expressed was the inability to monitor residents' hydration outside the care home. Staff felt confident that residents on their units were well hydrated when remaining under their care, but they were not sure what happened to them when they left the home, e.g. when being taken to hospital. Staff noted that during these times residents could request drinks if they felt thirsty or that the escorting HCA would still offer fluids, but they felt this time outside of their care was uncertain.

> *"But I would say they miss the bulk of the on-going care within the (care home)…"* (RN 2)

Lack of communication

It was apparent that the staff were not always aware of the needs and preferences of the residents. According to staff, his information was provided in care plans and could be consulted any time it was needed. However, the observations revealed that these remained locked in the nurses' office and were not readily available to HCAs for reference. When speaking to the deputy manager about this issue, it was mentioned that this information needed to be locked to protect the residents' privacy. This was because these care plans also contained some sensitive information about the residents and their families. As a result, the staff verbally communicated all information about the residents and made many assumptions about the individuals' needs. Care plans themselves often included the requirements of the residents, but the preferences were not always available. It was also evident when talking to the residents and the families that the drinks the residents received did not always match the needs and preferences written in these care plans. This was most prevalent in vulnerable individuals, such as those who required assistance to drink or those who were not able to communicate. As an example, one resident from unit A who liked tea, was not observed to be given any throughout the entire period they were observed, while another resident had no information written regarding their preferences. Both residents were fully dependent on staff to receive care and they were within the group of those who consumed the least fluids. Another resident who suffered from recurrent UTIs had a recommendation that he consumed at least 1500ml a day, but when HCAs were asked, they were not aware of this.

Insufficient knowledge

Staff in the focus group indicated that they were aware of the consequences of dehydration and noted infections (particularly UTI), kidney problems and death as potential complications of insufficient fluid intakes. They also recognised that not drinking enough, vomiting and diarrhoea as well as fever were risk factors for the onset of dehydration. Some participants mentioned signs and symptoms which would make them aware that the residents could be dehydrated, such as concentrated urine and changes in residents' behaviour. All agreed that hydration was very important:

> *"I would say it's more important than, even giving some personal care…"* (HCA 3)

Staff felt confident that the training and experience they gained working in a home were sufficient to care for different types of residents, including those with dementia and those at the end of life whom they found difficult to hydrate. They felt that the induction training and experience gained on the job provided them with the exact skills they needed to provide outstanding care. As one nurse stated about the training for the HCAs:

> *"We get them to be able to care for* (complex residents)*"* (RN 2)

In contradiction to staff reports, observations have shown that the knowledge and skills of the HCAs were sometimes insufficient to care for vulnerable older people. There were some circulating myths which influenced what and when was given to the residents. Some of the examples include the belief that residents would not eat if they were given a drink before meals, that the residents were not allowed to drink alcohol because they were on medication, the confusion about the care of diabetic residents and that water should be drunk by all residents. Additionally, it was evident that staff were not aware of the importance of positioning the residents before eating and drinking and they did not know how to manage residents with different swallowing difficulties. The latter was especially problematic as it was frequently noticed that when they served the thickened drinks, these were not made to a required consistency and sometimes they were serving thickened fluids to the residents with dysphagia who did not have the thickeners prescribed. They were also observed to use spouted beakers for serving drinks to the residents with swallowing difficulties.

While the staff felt confident that their skills and knowledge were adequate, they also stated they were 'doing their best' looking after their residents. Some took this to a personal level saying that they cared for their residents as they would for their own family members.

> *"We are trying our best for the residents. Because we are trying to…In my opinion, I'm trying to care – uh – about the resident. Like I will care my mum… my grandma… like I would my family…"* (HCA 3)

When asked if there were any changes or improvements that could be made to fluid provision in the care home, all staff uniformly stated that they did not think so.

> *"We know…we know our task. We know what we need to do"* (HCA 3)

However, this perceived confidence in skills and their ability to tend to residents' needs could result in choices being taken away from residents and sometimes could even put them at risk:

> *"We know our residents better… what they like, and how they like a drink is one of them"* (HCA 1)

Work organisation and resources

The problem of inadequate hydration care arose from a wider culture in the home that prioritised other care activities, especially providing personal care. There was an allocation sheet, which included a section to assign staff to hydration-related tasks such as the mid-morning and afternoon 'tea rounds' or ensuring that appropriate fluid consistencies are prepared for the residents who are prescribed thickeners, but this part was frequently not completed. Allocations to the individual residents concerned washing, toileting and documentation, but nutrition and hydration were not included.

There was also a system in operation where HCAs were given badges and were responsible for overseeing the residents at different locations such as dining room or lounge. However, the HCAs were still responsible for providing personal care to the residents allocated to them, which meant that at times, they were required to be in two different locations at the same time. Consequently, they did not spend any time at the locations assigned to them. Lack of allocations to hydration tasks resulted in staff considering hydration as less important and the fragmented care made them unaware of how little drinks they provided to the residents. Additionally, due to diffusion of responsibility, it was difficult to make staff accountable for their actions.

An extreme example of this issue was one occasion on Unit A where the afternoon drink round was missed. This happened because a member of the kitchen staff brought a cake and offered it to the residents in the lounge; staff assumed that if cake was given, the drink round was already done. After a while it was pointed out that the drinks were not distributed but since it was late in the afternoon, only the residents in a lounge were given drinks.

Staff focus on personal care was evident in both units, despite the claims in the focus groups and the questionnaires that the drinks were ongoing. The majority of the time was spent on washing the residents and changing the incontinence pads. Staff, and particularly HCAs went through the day trying to complete these tasks as quickly as possible. This ‘busyness’ was sensed by the residents and their families who mentioned that they did not want to disturb the staff when they wanted a drink.

> *“…sometimes I feel like a nice cup of tea, but I don’t ask for it because they are so busy”* (Resident, DR 2)

However, the time which was left at the end of the shift was perceived by the HCAs as ‘earned’ and was used for their private time. As observed a few times at the end of the shift, the staff were paying little attention to the residents’ needs after they completed all their tasks.

It was observed that the availability of the equipment also impacted the staff ability to provide fluids. Shortage of beakers was observed to be a problem for the staff on the unit, who had to retrieve them from the residents and hand wash them in the kitchenette. In the questionnaires, staff mentioned that the dirty crockery was sent to the kitchen for washing after the mealtimes, but the observations showed that there was no system in place to ensure the trolley’s prompt return to the unit or that adequate supplies are in place between meals. This routine, together with the low supplies of cups and beakers resulted in HCAs being reluctant to send any crockery to the kitchen and they took it upon themselves to wash most equipment by hand. This demanded a significant amount of time, which contributed to the delays in fluid provision.

Similar problems were observed with restocking the drinks themselves. It was mentioned in the questionnaires by the catering manager that early in the morning a kitchen assistant restocked the kitchenettes with the drinks and supplies such as juices or milk. However, it was observed that these were not always restocked to the level that ensured the supplies lasted throughout the day and staff in the focus groups mentioned that sometimes this was not done at all. During the shift, the HCAs were required to go to the distant kitchen and obtain these items themselves. Additional problems arose from the fact that HCAs did not check if other items were needed and made frequent trips to the kitchen throughout the shift. This resulted in a large amount of time wasted and sometimes delayed the drink provision to the residents. On one occasion it was also observed that the staff member was trying to offer an alternative drink to the resident because the drink requested was not available on the unit.

Clinical staff were the main fluid providers. Data from observations on unit A showed that 70% (33/49) of the drinks were given by HCAs and further 13% (6/49) were provided by nurses. Non-clinical staff such as housekeepers, managers and kitchen assistants were rarely involved in hydration care. Interestingly, while these staff members could relief the HCAs in the task of hydration, the nurses and HCAs did not expect them to do so and frequently said that these staff were not trained to provide fluids to the residents. On the other hand, during the focus groups the staff mentioned that the family members should be involved in hydration care and they felt resentful when this did not occur:

> *"They won't physically get up and pour it out, you know?! And I think, 'why can't you get up and get her a drink'?"* (AC 1)

> *"You're coming in to see your relative, the girls are busy. If you're coming in, and you're coming in to see them, then you're coming in to help. If they need to drink, you get them a drink…"* (AC 1)

Staffing issues

Staff shortage was an apparent barrier to providing adequate fluids, and the staff discussed this issue extensively. They felt that despite trying their best, they were often faced with an inadequate number of staff on duty. Their feelings seemed to be directed towards the system that allowed inappropriate staffing levels rather than the individual staff members not coming to work:

"…we're always short of staff…" (HCA 3)

They observed that even if the unit was short staffed, they were still expected to maintain the same level of care. They also mentioned that low staffing levels in other departments could sometimes result in HCAs taking responsibility for tasks from other areas e.g. restocking the supplies, but that they did not receive any help when their unit was understaffed. They recognised that this was when the quality of care was compromised:

"How can you give the best service if you're short staffed?" (HCA 2)

Residents did not speak specifically about the staffing issues, but they did mention that staff were often busy and that sometimes they felt reluctant asking them for help.

Quality of staff and their attitudes were also mentioned in the focus group. All staff felt that there were many people who started working in a care home but soon realised that the job was not for them. The staff felt that many problems arose from the fact that these people did not like the job or did not realise how hard it was. They attributed this behaviour to the reason for frequent staff turnover that could compromise the care of the residents.

"And a lot of people come to do a bit of training, then they realise that, 'no, I don't like caring', then they leave" (HCA 2)

"I don't think people realise what a hard job it is" (AC 1)

All staff agreed that problems they experienced could be resolved if the care home employed more staff and increased their wages:

"Just we need more staff and we're on about ten pounds an hour". (AC 1)

4.3 Process Mapping

The initial plan was to construct the map during the process mapping session, but this approach faced the challenges similar to recruitment to the focus groups. Additionally, since the focus groups, the questionnaires and the observations provided sufficient data and identified the barriers to drinking, it was thought that this activity was no longer necessary. While construction of process maps did not bring any additional information apart from what was already known from the previous activities, they were useful in communicating the findings with the staff and the residents and provided a good reference to the problems when planning the interventions for the Action-Effect-Diagram. While the results of the observations, focus groups and the questionnaires identified the reasons for the residents not to consume sufficient amounts, the analysis of the process maps identified the underlying barriers for staff to provide adequate hydration care.

The process maps showed that there was a pattern of how drinks were distributed to the residents. When in the café, the residents were served a variety of drinks and it was noted in the field notes that the residents were asked about fluid choices. This was discussed by the activity co-ordinators who mentioned that they had more time to talk to the residents and give them more attention than the HCAs. This may be explained by the description of their roles, in which the focus shifts from providing personal care to ensuring the residents are provided with enjoyable experiences. In this role, they are more likely to comply with what the residents want to do rather than what needs to be done. As a result, they are more likely to ask they residents about their likes and dislikes. From the observations in the café it was also evident that they had more time than HCAs to provide this type of care as the activities usually involved watching moves or playing games, which meant they had more time to talk to the residents and ask them about their drinks. Additionally, all residents were present in one location and therefore it was easier to monitor every resident's drinks. As opposed to the activity coordinators, healthcare assistants had to juggle multiple tasks and had to monitor the residents dispersed throughout the whole unit. This explains the reason why the healthcare assistants did not provide sufficient amount of drinks to the residents, especially those in their own rooms and why some residents were likely to get the drinks only at mealtimes and the afternoon tea. The HCAs acknowledged the seven opportunities, but said that they already had other tasks that they were supposed to complete during this time. For example, the time before the breakfast was spent to wash and dress the residents who wanted to be in the dining room and during the time between breakfast and lunch, they were washing the others. They also thought they had no control over the evening drinks because these were served after their shift finished. On the other hand, the night staff thought that they could not feasibly provide the evening drinks to the residents because by the time they started many residents were already asleep; they also thought they did not have sufficient time to do so because they needed to change some residents and others needed to be put to bed.

The staff also mentioned that the drink provision on the unit was also influenced by the fact that there was no reliable mechanism to distribute the drinks to the residents. Many residents were located some distance away from the kitchenette where the drinks were stored, which meant it was difficult for the busy staff to access them. This was discussed by the HCAs who mentioned that it took them a long time to go back and forth with the individual drinks. This resulted in the staff more likely to offer the drinks already present in the room, which unless the resident had their own drink, usually only included either water or squash. Additionally, the drinks provided at the afternoon tea and in the evening were also distributed individually. The staff mentioned they would benefit from a trolley on which the drinks could be placed, but this was seen by the managers as against the person-centred care approach. Paradoxically, this meant that the staff were required to deliver the drinks in a way that made it more time consuming and also made it more likely that some residents would be overlooked. As a result, staff often tried to deliver the drinks on the tray, so they could provide them to a few residents at the time.

Another interesting observation was the drinks distribution during the mealtimes. At breakfast, all residents were given a hot drink, including those in their own rooms. In general, all drinks were provided when the food was served. For the residents in their own rooms, the drink was placed on a meal tray together with the breakfast, but at lunch and dinner it was not included. Similarly, while the hot drinks were given to the residents in the dining room and the lounge at breakfast, at lunch and dinner the residents usually received the water and squash from the jugs on the tables. When queried, the staff were not able to provide the reasons behind this.

The HCAs also commented on the lack of choice of fluids for the residents. They mentioned that many residents were affected by the cognitive and physical disabilities that made the communication difficult and time consuming. They felt that asking the residents about the drink preference was a time wasted since they already knew what these residents wanted. They also mentioned that the residents did not always know which drinks were available or that they made mistakes when choosing them. They thought that as a result they were in better position to choose the drinks that they knew the residents liked. This was in contradiction to what was observed that the type of the drinks served to the residents was influenced strongly by the immediate availability of the drinks.

The lack of preparation for fluid delivery was also apparent. Ideally, all drinks should be prepared and easily available at each opportunity for drink distribution. It was however noticed that tea and coffee were made individually, resulting in even more time wasted. Staff commented that the supplies were always short, and that crockery did not always return on time, but it was also noticed that they did not check their availability before they started drinks distribution, resulting in time wasted. This could have been easily prevented if there was one person responsible for ensuring all stocks were present, but this was not assigned to anyone.

In summary, process maps identified the reasons for staff behaviour which usually was associated with competing tasks and the attempt to save time. Staff were identified to take ‘shortcuts’ such as not asking residents for fluid preferences or not giving drinks to all residents. At the same time, some routines in the home were not time efficient and resulted in a significant amount of time being wasted on non-essential tasks such as preparing and providing individual drinks.

4.4 Action-Effect Diagram

Data from observations identified several barriers, which contributed to inadequate hydration care and resulted in inadequate fluids consumed. These were categorised into five themes (Table 4.7) and provided the basis to designing strategies that could be tested to improve hydration of the residents during AED session.

The session took place as planned, and sixteen participants attended including care home and clinical services managers, deputy managers, one nurse from unit B, two HCAs from unit B, one AC, members of research team, a representative from local Clinical Commissioning Group and the team from CLAHRC. The AED session was important for a few reasons. It provided a team-building activity, which helped to motivate and engage staff. It also provided an opportunity to summarize the findings of the observations to all stakeholders and discuss their significance in relation to fluid consumption of the residents. Finally, the session helped to identify potential strategies for improving hydration care and optimising fluid intakes. The diagram itself was useful for providing a visual aid for describing why the included strategies were chosen and how they potentially contributed to the overall aim of increasing fluid intakes of the residents.

Based on the results of observations and discussions during the session, the AED diagram was created (Figure 4.7). Four key contributory factors have been identified that likely influenced fluid intakes of the residents:

CF1: Understanding residents' needs, preferences and abilities;
CF2: Providing drinks that meet needs and abilities;
CF3: Increasing opportunities for fluid consumption;
CF4: Identifying and responding to unmet hydration needs

Contributory factors 1-2 focused on delivering person-centred care with a goal to provide drinks according to residents' needs and preferences. Since the observations identified that meeting the resident preferences was an important factor affecting the experience of drinking, it was hypothesised that ensuring all residents were given preferred drinks and appropriate assistance would result in increased fluid consumption. The specific strategies therefore needed to identify which drinks residents liked to drink and making them available in the homes, establishing and communicating the individual drink preferences of the residents, and finding the efficient ways for residents to communicate their drink preferences with the staff. Contributory factor 3 focused on ensuring sufficient opportunities to obtain drinks were offered throughout the day. This was thought to be important because it was identified that while residents usually had access to fluids at all times, these usually did not include the types of drinks the residents preferred. Additionally, since the observations identified that some types of the residents did not have enough opportunities for obtaining drinks, it was important to introduce the strategies which would ensure that all residents were given drinks at frequent intervals during the day. The interventions addressing contributory factors 1-3 were expected to ensure that all residents received preferable fluids in sufficient quantities, which would help the residents to consuming adequate amounts of fluids. In addition, contributory factor 4, which concerned monitoring of the residents at risk would ensure that more attention was given to the residents who failed to consume their drinks and remained at risk of low fluid consumption. The identified strategies are included in the AED diagram. The rationale for using these specific interventions is provided in more detail in the following chapter. Few areas required further research before interventions were developed. These included: training, exploration of residents' drink preferences, and evaluating the drinking vessels.

Table 4.7: *Summary of barriers, which contributed to inadequate fluid consumption.*

Theme	**Issues**
Timing	Limited opportunities to obtain fluids
	Residents generally offered one drink at each opportunity
	Residents missing the opportunities if asleep or not present
	Residents missing the opportunities if requiring assistance
	Hot drinks not offered with or after the meals
	No mid-morning drink round
Location	Residents in communal areas get more drinks
	Residents in communal areas get a wider variety of drinks
Meeting resident preferences	Residents not asked about fluid preferences
	Limited type of drinks offered
	Short supplies of drinks available on the unit
	The quality of the drinks does not always meet resident preferences
	Drinks in the kitchenette not easily accessible and therefore not offered regularly
	Fluid rich foods: only available at mealtimes, favourite foods rarely available
	Fruit provided to the units but no equipment to cut it
Equipment	Limited availability of a drinking equipment, cups often hand washed by HCAs
	Cups and glasses available do not suit residents' needs and /or preferences
	Little thought is given into the type of cup most suitable for the resident
	Residents requiring some level of assistance not sufficiently supported
	Residents not correctly positioned for eating and drinking
System weaknesses	Inadequate communication between the staff
	Unreliable monitoring and documentation
	Staff perceive fluid intakes as adequate
	Other tasks given priority
	Gaps in staff knowledge about hydration
	Toileting issues
	Staff not allocated to tasks other than washing and dressing residents
	Drinks prepared and distributed individually

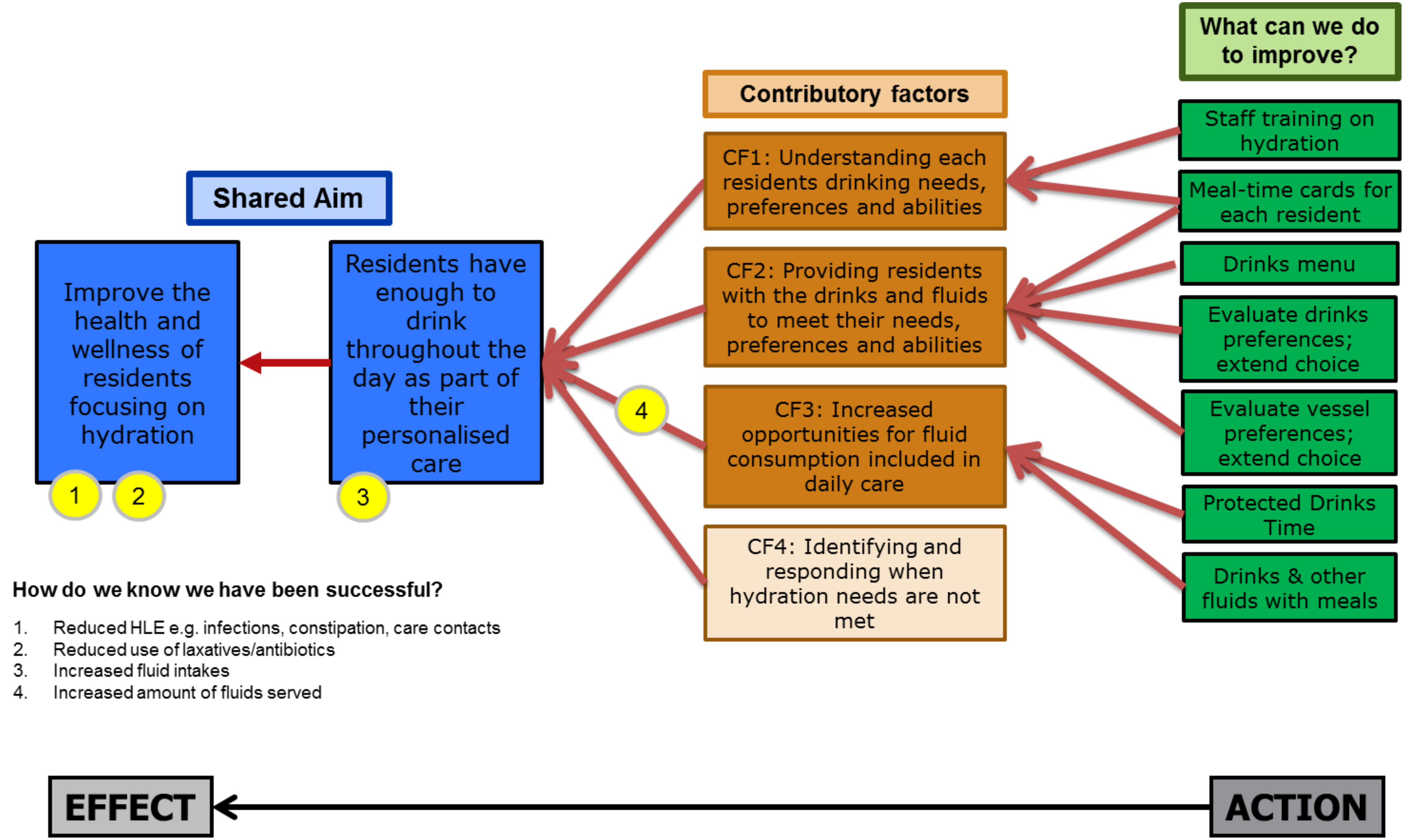


Figure 4.7 *Action-Effect-Diagram.*

Chapter 5 Intervention phase

This chapter describes the intervention phase of this thesis. Findings from the previous phase (Chapter 4) demonstrated that the residents were not able to drink adequate amounts of fluids because hydration care they received did not meet their needs. A number of barriers were identified, and a set of interventions were developed. The interventions were tested for effectiveness and feasibility using PDSA cycles. The results reported in this chapter were written in accordance with SQUIRE guidelines (Ogrinc et al, 2015).

5.1 Objectives and methods

The purpose of this phase was to test the effectiveness and practicality of the developed strategies to optimise hydration care for the residents. The summary is provided in Figure 5.1. The interventions were tested using PDSA cycles described in section 3.2.1. These were organised into three themes, each describing a contributory factor they intended to address. Brief description of the interventions is provided in Figure 5.2. One contributory factor, concerned identifying and responding to the needs of residents who did not consume adequate amounts, was not addressed. All staff agreed that to be able to address this, adequate monitoring would have to be in place. However, in the light of the current evidence, the experience of staff with documenting fluid intakes and the limited time of this project, it was thought that monitoring was a complex issue that required an effort of a separate improvement project.

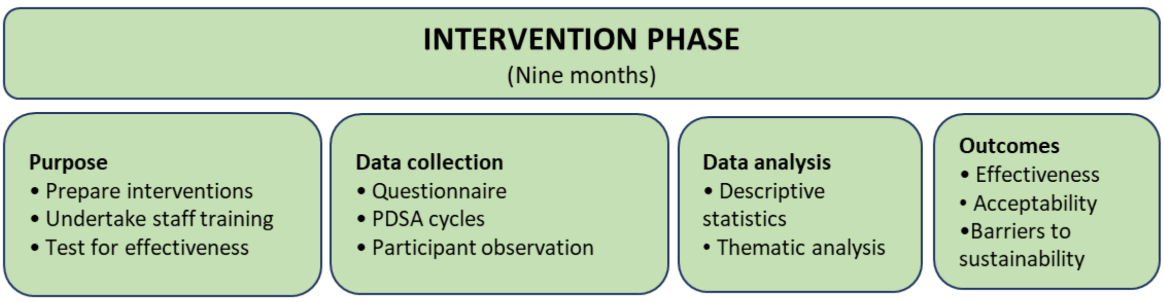


Figure 5.1: *Summary of the intervention phase*

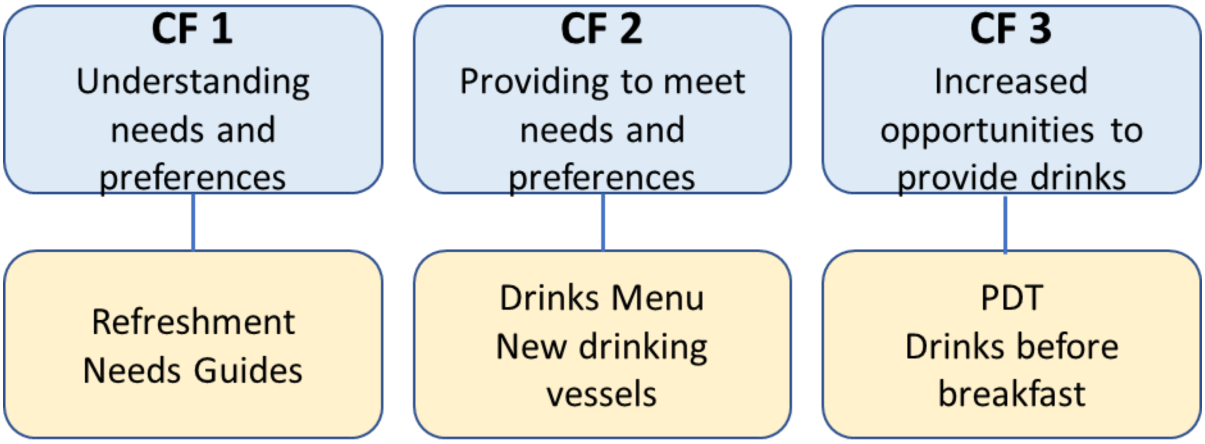


Figure 5.2 *Description of the interventions tested and reported in this thesis.*

Staff Training

This was necessary to address the gaps in knowledge and skills for the staff, so they could understand the importance of hydration and reflect on potential improvement strategies. Increasing staff knowledge about hydration was identified by the staff themselves, who asked for training to be provided to everyone before the interventions started. Managers and HCAs felt that while they received basic training as a part of induction, but this was limited and was not focused on hydration specifically.

A two-hour training session was devised, which comprised of a number of different components, each with specific goals regarding the overall outcome. These included emotional mapping to help raise awareness of importance of drink preference; a quiz to alert staff to common signs of dehydration and reasons that older people became dehydrated; case studies to help staff identify and manage residents at risk of dehydration; and practical session to teach skills in managing residents with swallowing difficulties.

A total of 61 staff members across the home attended the training. Participants reported that they enjoyed the training and thought it was useful. Most staff thought their understanding of hydration care has increased following the training. Although it was not possible to objectively assess the effect of the training on the quality of hydration care the staff provided, it was assumed that training alone would not change the practice.

Care home staff experienced some barriers in attending the training sessions, which were related to how the working rota was arranged. For this reason, there were only few members of staff from unit A and B who attended and when they did, it was suspected that they had little influence to make a change throughout the unit. To further facilitate the training of staff, ‘huddles’ were devised and introduced. These huddles lasted about 15 minutes and provided short bursts of training to the entire team on the shift. Huddles were often used to support current PDSAs, for example discussing the importance of residents’ individual preferences when the drinks menu was implemented. Supplementing the two-hour training session into shorter huddles carried out over one week was an efficient way of training a large number of staff on the whole unit team at the same time.

5.2 Results

5.2.1 Addressing Contributory Factor 1: Refreshment Needs Guides

Contributory Factor 1 concerns understanding each resident’s ability to drink and appreciating the importance of drink preferences. It is important for the staff to know what type of hydration care each resident requires and since some residents are not able to communicate effectively, this information should be available and easily accessible for the staff, so they can refer to it as needed.

The problem

Preliminary observational work identified inconsistencies in the communication of the hydration needs and preferences of individual residents. Details on residents’ needs and preferences were written in care plans and were stored in the nurses’ office, but these were not accessible and there were no systems to capture any new information on the residents in an efficient way. As a result, HCAs relied on a verbal communication to pass the information between each other, but this meant that assumptions were sometimes made about residents’ needs and preferences. Thus, the residents were not always provided with the hydration care they needed or preferred. It was thought that providing staff with accessible information would result in residents receiving the care they needed, which would help to increase their fluid intakes.

Purpose

The purpose of this intervention was to develop a simple communication tool that would enable the staff to easily access information on individual residents' hydration needs and preferences and therefore facilitate a more consistent hydration care.

<u>Prediction:</u> ensuring that the needs and preferences are met will result in increase of fluids consumed.

Intervention

The guides were modelled based on 'This is me' tool (Alzheimer's Society, 2010), and were adapted to mainly focus on hydration. They were developed based on observed practice and feedback from staff, relatives and the residents. The guides included food and fluid preferences, a photo of the resident and information on appropriate drinking vessels. The guides were colour coded, matching the level of assistance required.

Measurement

The first PDSA was used primarily to test logistics and was obtained in a form of feedback from one staff member. Cycles 2 and 3 sought feedback from staff and the data on number of completed guides. Upon introduction of the guides, staff were observed to determine the frequency of use of the guides and feedback was obtained from the staff, residents and the family.

Description of PDSA cycles

Cycle 1: The plan was for one HCA to complete a template of the guide provided for one resident on the unit, type and print it out with an accompanying resident photo.

This cycle was not conducted as planned. The HCA completed the handwritten copy of the guide but was not able to obtain a printed copy and the photo. The HCA also raised concerns regarding an ability of some staff to complete these. It was agreed that obtaining the handwritten copy was easy, and that the HCA would continue completing them in the next cycle. It was thought that obtaining printed guides was important to the overall success and sustainability of the intervention as more than one copy could be made available to the staff and that these could be easily updated. Therefore, it was agreed that the logistics of the guides being printed would be explored while the handwritten copies are completed.

Cycle 2: It was planned that the HCA would be given a month to complete handwritten guides for as many residents as possible.

This did not happen as planned. The HCA did not complete any guides in the time given and referred to lack of time as a reason. Therefore, it was decided that completing the guides should be the team activity with each HCA being responsible for completing guides for three residents.

Cycle 3: The plan was to complete all guides in one week. Each HCA was allocated three residents and asked to complete handwritten copies. The nurse and the HCA who participated in cycles 1 and 2 were asked to provide support in completing them. The researcher was to discuss with the care home administrator the possibility to obtain printed copies.

This was not carried out as planned. At the end of the week, two HCAs completed the guides for six residents. Staff reported these were easy to complete, but that they did not have time to do so. The discussions with the administrator revealed that due to their workload they could not contribute towards producing these guides. The feasibility to create the Refreshment Needs Guides in a printed or handwritten form was discussed among the team and it was decided that these required further exploration, which was felt would take considerable amount of time and effort. However, considering that it was unknown how these would affect the practice, it was decided that one HCA would be given time to complete these for all residents for distribution across the unit. Based on the results obtained, it would then be decided whether finding systems for completing and updating the guides was worth pursuing.

Cycle 4: The plan was for one HCA to complete the guides and for the researcher to prepare them in a printed format. Completed guides were to be introduced across the unit (Appendix 11) with three copies for each resident distributed across the unit: in the individual rooms displayed on the walls, in kitchenette for a folder to be taken with the drinks trolley, and in dining room and lounge used as placemats for the residents at mealtimes. Staff were asked to refer to them as needed for a period of one week.

This happened as planned. Upon introduction of the guides, staff were positive about them, but it was noticed that they were not used. When staff were asked why they did not consult the guides, they said that they knew their residents, therefore had no use for the guides. They mentioned that the new or agency staff would benefit from them. One new HCA was observed using the guides, but others still asked the established staff for information. In addition, one HCA raised concerns regarding sustainability of this intervention. In general, the residents acknowledged the guides but did not have any opinions on whether they liked them or not. The family liked the idea as they thought that the guides would help their loved ones eat and drink better. It was agreed that since staff found little use for the guides it was not feasible to continue with the development of these guides.

Post-PDSA

Considering the difficulties in generating and sustaining the refreshment needs guides, it was not feasible to develop this intervention any further. It was recognised that inconsistent care could potentially have negative consequences for the residents, therefore alternative methods of communication between staff were discussed following the decision to stop this activity. This coincided with the care home announcing the intention to introduce an electronic care planning software. As a result, the decision was made to abandon this activity as it was thought that access to care plans via an electronic system would provide an alternative to the guides.

Lessons learned

The success of this intervention was hindered by several barriers associated with both creating and using the guides.

Creation of the guides: The initial refreshment needs guide was prepared relatively quickly, but the staff reported difficulty completing them due to perceived lack of time. As observed in filed notes after the second cycle:

> *“she had a whole month but didn’t complete even one guide and said she was too busy”*

This was because the completion of the guides was not viewed as a part of the job, with other tasks being a priority. Considering the reported time pressures of the staff, it is not feasible to expect the guides to be completed during the shift, hence it is necessary to allocate time specifically for this activity. This would be difficult to negotiate since it would entail additional cost to the care home.

Involvement of administrative staff: Clinical staff had no routine access to computers and were only able to complete the templates by hand. The electronic copies were considered more appropriate because they looked more attractive and were easier to update. Involving the administrative staff who had computer access was unsuccessful as they were reluctant to take on additional responsibilities. As captured in the field notes from a first cycle:

> *"*[The HCA] *asked a receptionist if it would be possible for them to transfer the information from handwritten copies into the electronic copies, but was told that receptionists were not going to get involved. At the same time, she was also told that she wasn't allowed to use the computers"*

Leadership and authority of the management to influence the administrative staff or provide the clinical staff access to computer technology is necessary to overcome this barrier.

Staff skills and abilities: there were concerns that completing the guides may be difficult, especially for those with poor language skills. Interestingly, no staff reported any difficulties except the lack of time. It is possible that some staff members felt uncomfortable reporting difficulty completing them in fear of being belittled. Additional training could possibly help addressing this issue.

Staff making assumptions: On few occasions, it was noticed that the information included in the guides was either incomplete or incorrect. This became especially evident when the families provided feedback upon which a large proportion of the guides had to be updated. It is possible that the staff did not refer to care plans and did not consult with the residents or their families when completing the guides. This could be the result of staff making assumptions that they knew everything about the residents; an explanation that is supported by the staff feedback on the use of the guides and use of drink menus.

Communication means: Verbal communication is preferred for sharing the information between the staff. This was observed with the new staff who were more likely to ask another HCA for advice rather than consult the Refreshment Needs Guides easily accessible to them. The potential risk of verbal communication is that the information could be forgotten or misinterpreted upon which wrong assumptions could be made. This did not only influence preference compliance but at times could also result in unsafe practices.

Limitations

Refreshment needs guides intended to provide a communication tool to facilitate the dissemination of information on fluid requirements between the staff. However, the preferred method of communication for staff was a verbal form. Both, the established and the new staff seemed to find no benefit from using the guides and the feasibility of creating these guides remains unexplored. This is an example of an unsuccessful PDSA, which was abandoned due to unproven effectiveness and challenging barriers to sustainability. There is a possibility that this intervention may be feasible to sustain, providing that care homes are willing to invest in the development of this activity. However, considering that care homes are likely to move towards the electronic systems, this intervention will probably have little value in the future.

5.2.2 Addressing Contributory Factor 2: Drinks Menu and New drinking vessels

Contributory Factor 2 concerns providing the drinks that match the residents' ability and preference. This recognises that while the staff may be aware of the needs and preferences, there is a need to ensure that there are systems in place that ensure that suitable fluids are served appropriately to the residents.

The problem

Drinks provided to the residents did not always meet their preferences. Results of drink tasting, observations and feedback from the residents demonstrated that the preferable drinks such as tea and juices were not always provided, while the commonly served squash and water were not a popular choice. It was also evident that some residents were not aware of the full range of drinks the care home provided. Observations also showed that residents were not always asked about the drinks they wanted to consume, and when this happened it usually involved the HCA offering of a cup of tea. When queried, staff indicated that communication with some residents was difficult and that many residents were not able to make a choice for themselves. It was evident that there was a need for a tool that would support the residents making fluid choices.

Another barrier that the residents faced was the current drinking vessels, which hindered their ability to drink independently. The vessels, while difficult for the residents to handle were also found to provide insufficient amount of fluid. Testing of the drinking equipment demonstrated that the residents' needs could be better met if the equipment matched the specific features such as lower weight, larger handle and better grip. These could improve drinking experience, promote resident independence, and allow the residents to handle larger volumes. These would subsequently increase their fluid intakes.

Purpose

The purpose of this intervention was to increase the range of fluids given to the residents by providing them with a list of the drinks they could choose from, and serving these drinks in the drinking vessels that better suited their needs. It was hypothesised that providing the preferred drinks to the residents would encourage the consumption, while serving them in more appropriate vessels would make it easier for the residents to handle their drinks. It was therefore thought that preferred fluids, which are easily accessible will promote fluid consumption.

<u>Prediction</u>*:* a wider selection of drinks given in the vessels that suit the residents' needs will increase fluid intakes.

Intervention

<u>Drinks Menu:</u> To begin with, a one-sided A4 menu was created with both, hot and cold drinks listed. Next to each drink name was an image related to that drink e.g. a fruit or a drink's logo. Following feedback from staff and residents, the menu was redesigned with cold drinks on one side and hot drinks on the other (Appendix 10). This incorporated larger images, allowing residents to point at the drink they liked. The menus were distributed across the unit. Copies were placed in the dining room, lounge and in residents' bedrooms. Additional menus were provided so staff could take them to the residents individually as needed. It was thought that PDT presented a good opportunity to introduce the Drink Menu because fluids were given routinely around this time.

New drinking vessels: Four new vessels were introduced to replace the standard equipment across the unit (Table 5.1). To ensure sufficient supply for the duration of testing, four mugs and cups were ordered per resident. Since the double handed mugs and dysphagia cups were only necessary for a small number of residents, ten of each design were ordered to supply the unit.

Table 5.1: *Description of drinking vessels introduced across the unit.*

Cup/mug implemented	**Description**	**Rationale for introducing**
 China mug	Volume: 300ml Weight: 213g Weight with fluid: 513g Material: bone china Features: Lightweight, large and wide handle, to be used for hot drinks	Mug that mostly resembled one most favoured by the residents in testing.
 Sure-grip ® cup	Volume: 200ml Weight: 52g Weight with fluid: 252g Material: plastic Features: Lightweight, horizontal ridges enable easy grip, fits standard beaker lids, can be used for cold and hot drinks	Scored highly during testing, preferred to glass tumblers, could also be used as beaker with standard lids provided in a home
 Double-handled dignity ® mug	Volume: 200ml Weight: 305g Weight with fluid: 510g Material: earthenware Features: Two large and wide handles, to be used for hot drinks	Scored highly during testing, alternative for residents who had difficulty lifting standard mugs
 Dysphagia cup ®	Volume: 200ml Weight: 239g Weight with fluid: 539g Material: plastic Features: Lightweight, large and wide handle, oval shaped rim to allow the user to tilt the cup without tipping the head back, cone shaped inside to facilitate fluid flow, curved rim to encourage the fluid to flow to the front of the mouth, can be used for cold and hot drinks	Safe to use for residents with swallowing difficulties, overcomes the problems of the cup with measuring device, recommended by SALT.

Measurement

Drinks Menu: The effectiveness was assessed by observing and recording the number, type and amount of drinks given and consumed. This was collected for PDSAs 1-3. One set of data was also collected a week before the menus were introduced to provide a ‘baseline’ measure. In PDSA 4, observations were carried out by the researcher to assess whether the menus were used, but no data on fluid intakes was recorded. Feedback from the staff and residents was obtained in all cycles.

New drinking vessels: The effectiveness was measured by observing the residents and recording the number and volume of the drinks served, amounts consumed and number of episodes when standard vessels were used to serve drinks to the residents. Feedback from staff and residents was also obtained.

Description of PDSA cycles

Drinks Menu

Cycle 1: The plan was for HCAs to load the trolley with all drinks on a menu, take copies of the menu to the residents and encourage them to have both, a cold and a hot drink. Kitchen assistants were asked to supply enough drinks for the activity.

This did not happen according to plan. Staff were not briefed, and the menus were not utilised from the beginning. When menus were in use, residents were offered one drink rather than two. Juice supplies were low, and some types were not available by the time this activity started. Some drinks were available, but were not on a trolley, resulting in staff having to go back to the kitchen when these were requested. The staff were not allocated to PDT tasks; hence some residents were not given appropriate assistance. The drink menu did not increase the number of drinks given and number of types of drinks offered (Figure 5.4). Because the test was not carried out as intended, the data on fluid intakes were not collected. It was agreed that since the test was not carried out as intended, it was not possible to determine its effectiveness and that the test would be repeated in the same format, ensuring that staff are prepared for the activity and sufficient drink supplies are provided.

Cycle 2: The plan was to carry out PDT as intended and use the drink menu. Staff were asked to load the trolley with all drinks and encourage the residents to have a cold and a hot drink. Kitchen assistants were asked to ensure enough drinks were present and team leader was to remind staff about the activity.

In this cycle, there were only few staff to start PDT. Drink menus were utilised from the beginning, but not all residents were offered a choice. Not all drinks were available on a trolley and staff had to go make them individually. Some juices were not provided in sufficient amounts and HCAs had to get them themselves. Staff reported that it was difficult to communicate with some residents using the drinks menu. The number of types of drinks given to the residents increased, but number of drinks and fluid intakes remained the same. It was decided that it was not possible to assess the effect of this intervention because of the problems with conducting PDT. Hence it was agreed that the next test should be carried out in the same format, but that the nurse would allocate HCAs to their roles and breaks and monitor that these were adhered to. Since the menus were not offered to all residents, it was decided that the importance of providing preferable drinks would be addressed in huddles. Additionally, it was agreed that the deputy manager would discuss the concern regarding drink availability with the catering manager.

Cycle 3: It was planned that HCAs would carry out PDT according to allocations and would use the Drinks Menus to offer two drinks to the residents. Nurse was responsible for allocations and monitoring the activity. The catering manager was asked to ensure that kitchen assistant would provide sufficient supply of drinks.

In this cycle, the PDT was carried out with only one HCA present. The HCA offered drinks using the menu to all residents in the rooms, which she was able to serve by herself. The HCA encountered problems when serving the drinks to the residents in the garden. The HCA offered drinks to residents from the unit, but other residents also wanted drinks. The HCA was trying to serve drinks to all but was too busy with the demands. Staff from other units, who were present in the garden for activities, started serving drinks, but used all crockery resulting in the HCA not being able to serve drinks. Some HCAs joined in at the end of the activity, but it was too late as most residents were finished by then. Staff reported that some residents had difficulties reading the menu. The selection of the drinks was better than at baseline and similar to PDSA 1 and 2, but this did not result in more residents receiving drinks or fluid intakes increasing. The results were discussed, and it was agreed that PDT was not carried out as intended, which hindered fluid consumption of the residents. It was agreed that the next cycle should be repeated in this format, ensuring that staff are allocated to tasks and breaks. It was also agreed that the menu would be redesigned to include large pictures for the ease of reading for the residents. *Note: after this cycle, the activity halted for a few months, during which time, the issue of cost was negotiated with the catering and care home manager. The manager was* *keen to keep the menus in dining room, lounge and resident rooms, but without HCAs actively using them. This however was thought to limit the ability of the residents to obtain preferable drinks and would especially affect the residents who did not visit the dining room.*

Cycle 4: The plan was for the revised Drinks Menu to be introduced on the unit and used for a period of approximately two weeks, after which the feedback from staff would be sought. All HCAs were asked to use the menu each time they offered drinks to the residents; an activity coordinator was also asked to try the menu in a café. The nurse was asked to model the behaviour by showing the HCAs how to use the menu and prompting them to do the same.

This cycle was carried out as planned. All HCAs reported that they were using drinks menus, although the observations of the unit carried out around this time revealed that they did not use them. The nurse was found not to use the menu and did not encourage staff to use it. Many staff reported the menus to be time consuming and some also indicated that the residents were not able to understand them. Feedback from one AC was positive, with no problems using the menu or communicating with residents reported. The AC commented that she was surprised about some residents' fluid choices. Although no resident feedback was obtained, it was observed that the residents were reading the menu in the dining room, and one resident who could not remember the drink she liked, was able to recognise it on the menu and read it out or point at it. While staff were reluctant to use the menu, it was observed that they were verbally asking the residents about their fluid choices. It was agreed that although staff were not utilising the menus as intended, this intervention was at least partially successful because residents were offered a choice, hence it was decided that the nurse and the deputy managers would continue reinforcing the use of the drink menus.

New drinking vessels:

Due to the difficulties of replacing the equipment, it was decided that the new mugs and cups would be introduced and tested for a month as one PDSA. If successful, the new equipment would be implemented and stay on the unit following the end of testing.

Cycle 1: The plan was to replace the existing vessels with a new design throughout the unit, old vessels would still be available but in smaller quantities. Staff would be briefed before the introduction and asked to use the new equipment unless the resident specifically requested otherwise. It was agreed that staff and residents would be given approximately two weeks to adjust to new vessels and form the opinions about them, before measurement was taken.

This happened as planned. Staff were briefed beforehand and were observed to routinely use the new vessels, although initial resistance to move towards the new equipment was observed with a few members of staff. Some commented that the mugs would be too big, the residents would find them difficult to handle and that they contained too much volume which would not be consumed. One member of staff indicated that it would have been better to provide the residents with the plastic mugs instead. Some staff were also sceptical about the double handed mugs and dysphagia cups. All staff embraced the plastic cups for the soft drinks. Soon after introduction it was noticed that the staff were reluctant to serve drinks in mugs to residents who were in beds. When asked, they replied that the residents did not like them and requested cups, but the feedback from residents suggested that they preferred to drink from the mugs. This issue was resolved at the next huddle, where the feedback from residents was given to the staff. By the time the measurement was taken, new equipment nearly replaced the old type vessels. The teacup was used three times of the observed 101 episodes (3%) when drinks were given; glasses and beakers were returned to the kitchen and not used at all. Introduction of the mugs resulted in an increase of average fluid intakes at both, the breakfast and lunch (Figure 5.3). Many residents consumed more than 150ml, the volume of the standard cup or tumbler. When additional drinks were offered, some residents consumed up to 450ml of fluids. The amount of drinks offered before and after the introduction did not differ (1.36 vs 1.41 drinks per resident respectively) and the percentage of drinks consumed was also similar (69.5% vs 67.2%).

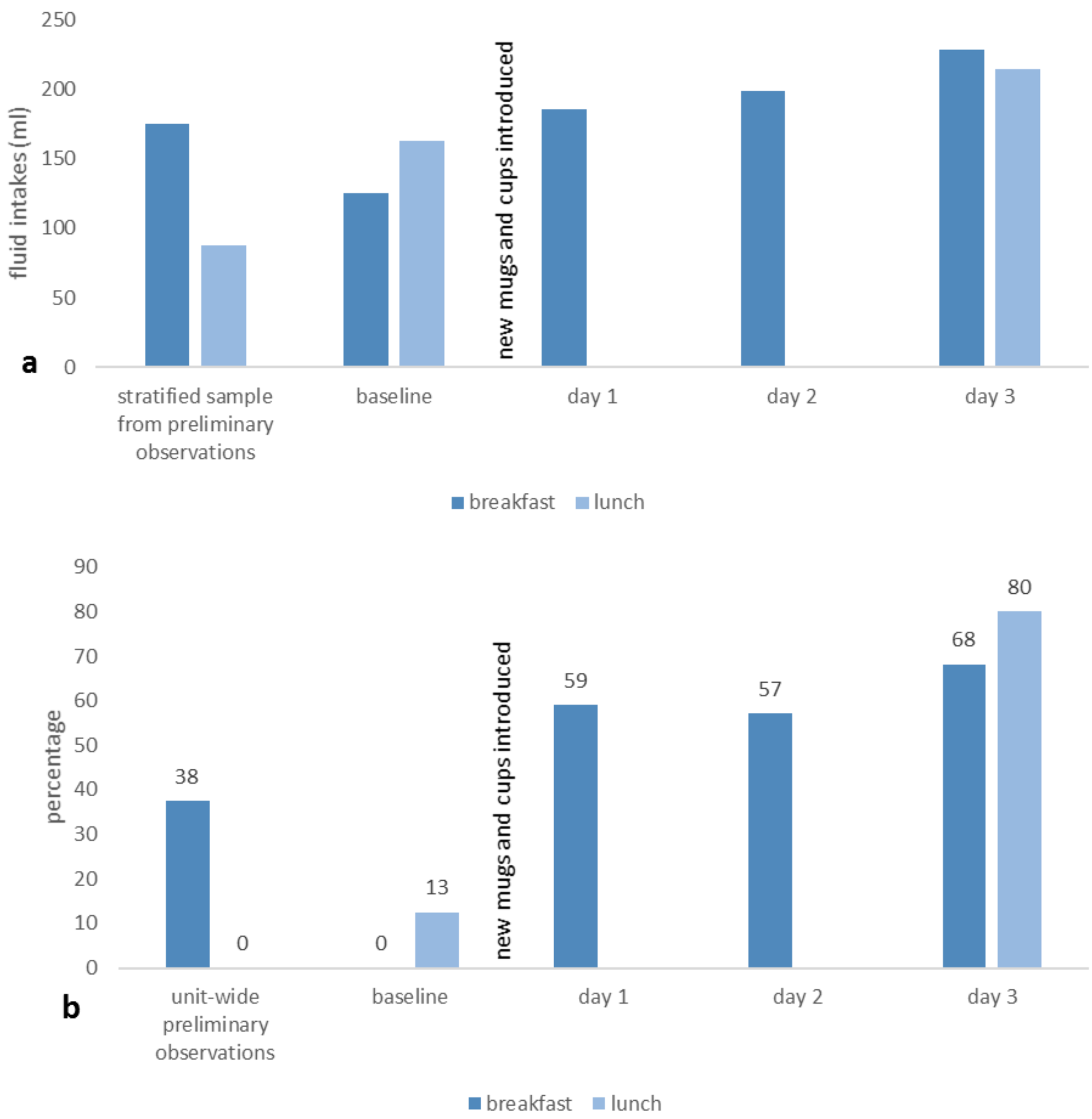


Figure 5.3: *Results of PDSA cycle for introducing new drinking vessels: a) average fluid intakes, b) proportion of residents consuming more than 150ml at the opportunity.*

Twenty residents were asked to provide feedback for the new equipment. Only three indicated that they preferred the older style teacup to the new mug; one mentioned that she found the cup easier because she got used to it, while another one said she only liked a small amount of fluid and did not see the benefit of the mug. The third resident said she found it easier but could not provide the reason why. It was observed that only two residents actively asked for the hot drinks to be provided in a small cup. Most residents said that they preferred the mugs. One of the benefits noted was the ease in handling because they were lighter and had better handles, and therefore felt more stable in the hand. Additional benefits mentioned by the residents included larger volume and thinner walls which prevented the fluid from spilling from the corners of the mouth. Some also mentioned that they looked more attractive than the teacups. One potential problem identified by the residents was a lack of saucers if snacks were provided at the same time. After the introduction of the mugs it was noticed that the residents were often given a cake or biscuits on a paper napkin because there were few side plates available. Saucers were frequently used in place of the side plates before the mugs were introduced.

Most residents preferred the plastic tumblers to the glass. The benefits mentioned included the lightness and the horizontal ridges that enabled easy grip. As with the mug, some mentioned that they appreciated a larger volume and that the walls of the cup were thinner and prevented spillage from the corners of the lips. A few mentioned they preferred drinking from the vessel made of glass, also acknowledged that the plastic cup was probably easier to hold and more practical. Nobody was observed to ask for a glass instead of the plastic cup.

The feedback indicated that the double-handed mug fulfilled the needs of a small cohort of residents. Four out of six residents indicated that the mugs were somewhat useful but did not feel that they got to the point where they had to use it; one also mentioned that it was too heavy. There was one resident who stated that she really benefited from the mug and thought that it gave her an independence to drink on her own:

> *"if I didn't have two handles, I wouldn't be able to hold it at all".* (Resident, VDT20)

Five residents also said they had a chance to try a dysphagia cup. Of these, two mentioned they did not see a benefit drinking from it, but it was also noted that these residents did not have swallowing difficulties. Another three residents stated that they coughed less. Although two indicated that they did not like the look of the cup, they saw the benefit in drinking from it because it prevented coughing.

Sixteen residents were asked if they would prefer a newer or the older style of cups and majority (n=13) stated they preferred the new cups; another two stated they did not mind either way. Eight out of fourteen residents asked (57%) also stated that the new equipment helped them consume more fluids.

Feedback was obtained from fifteen members of staff and the opinions expressed by the residents were confirmed. Staff thought that the mugs were lighter and easier to hold for the residents. The larger volumes meant that many residents could drink more, but also, they could be filled up to three quarters full and given to some more frail residents without the worry that they would be spilled. They also thought that the mugs saved time because they did not have to make additional cups of tea.

Plastic cups were well accepted by the staff not only because it was felt they were easier for the residents to handle, but also because they did not break and could be converted into the beakers. Staff confirmed that while a small proportion of residents benefited from the double handed mug, this was not for everyone. They thought some residents found them too heavy and that some were confused seeing two handles. For the dysphagia cup, staff mentioned it benefited some residents and they seemed to cough less when drinking from it. There seemed to be a division of opinions about their benefit, (possibly due to lack of awareness of the purpose of using them) as one staff member expressed the need to purchase more of them, while another stated that there was little use for them.

Eleven out of thirteen (85%) staff members asked thought that following the introduction of the new vessels, the residents were drinking more. Seven also (54%) stated that they made the job easier for them, while the rest said it made no difference to them which meant:

> *"no additional work for staff, but benefits for residents"* (HCA, BDT14)

All staff preferred the new equipment to the old and identified four residents who possibly liked the teacups more than mugs, but only two were asking for them.

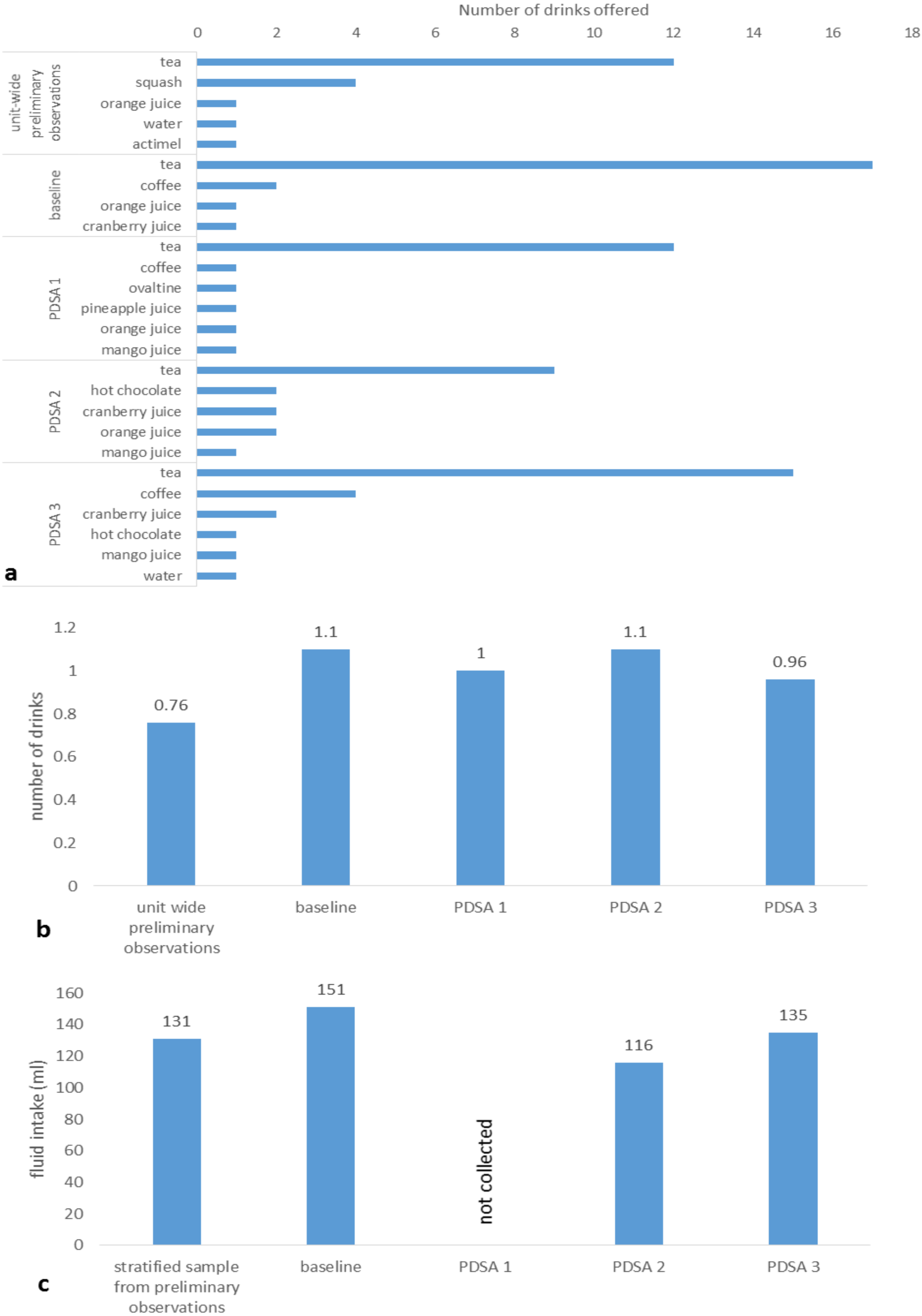


Figure 5.4: *Results of PDSA cycles for Drinks Menu: a) types and frequency of drinks given, b) number of drinks served per resident, c) resident fluid intakes*

Post implementation

Drinks Menu: Observations showed no change after the introduction of the drink menu. Fluid intakes remained unchanged following the initial testing, but this was also because residents were not given enough support during the PDT. There also seemed to be no increase in fluid intakes following the revision and reintroduction of the drink menu. This was most likely due to the activity not being fully implemented and the menu not being used as intended. While the menu was not fully utilised, it was noticed that the HCA were still providing more fruit juices and were asking the residents about the preferences. The printed menus were not allocated the storage space and many copies were quickly lost and were not available when needed.

New drinking vessels: Following the introduction of the vessels, it was decided that standard equipment would not be returned to the unit. It was expected that some of the equipment would be taken to the other units, but this did not occur. Frequent feedback from the kitchen and clinical staff indicated that the mugs did not chip or break easily, but despite this, the supplies of mugs (but not the rest of the equipment) were low within a month. These were replenished from the reserve stock, but they also highlighted the issue of sustainability of buying the equipment outside the mainstream sources. Within a month of introducing new vessels some staff were observed to pour about a half of the mug of tea or coffee, reducing the amounts offered to the residents. When asked, the staff explained that the residents found the mugs too heavy and the amount offered had to be reduced. While this may have been a problem for some, it was observed that many residents who did not have any difficulties were also given less than before and did not appreciate receiving less fluids.

Lessons learned

The data from PDSA cycles showed that when presented with the opportunity, residents made choices different than those assumed by the staff and when they were given suitable drinking equipment, they were able to increase their fluid intakes and uphold their independence. Hence if given preferable fluids and adequate drinking vessels, the residents may be able to increase their fluid intakes without increased staff workload. Final format is presented in Box 5.1. A few barriers to the successful implementation of these strategies were identified.

Leadership and allocations: the team leaders' role was essential to ensure that the drink menus and the new vessels were utilised appropriately. Initially, the staff were not informed how these were intended to be used. As recorded in the field notes immediately after the first cycle for testing the Drinks Menu:

> *"Drink menus were not utilised at first, staff were not briefed about what was supposed to happen. Drink menu was introduced halfway through the round"*

Also, staff seemed to be confused that they were supposed to offer more than one drink to the residents:

> *"Offering the drink menu served as a replacement for hot drinks, virtually everyone got some juice but no tea or coffee"*

The team leaders were not observed to use the menus themselves and did not always consider the most suitable vessels. As a result, HCAs were not always prompted to use the menus or chose a suitable vessel design. Staff allocations to the tasks and breaks were not always monitored, which resulted in the limited presence of HCAs on the unit at certain times and the staff not being able to determine which residents did not receive their drinks.

Making choices for residents: Staff assumed they knew what was best for the residents. Since the feedback from drink tasting (section 4.2.4) showed that many residents liked juices, these were often served instead of using the drinks menu. As in the exploratory phase, convenience (i.e. the access to a particular fruit juice) was the factor that determined which juice was served to the residents. Convenience was also a factor for using the drinking vessels and the doubt in the residents' ability resulted in the HCAs offering only half a mug of fluid. As captured in field notes on a day the drinking vessels were introduced:

> *"All vessels came down, although there were not enough plastic cups and the kitchen had to be asked to wash more. All HCAs were briefed as to what was going to happen. Initially, some residents were still given smaller cups…. When approached HCAs said that the residents requested the cups, but when I asked, the residents would request the mugs."*

And a few weeks after the vessels were introduced:

> “[When I noticed the mugs were only half full]. *When questioned, they said that it was because the residents were not able to handle them. This was observed for residents who I know are able to lift the mugs without any problems, but also drink a lot and would most likely drink the full mug.”*

To avoid this, staff need to be monitored and reminded that the residents have different fluid preferences and that they should not be assumed not to be able to handle the drinking vessels independently.

Lack of time: The time constraints were often mentioned by the staff as the barrier to utilise the drink menu. They viewed the drink provision to be a lengthy task and felt that adding a drink menu made it even more time consuming. The staff also assumed they knew their residents’ needs and preferences and did not need to spend additional time asking them what they wanted to drink. The implementation of drinking vessels was not impacted by this factor.

Drink and vessel availability: On some occasions there was either no stock, or not enough, of every type of drinks and vessels, which HCAs were expected to load onto the drink trolleys. These were restocked by the kitchen staff, but frequently to insufficient levels. Sometimes it was noticed that when the drinks and vessels were not available, the staff did not get them from the kitchen; instead they tried to encourage the resident to try a different drink or were looking for empty vessels throughout the unit. Staff sometimes went to collect the drinks from the kitchen, but it was time consuming. It was also observed that they were reluctant to request more stock from the kitchen. Field notes from one of the early cycles mentioned:

> *“There were less juices available than agreed with kitchen staff and HCAs ran out of mango juice before 3pm.”*

This seemed to be related to the various power structures within the home. As a result, when some drinks were not available the HCAs felt uncomfortable taking the menu to the residents. Similarly, when the required vessel was not available, they either offered a drink in a different type or spent a lot of time looking for one. To prevent these situations re-occurring, systems need to be put in place that ensure all drinks and vessels are delivered to the unit routinely and in sufficient quantities. To maintain the stock of the drinking vessels, it is essential to purchase them from the sources that can assure their steady supply, so they can be purchased and replenished any time.

Costs: The drinks availability was discussed with the catering manager on numerous occasions. The manager has mentioned a number of barriers to why the juices could not be provided, but it was discovered later that the most important barrier was the cost. There was some concern that the staff would be drinking the supplies made available, but also it was noted that the cost of juices for the residents would exceed the budget allocated to catering. On few occasions, the catering manager approached the staff and the management to complain about the amount of juice used on the unit. Despite raising concerns about the costs, the care home did not have a mechanism to capture how much of the juice was supplied to the unit, hence the estimated cost could not be calculated. Observations estimated the consumption of the juice at about 400ml/day per resident. The field notes taken shortly after cycle 3 was conducted demonstrate the manager's concerns:

> *"I had a conversation with the care home manager. She finally admitted that the reason for the kitchen not sending enough juices is cost. She was under an impression that the HCAs were pushing the juices and not offering other fluids. I was trying to explain but she didn't want to discuss it anymore. I told [my supervisor], we need to have a discussion how this will be handled. Why didn't they mention this before?"*

and another, which may help explain why the manager was concerned:

> *"*[Kitchen manager] *came to the unit and started to complain that the jugs in resident rooms are filled with juices, which is a waste. They are not, I checked. I don't know what he's talking about"*

HCAs were often observed not to use the drinks menu but giving the residents the juices without asking. This increased the tension due to some juice being wasted. The managers were therefore reluctant to support this activity as it was felt that while the costs increased, there was little benefit for the residents in terms of fluid consumption. Issue of the cost of the drinking vessels was not evident, however it was observed that the catering manager was reluctant to release the replacements, which were available for restocking as a back-up.

Communication skills: When observing the menus being used, staff seemed to be uncomfortable communicating with the residents. Different cognitive and physical disabilities of the residents often combined with poor language skills of the staff resulted in little verbal interaction. They would ask other members of staff but were less likely to ask the residents directly about their fluid preferences. When asked about the menu, the staff would respond that many residents were not able to make a choice, although this was not reported by the Activity Coordinator. Similarly, the staff did not consider asking the residents whether they could handle a particular vessel and as a precaution started offering only half a mug drink.

Limited knowledge: It was noticed that on some occasions, staff were not aware of the residents' requirements. One concern was the sugar content of some of the juices, especially for the residents with diabetes. While the staff paid little attention to the sugar content of the cakes and other foods, they thought that providing juices would be detrimental to the residents' health. Some of the adverse effects of sugar perceived by staff (not always correctly) included raised sugar levels for diabetics and an increased risk of UTI for the residents in general. They were also observed to encourage the residents to make "healthier" choices by offering them the juices perceived to be lower in sugar content such as cranberry juice, or the tea instead of the coffee. It was also evident that some staff did not understand the purpose of the vessels introduced. The on-going training, reminders and clear policy on management of different types of residents are necessary to ensure staff provide the drinks and vessels that most closely match the residents' needs and preferences.

Limitations

While the drink menu was not utilised as intended, residents were asked about fluid choices more frequently, therefore it was felt that the aim was at least partly met. An introduction of the new drinking vessels resulted in more fluids being consumed by the residents, but it must be noticed that this intervention on its own is not likely to increase fluid intakes unless preferable drinks are given to the residents. It is expected that the Drinks Menu has a potential to ensure these preferences are met and therefore can help to increase residents' fluid intakes, but the effectiveness of this intervention was not established in the PDSA cycles because of the problems associated with the running of PDT and the limited supplies of drinks available.

Box 5.1: Final format of Drinks Menu and new drinking vessels

- *All HCAs*
  - use Drinks Menu when offering drinks to the residents and provide the residents with the drinking vessels that suite the needs and preferences of the residents
  - ensure the copies of the menus, drinks, drinking equipment and any other supplies are and readily available at all drinking opportunities and throughout the day
- *Nurse*:
  - Model the use of Drinks Menu and the appropriate drinking vessel and encourage the staff to utilise them at each drinking opportunity
- *Kitchen assistants*: ensure all drinks, drinking vessels and supplies are available on the unit throughout the day
- *Catering manager:*
  - ensure sufficient supplies of the drinking vessels are available on the unit at each drinking opportunity:
    - Mugs: double the number of the residents on unit
    - Plastic tumblers: double the number of the residents on unit
    - Double handed mugs: half the number of residents on unit
  - Ensure sufficient reserves of the drinking vessels are available for replacement
- *Managers*:
  - Ensure ongoing staff training
  - Provide and communicate with staff a clear policy on adequate management of the residents with special dietary needs

The success of the new vessels was partly because larger volume meant that residents received more tea and coffee, which incidentally they liked to consume. Due to time limitations it was also not possible to assess fluid intakes at other times and the effect of this intervention on overall fluids consumed throughout the day is unknown. Additionally, considering the current lack of suitable vessels available for purchasing, the sustainability of this intervention may pose some problems to the care homes.

The Drink Menu was introduced to facilitate the communication between the staff and the residents, but staff found this method of communication uncomfortable and time consuming. This shows that the menu must be used together with appropriate support from the senior staff who should act as role models and prompt staff to use it routinely.

Additionally, offering preferable drinks in suitable vessels, but not providing enough drinking opportunities or assistance to some residents will not result in the increase of fluid intakes. These strategies are therefore most efficient if used in conjunction with other strategies described below.

5.2.3 Addressing Contributory Factor 3: Protected Drinks Time and Drinks before breakfast

The problem

Observations showed the need to create more opportunities for the residents to receive fluids. Data from unit-wide observations demonstrated that some residents were not given fluids at all opportunities and that at some opportunities very few drinks were offered. It was also observed that many residents only received the drinks at mealtimes and the refills or additional drinks were rarely offered. It was found that the residents who required full assistance were less likely to obtain drinks between mealtimes, and the residents who needed prompting would be given drinks but were not encouraged to consume them. Additionally, limited documentation and monitoring made it difficult for staff to identify the residents who consistently were not offered fluids. At the same time, many residents provided feedback that they would welcome more hot drinks throughout the day.

Purpose

The purpose of this intervention was to create structured activities for staff to give more drinks to the residents. Protected Drinks Time (PDT) focused on serving drinks to all residents and providing the time and assistance to those who required some level of support. Drinks before breakfast focused on serving drinks to all residents transferred to the dining room. It was hypothesised that if all residents got drinks and appropriate assistance, their fluid intakes would increase.

Prediction: the residents in the area where additional drinking opportunities were operated would be offered drinks, assistance to drink, and consequently their fluid intake would increase.

Intervention

PDT was introduced in place of the "tea round" at 3pm. Staff were asked to refrain from tasks other than providing drinks, assisting the residents and offering refills. Four cycles were conducted over a course of ten weeks prior to PDT being implemented. The drinks before breakfast were created as an additional activity, which was linked to the time when the resident was transferred to the dining room

Measurement

The effectiveness of both interventions was assessed by recording the number, type and amount of drinks given and consumed by the residents. Feedback from staff and residents was also recorded. For PDT, the first cycle was limited to the lounge only and was used primarily to test logistics and the last cycle was conducted without the presence of the researcher to ensure the staff were able to start PDT without the external cues. Data on drinks offered and consumed were therefore not collected for PDSA 1 and 4. For drinks before breakfast, additional data was collected once at breakfast to establish whether drinks given before breakfast would influence fluid consumption later.

Description of PDSA cycles

Protected Drinks Time

Cycle 1: The plan was for an HCA to stay in lounge for approximately 30 minutes offering drinks and assistance. To create a more social atmosphere, the HCA was encouraged to make themselves a drink and converse with the residents. This happened as planned. The HCA offered drinks and assisted those residents who needed it, although also used the time to complete her notes. It was agreed that the intervention has a potential to increase fluid intake, but the HCAs needed to focus entirely on assisting residents with drinks at this time.

Cycle 2: The plan was to extend PDT to all residents in the unit, with one HCA to stay in the lounge offering drinks and assistance and two HCAs to load the trolley with the drinks and distribute them to the residents in their own rooms. Staff were asked to offer drinks to the independent residents first, so they could then focus on assisting residents. Staff were also asked to offer refills to the residents. To create a social atmosphere, staff were encouraged to make drinks for themselves and consume them while conversing with the residents. The test started one hour earlier because a resident activity was scheduled for 3pm. Staff were not sufficiently briefed and did not have clearly defined roles. Most residents were offered drinks with some receiving refills, but because the trolley was not back from the kitchen, HCAs had to hand wash the cups and deliver drinks on trays. Because there was no trolley, staff could not offer a choice of drinks to the residents and majority were given tea. The residents with complex needs who required full assistance to drink were not offered drinks. The activity interfered with staff breaks and some HCAs went for lunch before PDT finished. Feedback from staff and residents was positive, but some residents could not finish their drinks because it was too soon after lunch. The proportion of residents given drinks, number of drinks per resident and fluid intakes increased (Figure 5.5). It was agreed that for this intervention to be efficient, the trolley with the crockery needed to return from the kitchen and that staff needed to be allocated to their roles and breaks.

Cycle 3: The plan was for the nurse to allocate staff to breaks and PDT tasks, with one HCA allocated to the lounge and two serving drinks to the residents in individual rooms. The nurse was also asked to allocate one HCA to collecting the trolley with the crockery from the kitchen. This cycle did not start according to plan because staff were not allocated to their roles until prompted by the researcher. After the nurse allocated the staff to their roles, all tasks were carried as planned. Most residents were given drinks, some also got refills, although the majority of residents were not given a choice. The staff mentioned that they were surprised that so many residents were willing to consume more than one drink. The proportion of residents receiving drinks was lower than in cycle 2, but still higher than at preliminary observations. Despite this, there were more drinks given per resident and fluid intakes were higher. The presence of the trolley and clear allocations helped the staff deliver drinks more efficiently. It was agreed that the nurse needed to allocate staff to their roles in advance and without prompting from researcher. The plan for a design of new PDSA to ensure the residents were given drinks they liked was also discussed.

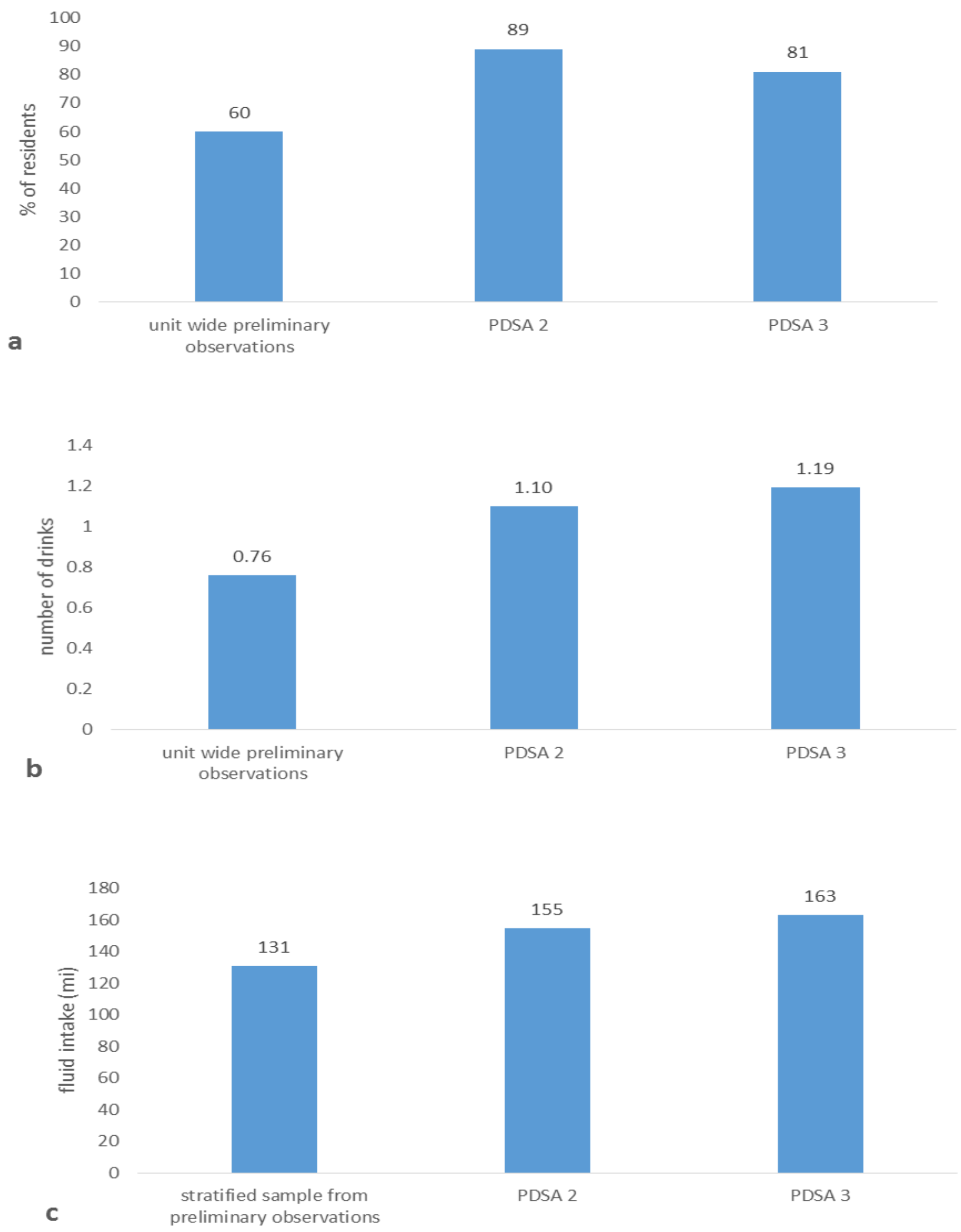


Figure 5.5: *Results of the PDSA cycles for Protected Drinks Time: a) percentage of residents given drinks, b) number of drinks per resident, c) mean fluid intakes/resident. Baseline data derived from preliminary unit-wide observations of the residents at all locations (a and b) and the preliminary observations of eight residents stratified into groups based on the level of assistance required and the location they usually stay during the day (c).*

Cycle 4: The plan was for the nurse to allocate HCAs to breaks and roles for PDT in advance and for HCAs to start the activity without the prompt from the researcher. Staff reported that PDT was carried out and everything went to plan. According to HCAs all residents were given drinks, but it was not possible to collect data on fluid intakes. This cycle showed that the PDT could be successful when initiated by staff, hence it was agreed that PDT should be implemented. It was also agreed that observations will be carried out a few weeks after the implementation to ensure PDT is carried out as intended.

<u>Drinks before breakfast</u>
Cycle 1: The plan was for each HCA to offer a drink to each resident they transferred to the dining room around this time. The staff would ask the residents what they wanted to drink and provide the fluid of choice. Staff were asked to assist residents as needed. This cycle was carried out as intended. All residents were given drinks, and fluid intakes increased (Figure 5.6), although the residents were predominantly given cold drinks. Resident fluid intakes at breakfast did not decrease. Staff noted that the activity had little impact on their workload and could be introduced as a daily routine. Feedback from residents was also positive as they welcomed a drink earlier than usual. It was agreed that the intervention was successful in increasing fluid intakes of the residents and that the same cycle would be repeated with another team of HCAs.

Cycle 2: The plan was for HCAs to offer drinks to the residents that they transferred to the dining room before breakfast. For this cycle, it was not possible to brief the staff about the activity beforehand and none of the staff participating in cycle 1 were present on that day. a nurse was responsible for briefing all HCAs at the start of the shift. This cycle did not adhere fully to plan. The HCAs were not fully aware of the activity and only offered drinks shortly before breakfast. The number of residents and fluid consumed were comparable to the time before the intervention. Residents were given only cold drinks. It was agreed that this cycle would be repeated in a current form and that staff would also offer hot drinks to the residents.

Cycle 3: the plan was for staff to prepare flasks with tea and hot water before the activity started. Staff were asked to provide preferred drinks to the residents who were present in dining room before breakfast. This cycle was carried out as planned.

The nurse prepared the flasks with hot drinks and prompted the staff to start the activity. The proportion of residents given drinks increased and some residents were given more than one drink. The residents' average fluid intakes increased and there was no effect on fluid consumption at breakfast. More hot drinks were offered to the residents, although these were not offered to all who requested them. The nurse did not remind the staff to carry out the activity but was observed to give drinks to the residents. It was agreed that this intervention should be repeated in a current format and that the nurse would ensure hot drinks were readily available.

Cycle 4: staff were asked to offer drinks to the residents while they were transferring them to dining room. The nurse was asked to remind the staff and ensure flasks with hot drinks were pre-prepared before the activity started. This happened as planned. The nurse prepared the flasks with hot drinks and staff did not require prompting. Hot drinks were provided to all residents who requested them. Fluid intakes for this period, and proportion of residents receiving fluids were higher than at baseline and comparable to cycle 1 and 3. Many residents received more than one drink and despite this fluid intakes at breakfast did not decrease. It was agreed that this intervention should be implemented in a current form.

Post implementation

<u>Protected Drinks Time</u>

Data were collected approximately two weeks after the implementation of the PDT. This showed a reduction in both the percentage of residents who were given drinks (38.0%) and number of drinks provided (0.38 drinks per resident). The activity took approximately 30 minutes, which was insufficient time for all residents to be given drinks and receive the required assistance. Although staff were allocated to their roles and breaks, they did not adhere to them. The staff mentioned that they were short staffed and falling behind the schedule, which prevented them conducting PDT as intended. Around this time there was a high turnover of staff on the unit. This resulted in many of the HCAs who had participated in the PDSAs cycles moving to other units and new staff joining the team who were not aware of the purpose and the conduct of PDT. In addition, a key team leader left the home, which meant that half of the shifts were covered by the temporary nurses who were not familiar with PDT. This resulted in staff not being encouraged to conduct the PDT or allocated to specific roles. Over the next two months the staff gradually reverted to the original system for “afternoon tea”.

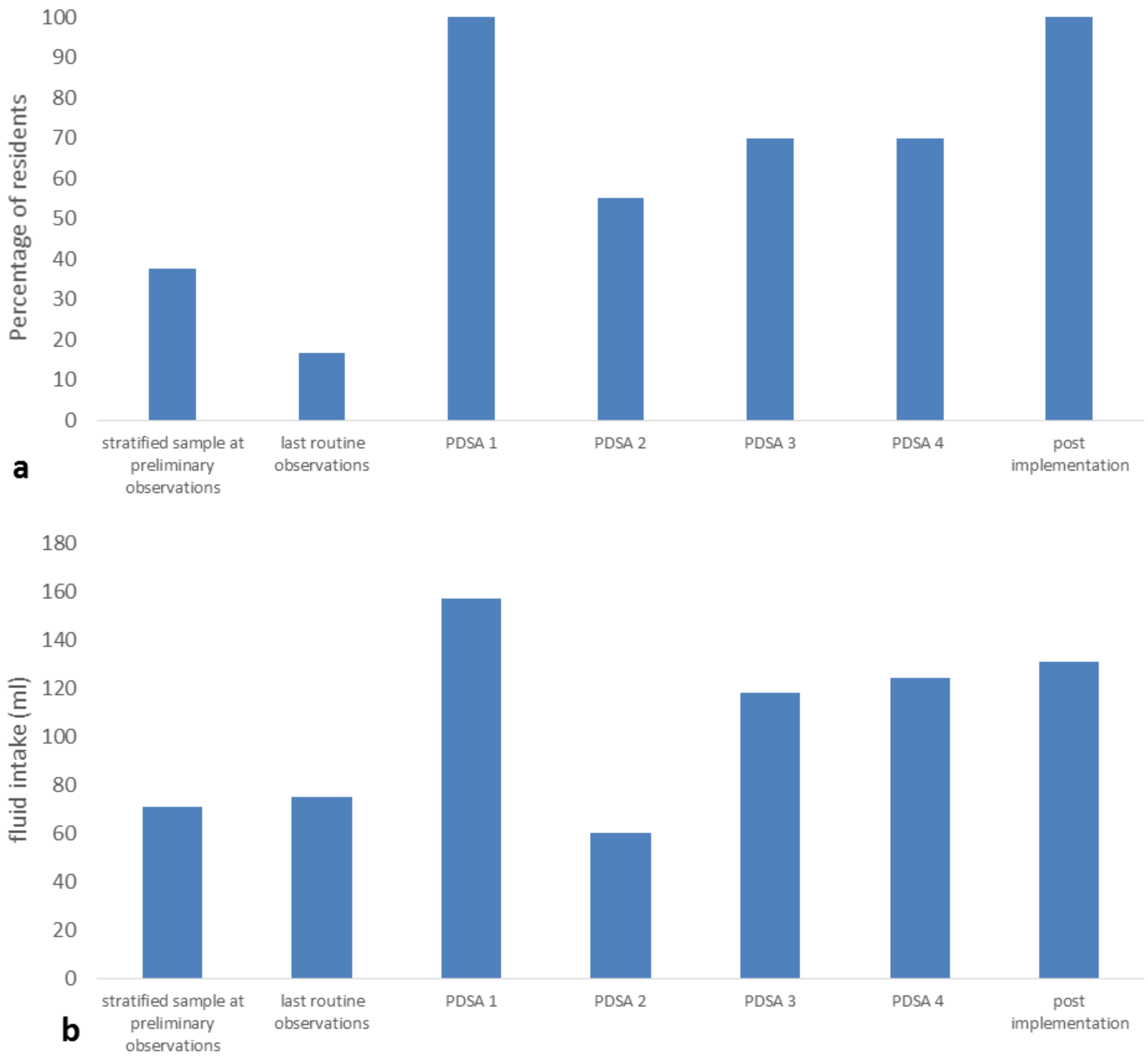


Figure 5.6: *Results of PDSA cycles for drinks before breakfast: a) proportion of residents receiving drinks, b) average fluid intakes.*

<u>Drinks before breakfast</u>

Data were collected approximately one week after the implementation of this intervention. The results showed that staff carried out the activities as intended, without prompting from the nurse. Proportion of residents receiving drinks and fluids consumed were comparable to those during PDSA cycles.

Lessons Learned

Both interventions have a potential to be a successful in increasing fluid intakes for the residents. Based on the typical day where four HCAs and one nurse were present, the final format is presented in Box 5.2 and 5.3.

While the quantitative data collected during PDSAs demonstrated that these interventions ensure that the residents receive drinks and therefore have a potential to increase fluid intakes of the residents, they rely on appropriate systems to make a sustainable change. Some barriers and facilitators were identified, which underpin the importance of general and context-specific logistics in supporting these activities.

Box 5.2: Final format of PDT

- *HCAs*:
    - HCA1 assigned to the lounge make drinks for the residents and themselves, support residents who need prompting or full assistance, offer additional drinks as required.
    - HCA 2 and 3 assigned to own rooms distribute drinks to the residents in their own rooms using a trolley, assist those who need it, offer refills as required, deliver the drinks to the residents who can drink independently first.
    - *HCA 4* on lunch break
- *Registered nurse*:
    - allocating to roles and breaks, reminding shortly before 3pm, monitoring PDT carried out as intended

However, there were several factors that were critical to the successful operation of barriers and facilitators identified highlight the importance of adjusting the existing tasks to fit these activities and planning ahead:

Leadership: The team leader was critical to ensuring that both activities occurred, were carried out as intended and were sustained when new staff arrived. They were essential in allocating staff to breaks and tasks, prompting staff to initiate the activities. Continuous monitoring and reminders resulted in drinks given without delays and more residents being offered drinks at these times. The post-implementation period of PDT further illustrated how the loss of a key leader resulted in the activity gradually being degraded. For drinks before breakfast, when it was observed that the nurse did not prompt the staff but tried to provide the drinks herself, less residents received drinks because they were difficult to monitor. This highlights the importance of assigning the responsibility of serving the drink to the HCA who transferred the resident to the dining room. Appropriate mentoring of new staff members was also important to establish the routines as it was observed that when a new HCA was asked to provide the drinks for a few residents, she repeated the same task without prompting the next day.

Box 5.3: Final format of drinks before breakfast

- *HCAs:*
  - The HCA transferring the resident to the dining room is responsible for offering a drink of choice and assistance to the resident
- *Registered nurse*:
  - Reminding about the activity, preparing hot drinks in the flasks, monitoring that the activity is carried out as intended
- Kitchen assistants:
  - Ensuring all drinks and drinking vessels are available for the activity

Allocations to breaks and tasks: For the PDT to be efficient, it required at least three HCAs with clear allocations to break times and PDT tasks while for the drinks before breakfast, it required all HCAs to provide the drinks. However, it was sometimes noticed that the nurse did not allocate the HCAs or that the allocations were not adhered to. One extreme example was captured in the field notes after the PDT was implemented:

> *"The PDT happened with only one HCA present who was struggling to cope"*

Timing: PDT needed to start around 3pm. If drinks were given too early after lunch, some residents were not be ready to receive them. Drinks before breakfast can be offered at any time as they do not affect the fluid intakes later.

Availability of equipment: for these activities to be efficient, the drinking equipment and a selection of drinks needs to be available on the unit at the start. If clean crockery was not available staff time was diverted from assisting the residents to washing the cups and beakers. The allocation of one HCA to collect the trolley from the kitchen helped to avoid this. When the nurse prepared flasks with hot drinks, more of these drinks were served to the residents. The flasks also served as a reminder to staff to offer the drinks. During the PDT, the trolley was necessary as without it the staff were not able to distribute drinks efficiently or provide a range of drinks.

Allowing time for hydration: to ensure all residents received appropriate assistance, staff needed to focus only on PDT for about 45 minutes. As indicated by the post-implementation period, reducing the time allocated to PDT resulted in some residents not receiving drinks and assistance. During the time before breakfast, it was difficult for the staff to find time to hydrate the less independent residents.

Linking to existing opportunity: Both interventions were successful because they were linked to the activity that the staff were providing at this time, i.e. the afternoon tea and the transfer of the residents to the dining room. This ensured that the staff time was less compromised.

Limitations

Both interventions were shown to be effective initially in increasing fluid intakes of the residents and the feedback collected from staff and residents after PDSAs was positive. However, the PDT was difficult to sustain. Staff turnover and the loss of leadership were detrimental to the success of PDT. This highlights the importance of ensuring staff see the activity as an integrated part of providing care to the residents rather than a stand-alone task. It is also possible that the activity was implemented too soon, and that cycle 4 where staff initiated the activity without the prompt from the researcher should have lasted longer. Drinks before breakfast were limited to the residents transferred to the dining room at this time. The residents who benefited most from this intervention were those who were independent because the residents who needed prompting or assistance did not always receive the support they required. Ensuring all residents received appropriate assistance or extending this intervention to reach the residents in their other rooms would be difficult logistically as staff were busy washing the residents at this time. The problems with sustaining PDT activity suggest that there is a possibility that staff did not provide the truthful feedback or in some way were not able to identify the barriers at the time of testing. If these were unresolved, they would negatively impact on sustainability of any improvement activities.

5.2.4 Dissemination to unit A: The Bundle

The problem

Barriers to adequate hydration, including limited opportunities to obtain drinks, lack of choice of fluids offered, and inadequate drinking vessels were similar on both units, therefore it was thought that the interventions implemented on unit B could be introduced to benefit the residents on unit A.

Purpose

The purpose of this intervention was to introduce some improvement activities as a bundle, determine whether they could be feasibly implemented in the new setting, and to explore contextual issues arising from introducing these changes.

<u>Prediction</u>: The interventions will result in increased fluid intakes for the residents and may have a synergistic effect if they are combined as a bundle.

Intervention

The dissemination included the following activities: PDT in conjunction with the Drink Menu, Refreshment Needs Guides and introducing new drinking equipment. Although the Refreshment Needs Guides were not shown to be successful in unit B, the unit manager was still keen to try these with their staff. The staff were also encouraged to provide the drinks before breakfast, but this was not considered a part of the bundle and was not included in PDSA testing. The diagram summarising the interventions is provided in Figure 5.7.

Measurement

Due to time constraints because the dissemination was introduced a month before the project ended, it was not possible to monitor changes in residents' fluid intakes and health over time. Most of the data were qualitative and were obtained from the staff and resident feedback. Quantitative data were obtained in PDSA 2 where new drinking vessels were introduced, and in PDSA 4 and 6 where PDT in conjunction with Drinks Menu was carried out in place of the afternoon tea.

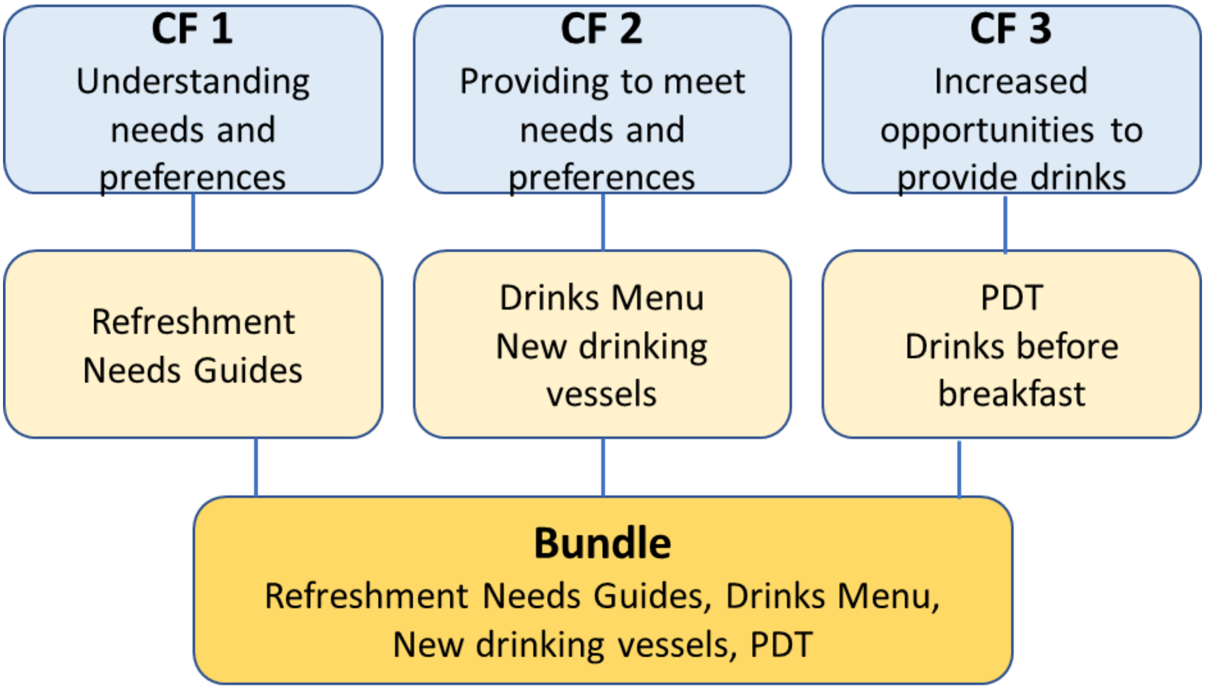


Figure 5.7: *The diagram describing the components of the bundle*

Description of PDSA cycles

Cycle 1: In this cycle the plan was for the staff to ask the residents for preferences using the Drinks Menu when giving drinks to the residents at 3pm. This went as planned, although it was observed that one HCA, who was asking the residents in the lounge used the menu but did not provide any drinks to the residents. Staff said that the Drinks Menu was easy to communicate with the residents and were surprised by some residents' choices. The resident feedback was also positive. Many residents were surprised to find some of their favourite drinks were available in a home and few asked how they could purchase these drinks, as they assumed that these would not be routinely provided. It was agreed that the Drinks Menu would be tried with PDT in the following cycles.

Cycle 2: The plan was to introduce a new drinking equipment throughout the unit for a month. The staff were asked to give the drinks using the new vessels unless the resident requested otherwise. This cycle was carried out as planned. Fluid intakes at breakfast increased from an average 158ml to 201ml. Staff and residents mentioned that they liked new equipment. It was decided that old equipment would not be returned to the unit and the new drinking vessels would be routinely used to serve drinks to the residents.

Cycle 3: The plan for this cycle was for the nurse on the unit to allocate the staff to complete the Refreshment Needs Guides. Staff were allocated to two residents each and were given a week to complete the guides. This cycle was not carried out as planned. The nurse allocated the HCAs, but some said that they were not aware of the activity and no guides were completed. It was agreed that for next cycle each HCA will be approached individually and will be given a target for completing the guides for allocated residents.

Cycle 4: The plan was for staff to conduct PDT. The nurse on duty described PDT to the HCAs and asked them to carry it out as designed for unit B, also asking the residents for drink preferences. This cycle was carried out as planned. All staff were present at 3pm, although this meant that it delayed the breaks for some. More residents received drinks and a greater variety of fluids was served to the residents. This resulted in an increase in fluid consumption (Figure 5.8). However, it was also observed that residents who needed assistance were not offered drinks. Staff and the resident feedback were positive, and no issues were identified. It was agreed that in next cycle staff needed to aim to provide drinks and assistance to all residents and that PDT would be supported by using the Drinks Menu.

Cycle 5: The plan for this cycle was for HCAs to complete the guides for the residents. A staff meeting was held, and HCAs were asked to choose two residents each. After this time, HCAs were approached individually, we asked if they needed support in completing the guides and the deadline for completion was negotiated. This cycle did not go according to plan. Only two HCAs managed to complete the activity, with others stating lack of time and not being able to obtain templates of the guides as barriers. Those HCAs who completed the guides provided limited information and it was evident that residents/family and care plans were not consulted. Following this, it was agreed that this activity should be abandoned.

Cycle 6: The plan for this cycle was to conduct PDT with Drinks Menu. A staff meeting was scheduled to brief the staff of the activity. To overcome logistic issues, PDT needed to be modified. Unit A was smaller and required only three HCAs in the afternoon, of which one would be on their lunch break. Hence two HCAs who were available at 3pm were asked to load the trolley with all drinks and distribute them to the residents, asking for preference by using the Drink Menu. They were asked to provide the drinks to the residents in the lounge first and take a trolley around the individual rooms later. After assisting all the residents who required it, HCAs were asked to go back to the lounge, offer additional drinks and prompt the residents as needed. Following this, they were asked to do the same in the individual rooms. The activity was not conducted as intended. Staff were briefed at the short meeting beforehand, but they were reluctant and mentioned a few barriers. During the PDT, HCAs relied on the researcher to communicate with the kitchen, bring back the trolley and ensure all drinks were available. At the start of PDT, it was noticed that there was only one HCA left on the unit. The activity started, but it was not very efficient. All residents were prompted to choose two drinks from a menu, although only one resident was offered refills. The proportion of residents given drinks and the variety of drinks offered were greater than at preliminary observations or when PDT was first conducted in cycle 4. Fluid intakes also increased. Synergistic effect of combining PDT and Drinks Menu was observed as some residents consumed up to 1000ml of fluids. The residents gave a positive feedback, they were very happy that they were given a choice and that they were able to receive these drinks *ad libitum*. It was decided that this activity could be implemented, but that allocations to breaks and tasks needed to be addressed.

Post implementation

Following the second testing of PDT and Drinks Menu in cycle 6, it was decided that these activities would be implemented. While it was thought that some logistic issues still existed, due to lack of time at the end of the project it was not feasible to continue with testing. Instead, it was agreed that if the problems persisted, it was a responsibility of the nurse to ensure staff continued to support the residents as intended. A week following the last cycle, the manager reported that the PDT was carried out by staff as intended without a prompt from the nurse and that staff were using the menu.

Observations showed that the new vessels replaced standard cups completely within a couple weeks, although double handled mugs and dysphagia cups were rarely utilised. As on unit B, approximately a month after the introduction, some equipment needed restocking.

Figure 5.8: *Results of PDSA cycles for dissemination to unit A: a) proportion of residents receiving drinks, b) types and number of drinks offered, c) mean resident fluid intakes. Results show data for PDT 1 and 2 conducted in cycle 4 and 6 respectively.*

It was hoped that the dissemination to unit A would also encourage the staff from other units to use the bundle. It was also though that the positive feedback from the residents and their willingness to try the interventions would further prompt the staff to try them in their units. A number of meetings were held with the nurses from the other units to explain how the interventions had a potential to increase fluid intakes of the residents, what things they should consider when implementing changes, and how they can use PDSA cycles to achieve the change. They were also informed of how they placed a central part in driving the improvement and ensuring the changes are sustained. The person responsible for the training was given all the materials and was instructed on how to conduct the sessions.

Lessons learned

As in unit B, PDT, the Drinks Menu and new drinking equipment can be successful in increasing fluid intakes. Final format of this intervention is described in Box 5.4. Similar barriers to implementation were observed, which possibly impacted the sustainability of the interventions.

Leadership: The resistance to change was apparent before the start of the dissemination. The common worry for staff was the lack of time and not being able to complete other tasks. Leadership from senior member of staff was important to initiate the activities and demonstrate the commitment and support to staff. Middle leadership from the nurse was also necessary to further drive the activity and ensure it was conducted as intended. The field notes below illustrate how staff were reluctant to start the activity and how important it was to have the input from the team leader. These were taken in the morning and in the afternoon on a day the cycle 6 was conducted:

> *“I asked the nurse to join me for the meeting when I explained what the staff were going to do. I wanted her to join to show that this was not just my idea but that the managers and team leaders supported these activities as well. One of the HCAs said to her ‘you do realise that we will be late changing pads…’. The nurse was supportive, she said that we were just going to try this time and see what happens”*

and later immediately after the PDSA:

> *“the beginning was a mess. I came in shortly before the PDT was due to start and I realised that the trolley was not collected from the kitchen. The HCAs said that they did not have time to collect it. I realised that the nurse did not do any allocations to tasks and breaks as she was supposed to do. Two HCAs were on a break and one was taken away to help on another unit for the rest of the shift. One HCA present. She started the PDT, but was distracted by one resident who wanted to go to toilet. She disappeared for ten minutes and there was no one on the unit. (...) Half an hour later the two HCAs came back from the break and joined in. One told me she had back problems and wasn’t going to push the trolley. Despite all the problems, when the PDSA finally happened everything went smooth. Residents loved it.”*

Another example was with the Refreshment Needs Guides when these were left with the team leader to be completed by the staff (cycle 3):

> “[When I came back to collect them] *none of them were ready, one HCA told me she wasn’t even aware she was supposed to do it, others told me they couldn’t find the templates or that they were too busy*”

Allocations to breaks and tasks: Not dissimilar to the findings on the unit B, most of the staff took their lunch breaks around 3pm. The team leader was asked to assign staff to breaks, but this was not adhered to. Adequate staff numbers impacted the success of PDT because it was difficult to provide sufficient support for all the residents on the unit. However, allocations to the breaks and ensuring these were observed would have made the PDT more efficient. Similarly, the lack of allocations to tasks hindered the conduct of PDT and contributed to Refreshment Needs Guides not being successful.

Availability of equipment: The staff were worried about the trolley availability for PDT, but this was communicated with the kitchen and the trolley was ready before the start. Although the trolley was prepared, it was noticed that this put an additional stress on the kitchen staff. It is possible that this could become a problem if the PDT was to be introduced across all eight units of the care home. The existing process of washing and restocking after meals was not efficient to support this activity and the alternatives would be necessary. This is an example how escalating the

Box 5.4: Final format of dissemination to unit A

- *Nurse:*
    - *E*nsure all introduced interventions are implemented and monitored
    - Allocate HCAs to tasks and breaks
- *HCAs:*
    - PDT: 2x HCA load the trolley and distribute the drinks starting with the residents in the lounge, and offer refills after assisting the residents, 1x HCA on a break
    - Drinks Menu: use at all drinking opportunities including PDT, encourage residents to get a hot and cold drink
- *Catering manager:*
    - Ensure sufficient supplies of all drinks are available throughout the day
    - Ensure the drinks trolley with sufficient drinking equipment is available before PDT and that drinking vessels are available for restocking
- *Care home/deputy managers:*
    - Provide support and emphasise the importance of these activities in maintaining optimal hydration of the residents

interventions into a wider setting may entail additional unforeseen difficulties and how other departments are also affected by improvement activity.

Availability of equipment: The staff were worried about the trolley availability for PDT, but this was communicated with the kitchen and the trolley was ready before the start. Although the trolley was prepared, it was noticed that this put an additional stress on the kitchen staff. It is possible that this could become a problem if the PDT was to be introduced across all eight units of the care home. The existing process of washing and restocking after meals was not efficient to support this activity and the alternatives would be necessary. This is an example how escalating interventions into a wider setting may entail additional unforeseen difficulties and how other departments are also affected by improvement activity.

The availability of the new vessels also became a problem. For the testing, there was enough to supply units A and B only, but the HCAs complained that these were sometimes taken to other units.

Context: Unit A was slightly smaller which required less HCAs on a shift and resulted in less staff being available at 3pm. This required different format of PDT, which highlighted the issue of context and the need to adapt the activity to overcome logistic difficulties.
Time: The decision to disseminate to unit A was made at the end of the project. This was to determine whether these interventions could be successful outside if they were situated in a different context. While the effectiveness was established, it was felt that more time was required so that the research team could provide support with an implementation of these interventions.

Limitations
The results confirmed the effectiveness of the interventions and showed that these can be introduced across new settings with minor modifications. However, one of the issues identified was the impact of escalating these interventions across the home, which potentially affected other departments, although due to time limitations of the project it was not possible to determine the extent of this being a problem. Another limitation was a small number of PDSA cycles to ensure successful implementation of the interventions on the new unit. As observed with PDT, more work was required to resolve the barriers around allocations, but this was not possible to conduct. Additional PDSA cycles and monitoring post-implementation would be necessary to ensure that the interventions were carried out as intended, however this was not possible at the end of the project.

From the lessons learned on unit B, it can be suspected that long-term sustainability of this bundle could be affected if the support and the leadership were not present. Since it was not possible to continue with this project past the time given, it is not possible to determine whether these interventions were sustained once the project finished. According to the manager, the staff were using the drinks menu and used the trolley to distribute the drinks. The manager also mentioned that this was done without the prompts from the unit leaders however, it was not possible to determine whether this took place every day and whether the interventions were used as intended. The observations from the unit B showed that the staff were 'cutting corners' and gradually regressing to the old routines. Without appropriate monitoring and continuous promotion of the bundle, it is possible that the staff on unit A would do the same. Hence, there is a need to consider what needs to be done to ensure a lasting success of these interventions.

It was also not possible to measure the effects of these interventions on the daily fluid intakes and health outcomes of the residents. This would provide some indication of the effectiveness as well as sustainability of these interventions over time, but to be able to observe meaningful results, it would be necessary to extend the data collection for another year.

5.3 Summary of findings

The results of the PDSAs showed that preference compliance, improving the design of the drinking vessels, increasing the number of opportunities to receive drinks and providing sufficient assistance during these opportunities can be effective in increasing fluid intakes of the residents. To ensure the interventions are successfully implemented, there is a need for strong leadership, which in turn positively influences the systems in place, availability of equipment and supplies as well as the ability and willingness of staff to provide good quality of care. The barriers and facilitators are summarized in Figure 5.9. There also is a need to consider how these interventions could be sustained and truly embedded into practice, these issues are further explored in a discussion section. The next chapter describes the effect of these interventions on long-term fluid intakes and health outcomes of the residents.

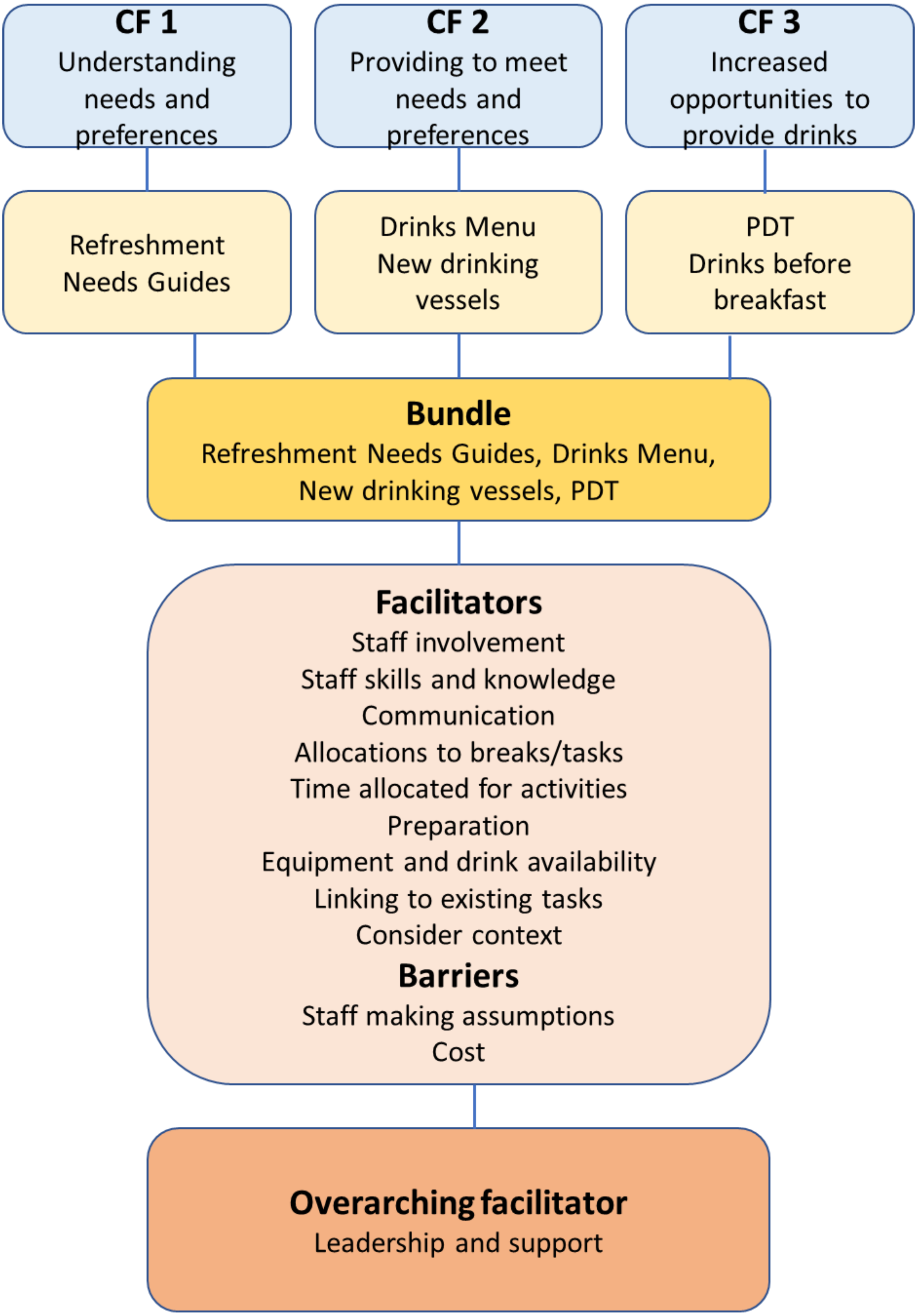


Figure 5.9: *The summary of the interventions presented in this phase and a list of barriers and facilitators which influence their success.*

Chapter 6 Evaluation phase

This chapter describes the overall effect of the interventions (presented in Chapter 5) on fluid intakes and the health outcomes of the residents.

Measurement is an important part of improvement because it informs the team whether the changes truly lead to better outcomes. Measurement for Improvement is different than the measurement in research. Thus, the purpose of this phase was to assess whether the introduced interventions had an effect on fluid intakes and health outcomes of the residents. The data were collected frequently at different time intervals to monitor progress and sustainability of the improvement work over time. In accordance with IS principles the data were collected without an attempt to control for confounders, which cannot be avoided in the real setting.

6.1 Objectives and methods

The purpose of this part of the research was to evaluate whether interventions influenced fluid intakes and health outcomes of the residents. A summary of this phase is provided in Figure 6.1. The intention was to systematically collect data on potential markers of hydration status to determine whether introduced changes resulted in sustained improvement. Data were collected prospectively throughout the entire improvement project, starting two months before the first intervention (training) was introduced and ending two months after the introduction of the last interventions (new drinking vessels and drinks before breakfast). Since laxative consumption was recorded on the drug charts, additional data were collected retrospectively for a period of four months before the start of the interventions. The details of methods of data collection and analysis for this phase are described in section 3.3.5.

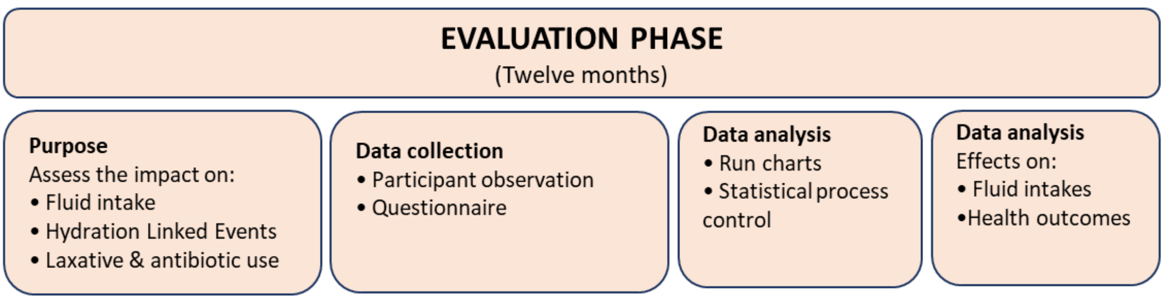


Figure 6.1: *Summary of the evaluation phase*

6.2 Results

6.2.1 Observations of fluids served and consumed

Data were collected over a one-year period during which time 13 data points were obtained on 74 resident days. Data were collected on six residents for all but three episodes when observations of all residents were not possible (e.g. resident taken to hospital). The mean fluid intakes throughout the project were 1159ml (±502ml). Following the introduction of the first interventions, fluid intakes increased and remained relatively high for approximately four months (Period from 05/05/16 to 21/07/16, Figure 6.2). From the next observation point (11/08/16), fluid intakes decreased, although not to the level observed at baseline. The decrease coincided with an internal and external staff turnover. Following the meeting with the care home and the clinical services managers, the attempt was made to reintroduce the interventions previously implemented, together with huddle training and introduction of the refreshment needs guides. This resulted in fluid intakes increasing (09/11/16). Fluid intakes further increased following the introduction of the new equipment (07/12/16). The decrease was again observed at the end of the project (04/01/17). Despite the decrease, fluid intakes were higher than that observed at baseline.

It was observed that some residents consistently consumed more fluids than that observed at baseline. For example, one independent resident whose fluid intakes were 1060ml and 725ml before the interventions started, consistently consumed more than 1500ml of fluids afterwards. Another resident who needed prompting consumed 650ml at baseline, increased their fluid intakes to above 1000ml for five out of six episodes of the observation.

Relationship between fluids served and consumed

Fluid intakes correlated highly with the amount of fluids served to the residents. Pearson's correlation confirmed a strong, positive relationship between the amount of fluids offered and consumed ($r(73) = 0.73$, $p = < 0.001$). The residents consumed on average 66% (±18.2%) of the fluids served, which was consistent throughout the course of the study. Fluids given to the residents were initially below the 1500ml recommended fluid intakes, although these also increased throughout the project (Figure 6.3).

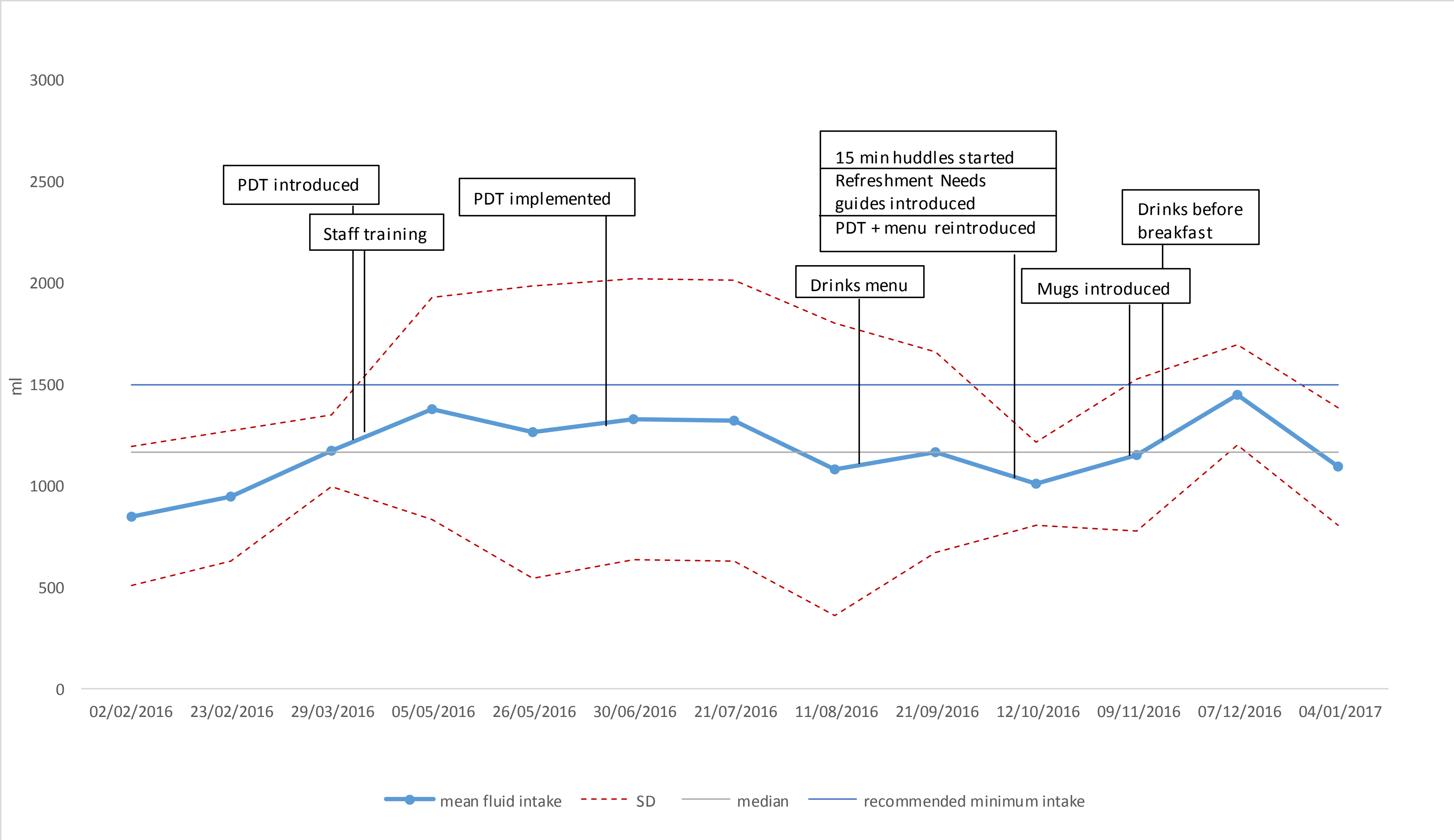

3000
2500
2000
1500
1000
500
0
ml
PDT introduced
Staff training
PDT implemented
15 min huddles started
Refreshment Needs guides introduced
PDT + menu reintroduced
Drinks menu
Drinks before breakfast
Mugs introduced
02/02/2016
23/02/2016
29/03/2016
05/05/2016
26/05/2016
30/06/2016
21/07/2016
11/08/2016
21/09/2016
12/10/2016
09/11/2016
07/12/2016
04/01/2017
mean fluid intake
SD
median
recommended minimum intake

Figure 6.2: *Average fluid intake data collected routinely throughout the project. Six randomly selected residents were used for observations, median was calculated prospectively from the first ten data points.*

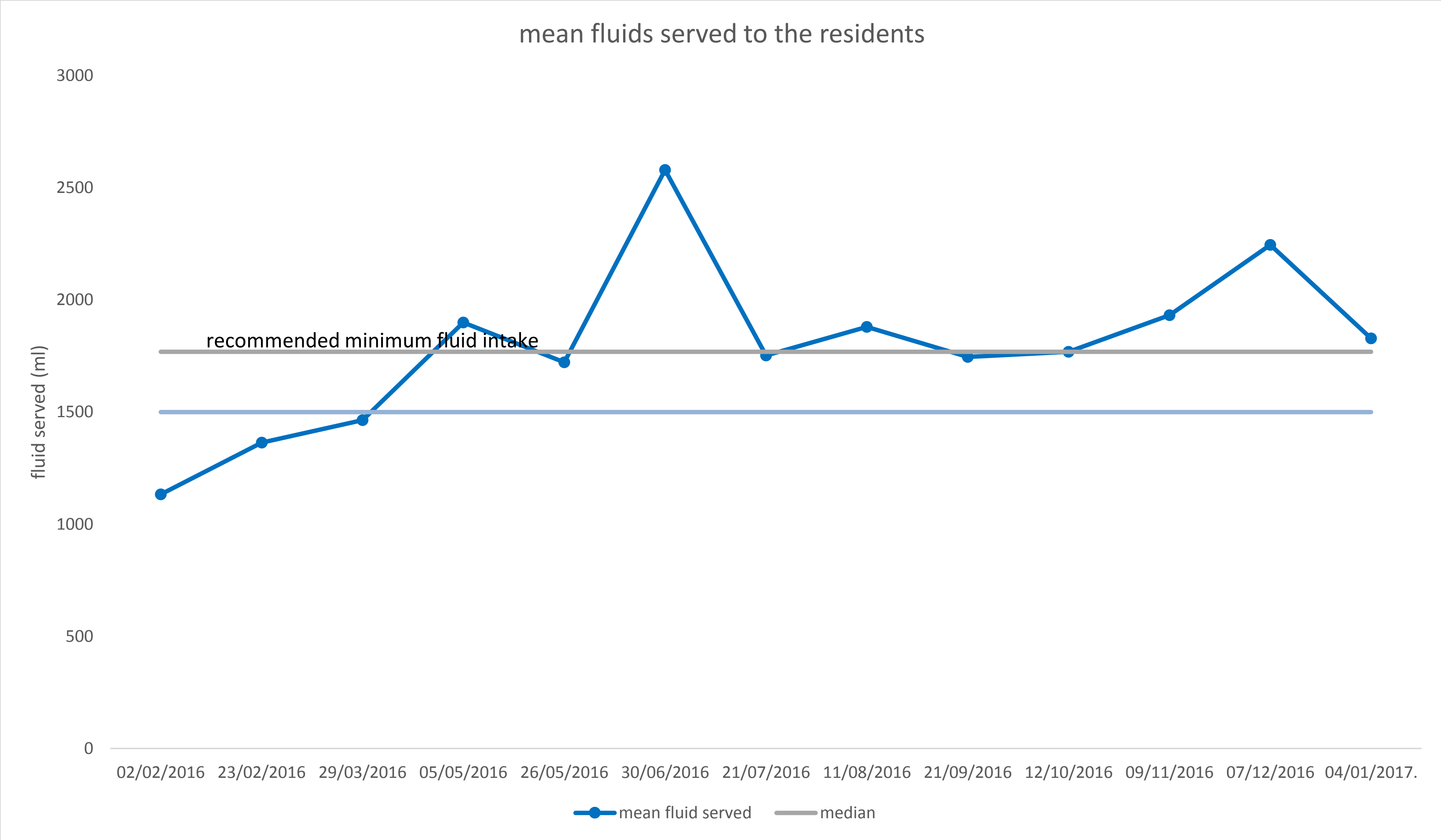


Figure 6.3: *Average fluids served to the residents throughout the project. Six randomly selected residents were used for observations, median was calculated prospectively from the first ten data points available.*

Resident typology and fluid intakes

Fluid intakes throughout the project were significantly different for different types of the residents (Table 6.1). The residents who were able to drink their fluids without assistance (i.e. “independent” and “needs assistance”) were given fluids in the excess of the recommended intakes but still consumed less than the minimum 1500ml target. However, the residents who required full assistance received less than the minimum recommended amount and consumed about two thirds of the fluids offered, demonstrating that they were neither given adequate amounts nor support to help them drink. They received higher proportion of drinks at mealtimes and approximately a quarter of their drinks was from fluid rich foods, although these were not significantly different between the groups. The independent Student’s t-test showed that the differences between the residents who required assistance and those who did not were even more evident when excluding the residents who received help from the family. The mean amount of fluids offered for the residents who needed assistance was 1100ml (SD=277), while those who were independent or required prompting received a mean amount of 1788 (SD=473), $t(54)=-4.98$, $p<0.0001$. The mean amount of fluids consumed by the residents who needed assistance was 708ml (SD=261), while those who were independent or required prompting received a mean amount of 1229 (SD=408), $t(54)=-4.33$, $p<0.0001$. Thus, while the fluids offered and consumed were insufficient for all groups, they were extremely low for those who needed assistance.

Table 6.1: *Mean fluids offered and consumed for different types of the residents throughout the project. All variables were compared using One-way ANOVA. Values presented as mean (±SD)*

	Fluids (ml)		**Percentage of fluids**		
Resident type	**Offered[1]**	**Consumed[2]**	**Consumed[3]**	**From mealtimes[4]**	**From food[5]**
Independent	1812 (±493)	1237 (±444)	69% (±15)	56% (±14)	19% (±9)
Needs prompting	2575 (±589)	1236 (±615)	49% (±25)	42% (±15)	19% (±10)
Needs full assistance	1437 (±810)	920 (±546)	65% (±19)	62% (±19)	26% (13%)

[1]$F(2,70)=7.26$, $p=0.001$, [2]$F(2,70)=5.14$, $p=0.008$, [3]$F(2,70)=8.70$, $p<0.001$, [4]$F(2,70)=2.73$, $p=0.072$, [5]$F(2,70)=2.47$, $p=0.092$

Length of hydration care

The mean length of hydration care was 9 hours and 39 minutes (±1.59). This was calculated as a time between the first and the last drink received by the resident on a given day. The mean length of hydration care roughly represented the time between breakfast and dinner. For some residents, the opportunity was as short as 6 hours when the first drink was given late at breakfast and the last drink given before dinner. The latter was observed three times on separate occasions in three different types of the residents. All residents were in their own rooms at that time. The length of hydration care and the time the first and last drinks were given did not vary significantly for different types of residents. Majority of the residents (63%) received their first drink at or after 9am, and those requiring assistance tended to get their drinks slightly later than independent residents (Figure 6.4). Similarly, almost a half (49%) of the residents had their last drink at 6pm or before (Figure 6.5).

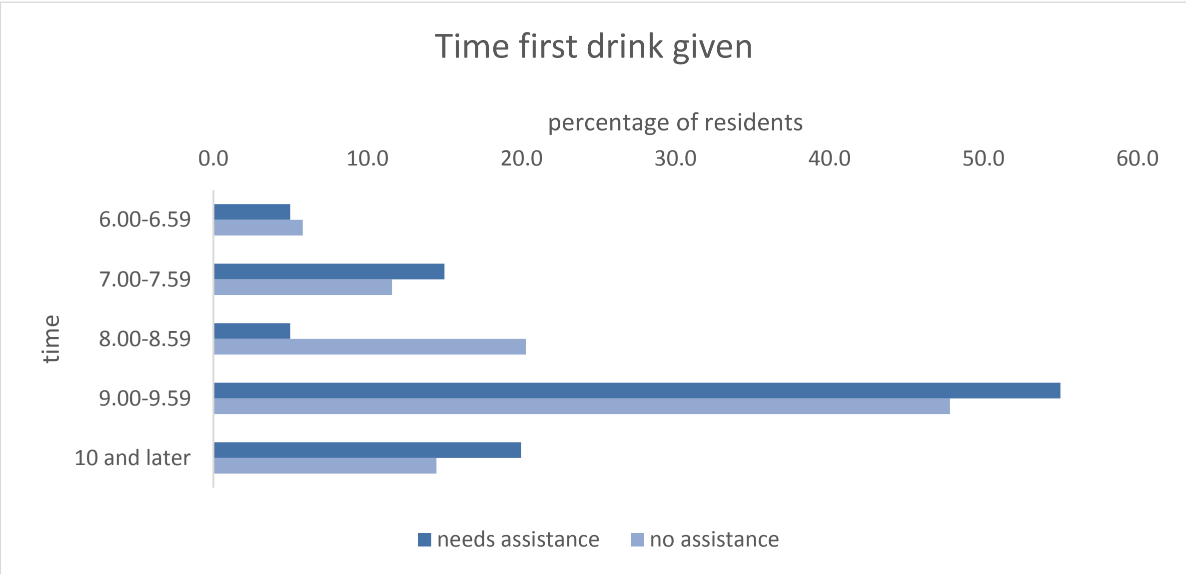


***Figure 6.4**: Proportion of residents receiving their first drinks at different times of the morning period.*

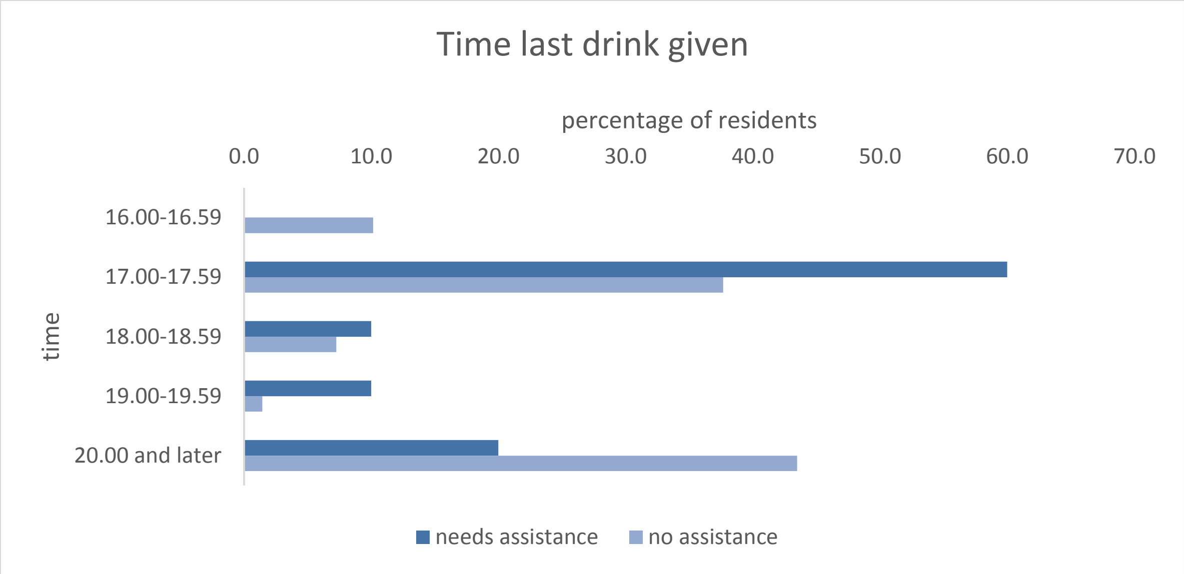


Figure 6.5: *Proportion of the residents receiving their last drinks at different times in the afternoon and evening.*

6.2.2 Hydration Linked Events

The data were collected over a 58-week period. There was a concern in the quality of the data provided by the nurses. For instance, delirium was especially difficult to assess. The problem often related to the nurses sometimes mistaking the signs of delirium for the behavioural issues associated with their diagnosed dementia, stating the residents were '*sometimes confused*'. On the other hand, some residents with no cognitive impairment who displayed their anger were thought to suffer from delirium. Upon reviewing the medication charts for laxative use, it was evident that at times residents had been given enemas or larger doses of laxatives, clearly indicating constipation, but these did not always match the data reported by the nurses. Diagnosis of dehydration was rare and only four incidences were reported throughout the study period. As a consequence, it was decided that the data on delirium, constipation and the diagnosis of dehydration should not be included in the analysis.

The incidence of HLE did not seem to be affected by any changes to fluid intakes (Figure 6.6), except for hospital admissions, which were weakly negatively correlated with the fluid intakes $r(13)=-0.56$, $p=0.045$. The noticeable sudden drop in UTI in September could not be entirely attributed to the changes in hydration status as it coincided with the care home policy for diagnosing the UTI. Up to this point, the diagnosis of this condition depended on the nurses' judgement and was not always supported by the results of the urine analysis. Discussion with the GP about the overuse of antibiotics and the risk of encouraging resistant pathogens resulted in the change for diagnosing UTI and prescribing the antimicrobial treatment. The incidence of respiratory infections significantly decreased from September onwards (shift of the six consecutive points to below median), which could be associated with an observed increase in fluid intakes. There was no difference in the incidence of falls and hospital admissions. Average incidence rates of HLEs throughout the project are presented in Figure 6.7.

Figure 6.6: *Relationship between fluid intakes and Hydration Linked Events: UTI (a), chest infections (b), falls (c) and hospital admissions (d). Median calculated prospectively from the first ten data points available.*

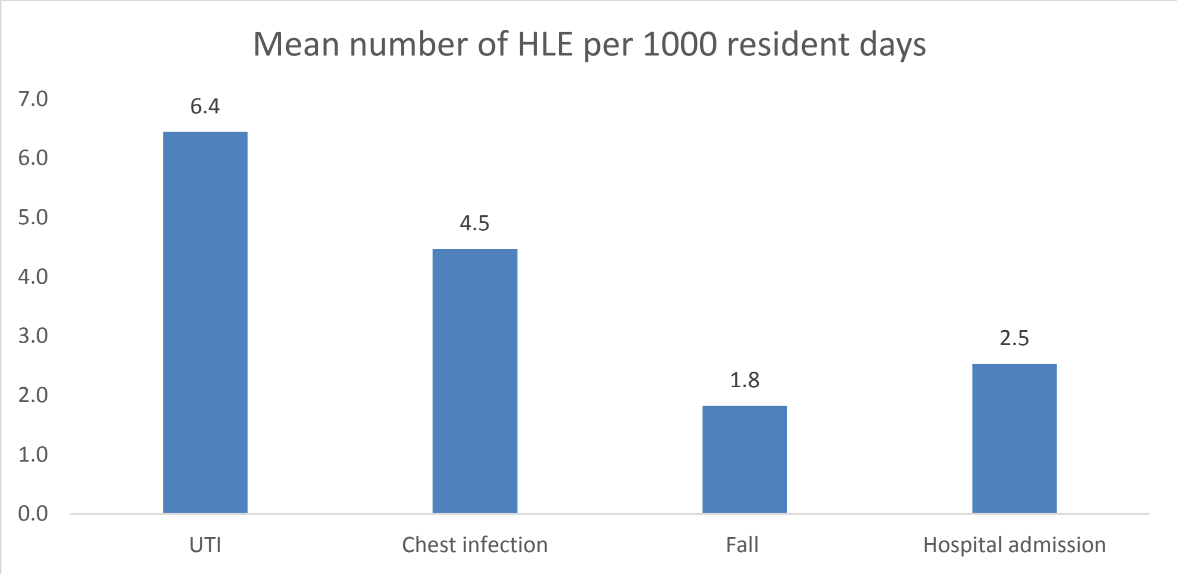


Figure 6.7: *Mean number of Hydration Linked Events per 1000 resident days throughout the project.*

6.2.3 Laxative and antibiotic use

Data were collected prospectively during the 58-week period and because this data were available in documentation, another 10 weeks of pre-intervention data were obtained retrospectively. There was a significant improvement in the laxative use over time, decreasing from 0.83 (±0.09) doses per resident per day at baseline to 6.9 (±0.12) from October onwards. Overall, throughout the project, the mean number of doses was 0.81 per resident per day (± 0.16).

The changes to laxative consumption are shown in Figure 6.8. The initial significant increase occurred at the start of the project. It is not clear why the increase occurred, but it was suggested that it could have been due to one nurse leaving the care home and that the temporary staff were less likely to ask the residents if the laxatives were required. The first significant decrease in laxative consumption was observed in August. The sustained change was observed with a second decrease in October (23/10/16), at which point it was decided that the change was most likely due to the improvement activity and the mean and the control limits were recalculated. It was expected that a hotter weather in summer months would affect the laxative consumption, but this was not observed. The mean laxative consumption decreased at the end of July and remained lower for the month of August. Additionally, during the data collection, it was observed that some residents previously prescribed laxatives were taken off prescription or had their doses reduced.

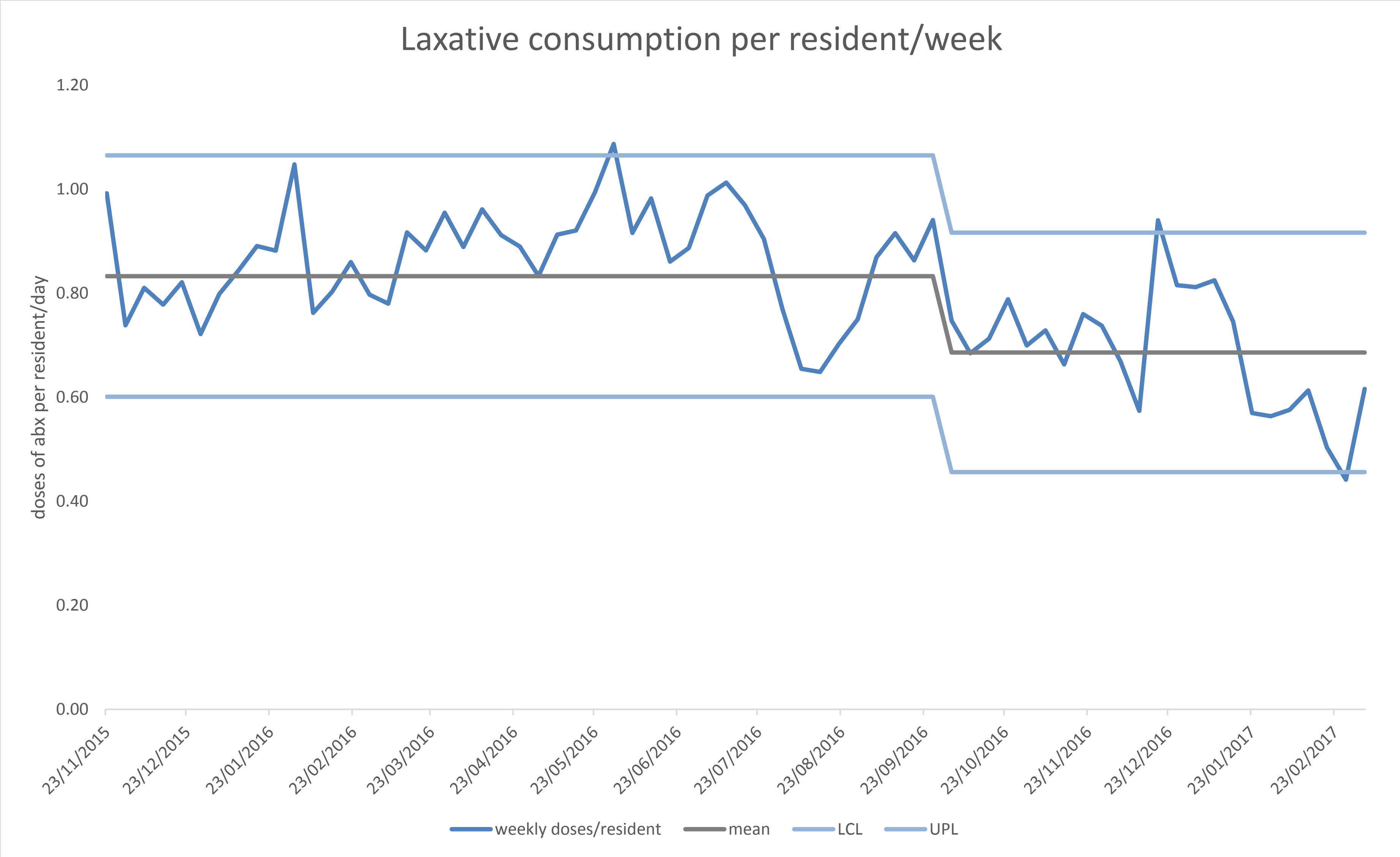


Figure 6.8: *Trends in laxative use aggregated to weekly intervals for the duration of the research project.*

There seemed to be no effect on the prescription of antibiotics (Figure 6.9). Mean antimicrobial prescription throughout the entire project was 8.06 episodes/1000 resident days (±3.38). There was a sharp increase in a number of antibiotic prescriptions during the summer.

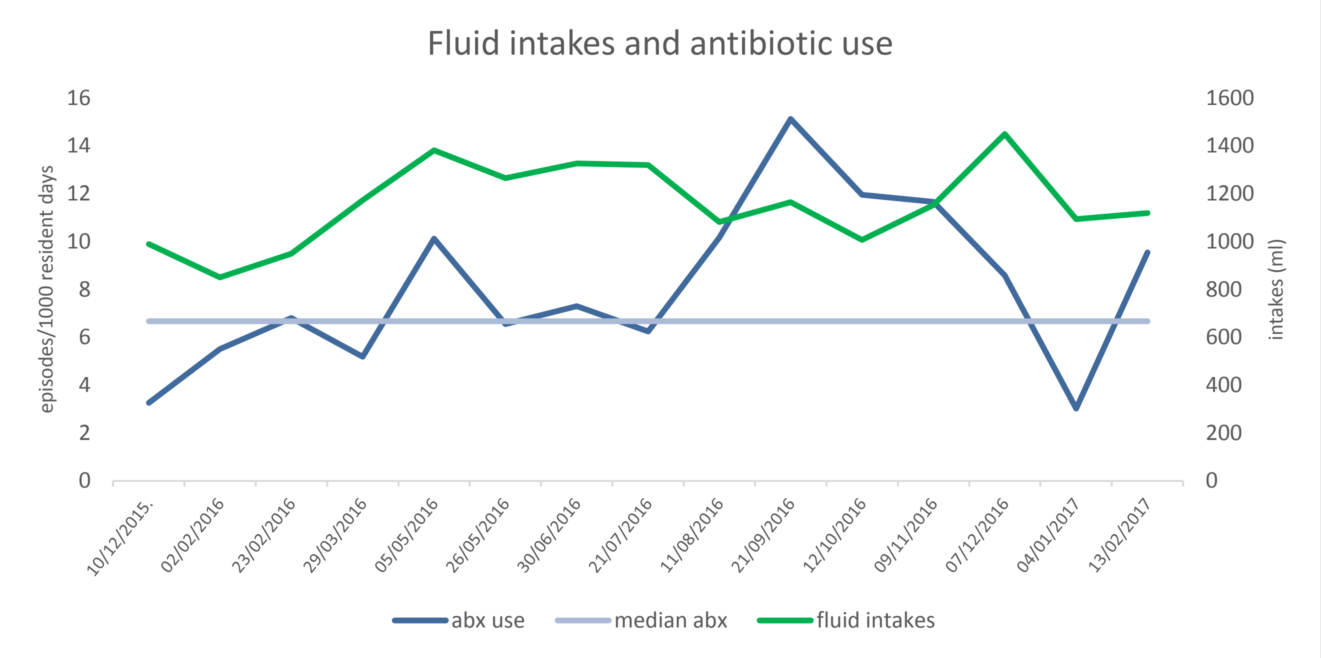


Figure 6.9: *Trends in antimicrobial prescribing throughout the project.*

6.3 Summary of findings

The data reported in this chapter suggested that the interventions had some impact on residents' fluid consumption and that this change positively affected some healthcare outcomes. These changes were due to an increase in number of opportunities to obtain drinks, the larger volumes of the new drinking equipment and possibly residents receiving the drinks of their choice. However, the observed trends of fluids given and consumed suggested that the interventions were not fully embedded in practice and more work was required to sustain them. Additionally, the challenge of monitoring to ensure that the residents consume the fluids they are given, still remains.

Chapter 7 Discussion

This chapter discusses the findings from the research presented in Chapters 4-6. The results of the research have generated new and important knowledge, which demonstrates that fluid intakes of the residents are low, but the residents' willingness to drink is not a primary factor for the inadequate consumption. The discussion further provides the evidence that fluid intakes can increase if an active and systematic approach is taken to ensure all residents receive fluids regularly. The chapter also discusses the barriers and facilitators to achieving a successful change.

7.1. Hydration care and factors that influence fluid intakes of the residents

The results presented in the exploratory phase (Chapter 4) demonstrated that fluid intakes of the care home residents were low. The majority of the residents failed to meet the recommended minimum 1500ml of fluid consumption, which could lead to dehydration and other hydration-related problems. These findings help to explain why other studies find that many care home residents are dehydrated (Wolff et al, 2015; Hooper et al, 2016; Marra et al, 2016). However, this study also provides the evidence which challenges the view depicted in the literature that residents refuse to drink. In contradiction to the expert opinion that care home residents lack desire or cognitive ability to drink (Begum and Johnson, 2010; Hooper and Bunn, 2014; Hooper, 2016), the findings of this thesis demonstrated that the current hydration care failed to provide adequate hydration care for their residents.

The evidence that the residents receive insufficient amount of fluid is important and suggests that the care homes are at least partly responsible for low fluid intakes of the residents. This finding is not entirely new as the poor quality of hydration care has been previously reported by the studies conducted in the US care homes (Kayser-Jones et al, 1999; Simmons et al, 2003). However, the findings of this thesis take this knowledge further because it is the first that also reported the amount of fluids served. This study was also the first to quantify the amount of drinks the residents received throughout the day and showed how this differed depending on the type of the residents and where they were located when drinks were delivered. While no previous studies measured how much fluid was served to care home residents, some intervention studies which aimed to increase opportunities to obtain drinks, concur with the findings of this research and have also shown fluid intakes to increase (Spangler et al, 1984; Mentes and Culp, 2003). Hence, it is reasonable to assume that the problem of insufficient fluids served is prevalent and may be present in many care homes.

To be able to drink adequate amounts, the residents need to be offered fluids frequently throughout the day (Kayser-Jones et al, 1999). Taking the typical volume of the drinking vessel found in the care home, residents require at least ten drinks being served to them so they can receive 1500ml. If one considers that some drinks will ultimately be left undrunk, the number of drinks should be higher. However, the observations identified seven opportunities during the day when the drinks should be given and consumed, which means that even if the residents are given a drink at each of the seven opportunities, it is still not sufficient to meet the recommended 1500ml. Hence more than one drink should be offered at each of these opportunities and fluid rich foods should supplement the drinks. Yet, the results of the observations demonstrated that the residents were not served the drinks at each opportunity, and were rarely given the refills. Fluid rich foods would have supplemented the drinks, but these were also not provided frequently and were generally only available at mealtimes. While there are no studies evaluating the relationship between the amount of fluids served and consumed in the care home residents or the older population, previous research has shown that the number of available times to consume fluids was positively correlated with the amount the residents consumed (Gaspar, 1988; Gaspar, 1999). It is also known that older people in the community settings tend to drink more than the care home residents, and this is at least partly explained by the fact that they have an unlimited access to a variety of fluids (Chernoff, 1994). Many older people in community are generally healthier and therefore more independent, which means that they are able to get the drinks themselves. In contrast, the typical care home resident is completely reliant on the care home staff to receive a drink. This explains why the observations of fluid intakes demonstrated a strong correlation with the amounts they were given. One study previously reported that residents did not receive the drinks between the meals (Simmons et al, 2001), which means it is hard for the residents to drinks sufficient amount even if plenty of fluids are available at mealtimes. Another study commented on the short period of time during the day when fluids were given, showing that the majority of the fluids were given between 6am and 6pm and virtually no drinks delivered outside these times. (Armstrong-Esther et al, 1996). This is in concordance with the observations in this thesis which showed that only a small proportion of the residents were able to obtain drinks after dinner. Additionally, another study demonstrated that first and last drinks were delivered too late and too soon (Godfrey et al, 2012), which further limits the drinking opportunities. This has also been observed in this thesis, where for some residents the period between the first and last drink was shorter than six hours. Hence a short window of opportunity for the drinks to be delivered, coupled with frequent lack of the drinks between meals, resulted in too little fluid delivered to the residents. This observation provides a main reason why the residents do not consume enough and become underhydrated. The observation that the drinks may be available but not accessible to the residents (e.g. not poured into the glass or the glass too far for the resident to reach) could further prevent them from drinking.

Other findings from the exploratory phase suggest that the reasons why the fluids are served in insufficient amounts are numerous and highlight the complexity of the problem. These ultimately explain how hydration is perceived in relation to other tasks. Understanding the factors that attribute to the insufficient fluids delivered to the residents is important as they form the basis for making suitable changes. The factors that have been identified in this research can be divided into institutional and resident-specific barriers. The institutional barriers are the weakness in the work organisation that result in the residents not receiving sufficient amount. These include the problems with how the care is organised, the limitations of the monitoring system and the pitfalls relying on it. These also include the staffing issues, the skills and abilities of the clinical staff, the care home’s resources and the availability of the drinking supplies and equipment. On the other hand, the resident-specific barriers are those that are only experienced by some residents and that these may further prevent the residents from drinking. These include the residents’ level of dependence, the location they stay for the day and their drink preferences. The following sections discuss that the care homes can influence both, the institutional and resident barriers, but to do this they require the commitment of all staff to achieve a sustainable change.

7.2 Improving hydration care

Some experts believe that achieving recommended fluid intakes in older people is not possible (Ferry *et al*, 2005; Hooper and Bunn, 2014; Hooper, 2016) and this attitude was observed amongst the staff in this study (Chapter 4). However, this study also demonstrated that the staff, including the managers, were not aware that the hydration care they provided was inadequate and therefore they did not think hydration care could be improved.

The results of the intervention phase (Chapter 5) demonstrated that increasing fluid intakes in residents is possible. Strategies such as providing preferable drinks, increasing opportunities to obtain drinks and/or increasing the volume, providing adequate assistance or equipment that facilitates independence, all helped to increase resident fluid consumption. Many of these strategies are not new and similar approaches alone or as a part of the bundle were reported in other studies and have been shown to be effective (Spangler et al, 1984; Simmons et al, 2001; Robinson and Rosher, 2002; Mentes and Culp, 2003). One interesting observation from the intervention phase in this project was that while fluid intakes increased, the resident ability and willingness to drink did not seem to plateau and there was still no evidence of the residents refusing drinks.

This observation provides evidence that addressing institutional and the resident factors results in the increase of fluid intakes. More importantly, this finding shows that whilst there may be some residents who would refuse to drink, this type of resident is likely less prevalent than previously thought. Older people have a diminished sensation of thirst and therefore may lack a motivation to drink if the less preferable fluids are served, but providing the residents with the drinks they like enhances their experience of drinking. A previous study showed that the food liking correlated with the food intake of the older care home residents, regardless of their cognitive status (Pouyett et al, 2015). As with the lack of thirst, older people experience anorexia of aging which limits food intake. Thus, the study by Pouyett et al (2015) demonstrates that these age-related challenges can be overcome by shifting the purpose from meeting the physiological need to attaining pleasure. Other studies which used preferable drinks as a part of the strategy to increase fluid intakes further confirm this finding (Spangler et al, 1984; Gaspar, 1988; Armstrong-Esther et al, 1996; Zembrzuski, 1997; Robinson and Rosher, 2002; Simmons et al, 2003; Mentes et al, 2006a; Kayser-Jones et al, 2009; Kenkman et al, 2010; Godfrey et al, 2012).

Similarly, drinking vessels have an ability to enhance residents' drinking experience and therefore influence the amount they drink. A previous study identified that some residents avoid drinking in communal areas such as the dining room or the lounge in order to conceal their disability and avoid embarrassment in front of others (Sidenvall, 1996). The same study also reported that the residents found the assistive devices for eating and drinking acceptable only when they were entirely dependent on them but tried to use 'normal' equipment for as long as they were able to. This is also supported by other studies which demonstrated that the acceptability of the assistive devices is poor (Gitlin et al, 1996; Lilja et al, 2003; Sutton et al, 2013). Choosing a drinking vessel is important because a cup or glass that is difficult for the resident to handle can prevent him or her from being able to use it. On the other hand, assuming that the resident would benefit from the assistive device, but not accounting for a preference, would also result in the drink not being consumed.

The concerns expressed by the clinical staff in the exploratory phase about the fluid restriction for some residents were shown to be unfounded, because the problem seems to be less prevalent than they reported. No studies so far, including the focus groups with care home staff by Mentes et al (2006), identified this to be an issue. Toileting, which has been previously identified as a reason for inadequate fluid consumption (Hooper et al, 2016) was not observed throughout the entire conduct of this study. Interestingly, the residents themselves recognised this to be an issue and reported that sometimes they restricted their intakes, but this behaviour was not observed. In fact, when preferable drinks were served and the appropriate assistance was given, the residents were observed to consume the entire amount and sometimes also requested more. Additionally, some residents with cognitive impairment who refused the drink when asked, also consumed the entire amount if one was served. Lastly, dysphagia has frequently been recognised as a risk factor for low fluid consumption, either because the residents were afraid of aspiration (Mentes, 2006a) or because the fluid thickener affected the palatability of their drink (Godfrey et al, 2012). While this is true to some extent, the observations of the residents in the exploratory phase demonstrated that two residents with dysphagia who were also independent drinkers, consumed relatively high amounts of fluid compared to other residents. However, the observations also identified that the residents who had an impaired ability to swallow were also frequently those who required assistance with eating and drinking. Thus, the underlying reasons for not drinking the adequate amounts was likely their inability to drink independently rather than the swallowing difficulty. Additionally, inadequate skills of the staff such as not being able to prepare a drink to appropriate consistency or the inadequate positioning or feeding techniques could increase the residents' fear of aspiration and diminish their experience of drinking.

Therefore, the resident refusal to drink should not be taken for granted because it may indicate not the unwillingness of the resident to drink, but the presence of the resident related barriers such as not being given the preferable fluids or appropriate support. Thus, it is the duty of the clinical staff in the care homes to recognise that the drink that was not consumed should not be regarded as the resident's refusal to drink, but should warrant a review of the resident's needs and preferences to establish if there were any barriers that prevented them from drinking. As demonstrated in the intervention phase, addressing these barriers results in an increased fluid intake of the residents.

The most successful intervention was arguably an introduction of the new drinking vessels. This is not surprising considering that this intervention required no additional time for preparation or the conduct of the PDSA. The fluid intakes increased during PDSAs and there was a noticeable sharp increase in fluid intakes at the next episode of monthly observations. The senior managers were highly supportive of this intervention (the money for purchasing the equipment did not come from the care home budget) and the staff reported that they were able to deliver more fluids in the same amount of time. Some resistance was observed, with some staff choosing the previous vessels for the residents or using the new vessels but only filling them half-way. The staff believed that this was the best for the residents, but they did not listen to the resident feedback. This again highlights how the staff frequently take charge in making choices for the residents even though they are frequently incorrect with their assumptions. Sadly, the lack of availability of the appropriate drinking vessels on the market make this intervention unsustainable.

Introducing structured drinking opportunities, namely PTD and drinks before breakfast also increased fluid intakes. At their best, these interventions ensured that all residents received drinks and refills, which illustrates previous systems for care provision were not sufficient. However, these interventions were not as well accepted by staff as the new drinking vessels. Especially the PDT, which took considerably longer than the afternoon tea was considered an inconvenience to the staff and they were in a hurry to go back to provide personal care. This is surprising considering that one previous study demonstrated that the staff were not always happy that their job was associated with the ‘dirty work’ (Ostaszkiewicz et al, 2016). One would think that considering this, the staff would be pleased for the PDT to take place because it would bring them a change that they needed. However, the PDT was seen as an additional chore that the staff had to complete on top of the other tasks they already had. Interestingly, the observations did not identify that the other tasks were left unfinished if PDT did take place. This suggests that the time previously used was not utilised efficiently and that the work can be organised better. Additionally, the success of these two interventions was largely due to the fact that they were connected to the task the staff were already performing. For example, PDT was built on the ‘afternoon tea’ which already took place each day, while the drinks before breakfast were linked to the transfer of the residents to the dining room. Because of this, these activities required little additional effort from the staff. Furthermore, the preparation beforehand (e.g. loading the drinks trolley or making hot drinks in advance) made these activities more time efficient, which enabled the staff to spend more time assisting the less independent residents. Further opportunities have been identified but not tested in this study. These included the drinks that could be given to the residents immediately after meals when the crockery is picked up or offering a drink at each resident contact, e.g. a resident was washed, changed or made comfortable in bed.

Drinks Menu, although well accepted by the residents and potentially successful, was not well received by the staff and the managers alike. Previously, data from the staff focus groups and observations in the exploratory phase demonstrated that staff were under an impression that they knew residents’ fluid preferences and therefore had no need asking the residents what they wanted. Thus, from their point of view, the menu was a waste of their time that could be spent on other tasks. Despite the consistent data which showed that residents did not always make the choices the staff expected them to make, the HCAs insisted they knew better what the residents wanted or what they should consume. Additionally, more time would have to be spent on gathering all drinks on the list, especially if some of them were not available on the unit. Godfrey et al (2012) previously described how some residents in the care homes and hospitals complained that they were not able to make choices for themselves, which shows this problem may be universal. An extreme observation was reported by Kayser-Jones et al (1999) where a staff member who was pressed for time mixed the resident's meal with a nutritional drink supplement and forced it on a resident despite their obvious protests. In the same study, the authors also reported that staff did not want to grant residents' requests for coffee to prevent them from getting wet later. This suggests that the staff want to be in control of what is given to the residents. This may be either because they simply want to save time, but there may be other underlying reasons. For example, the staff may be under an impression that the residents are not able to make sensible decisions or because they may take pride in knowing their residents' needs and preferences. On the other hand, senior managers' reluctance to the Drinks Menu was the underlying financial consequence of providing more expensive drink options, namely juices. They worried that the increased juice consumption would increase the costs and prove too expensive to sustain. At first it was thought that these concerns were unfounded, but unfortunately the HCAs were observed to not ask the residents about their fluid preferences and instead served the juices to all residents when they were informed that these were well accepted. This resulted in unnecessary wastage which probably contributed further to the Drinks Menu being less successful.

The real benefit of these interventions was observed on the unit A, when PDT, Drinks Menu and the drinking vessels were introduced as a bundle. The fluid intakes during the afternoon tea increased dramatically. This was because the residents had an opportunity to obtain the drinks of their choice ad libitum and were provided with an assistance they needed. If this intervention continued as intended and more opportunities were offered during the day, they would likely reach the fluids of 1500ml and beyond. Previous intervention studies reported similar results. Simmons et al (2001) demonstrated that just by offering prompting four times a day, fluid intakes increased significantly; they were even higher when eight prompts were provided and the highest was achieved when preference compliance was introduced in addition to prompting. Robinson and Rosher (2002) introduced a beverage cart where a selection of drinks where available and reported that hydration status improved for all but two residents who were severely affected by dementia. Mentes and Culp (2003) demonstrated that a hydration protocol consisting of offering additional fluids throughout the day and organising drink related activities such as afternoon tea reduced hydration linked events in the frail residents. Lastly another study showed that an intervention where a hydration assistant circulated a unit offering a range of drinks and providing assistance with toileting resulted in higher fluid intakes (Spangler, 1984). What these studies demonstrate, which is consistent with the results of this thesis, is that providing sufficient amount of fluids, adequate assistance and the preferred drinks, results in higher fluid intakes of the residents. However, there is a need to establish a reliable mechanism that ensures these strategies are sustainably embedded into practice. Due to the time limits of the improvement project, it was not possible to assess whether introducing the bundle on Unit A was successful long term.

7.3 Factors affecting the success of the interventions

A number of factors contributed to the success of these interventions during the running of PDSA cycles, and their sustainability following the implementation. These included the issues of equipment and supplies, environment and systems of care, and the staff skills and knowledge. Important considerations regarding the use of PDSA methodology in the care homes were also identified.

To be able to provide appropriate hydration care, staff on units need to be supported with adequate supplies of drinks and equipment. This requires some support from other departments such as the kitchen, but also shows the importance of preparation for the activity. It was observed throughout the PDT cycles that the HCAs wasted their valuable time if the trolley or the drinking vessels were not available. This resulted in HCAs not being able to focus on providing the drinks and assistance to the residents. Likewise, limited supplies of juices during the testing of Drinks Menu resulted in either staff making unnecessary visits to the kitchen or the juices not being offered to the residents. The importance of availability of flasks with pre-made hot drinks were also critical to success of drinks before breakfast. Hence, ensuring adequate stocks of equipment and supplies enable the staff to carry out their tasks more efficiently while preparation of drinks before the activity ensures that staff are able to provide a selection of drinks to the residents. This activity can be compared to those reported in he studies by Robinson and Rosher (2002) and Spangler et al (1984), where preparing a drinks trolley was a vital part of the interventions that contributed to their success. This was possible because in both studies, there was a person responsible for preparing the trolley for use, which suggests that allocations to task should be a part of a daily routine. The lack allocations to hydration activities was shown to be a barrier to providing sufficient amount of drinks in the exploratory phase, hence it is not surprising that assigning the responsibility to a particular staff member was shown to facilitate the efficient conduct of these interventions. The results of the PDSAs further demonstrated that these tasks not only need to be allocated, but also monitored and staff should be held responsible for their execution. This in turn requires appropriate support from the senior managers and skilled middle level leadership.

Lack of awareness affects the quality of care provided. Throughout the project it was observed that staff did not always have skills and knowledge to care for the residents. Training was requested by staff and was available throughout the entire period of improvement activities, but some problems persisted. Lack of awareness led the staff to believe that they provided a good quality care to their residents and many of them thought that hydration care did not require improvement. Interestingly, despite the frequent observations that the staff require more training (Armstrong-Esther et al, 1992; Holzapfel et al, 1996; Kayser-Jones et al, 1999) the staff themselves do not seem to recognise this. In fact, the results of the focus groups in the exploratory phase, as well in other studies (Mentes et al 2006a; Godfrey et al, 2012), suggest that staff are very confident and clearly not aware of their gaps in knowledge. Staff were frequently observed to have limited skills to provide safe care for the residents including appropriate positioning, feeding and choosing appropriate vessels for serving fluids. The similar observations were reported by Kayser-Jones et al (1999), but it is not possible to establish whether this practice is due to a lack of training provided by the care homes or whether these result from picking up the bad habits at work. The observations in the exploratory phase suggest that both factors may contribute. It was noted that the new staff were provided with a theoretical training, but the practical skills they needed were provided ‘on the job’. These new recruits were observed to work alongside the established staff members who often did not possess the skills themselves. Sometimes they were also asked to work on their own, for example for feeding the residents or giving them a drink, which meant that no supervision was provided to teach them appropriate techniques. Interestingly, the literature does not always recognise the importance of repeated training, which is necessary to ensure the practice remains safe. One study, which assessed the skills of the nurses 18 months after taking the Advanced Life Support course, demonstrated that while the nurses were able to pass the theoretical knowledge test, 25% failed the practical part (Hammond et al, 2000). The study demonstrated the dichotomy of the knowledge assessment and suggested that the failing of the practical assessment might have been due to the habits picked up at work. It is therefore important to acknowledge that the staff in care homes should be exposed to a practical and repeated training to demonstrate how to administer the food and drink safely. This would assure that the bad practice does not become a routine for every staff member in the home. The staff also need additional training that would enable them to care for older residents, especially since many of them also have multiple morbidities. Previous studies recognised that HCAs require additional training to meet the increasingly complex needs of the residents (Lerner et al, 2010), and the observations throughout this improvement project demonstrated that the staff were not always aware how they could meet these needs and how they can change over time or on the day-to-day basis. Interestingly, the exploratory phase highlighted a discrepancy between the knowledge and skills perceived by staff and those observed in practice. This demonstrates that the staff are unable to assess their performance and are therefore not aware of their ignorance and potential training needs. Drawing from the field of psychology, the learning model of conscious competence suggests that the HCAs who are at the lowest level for learning, are not able to understand how do something and are also not able to recognise the deficit (Flower, 1999). This may explain why some staff were more resistant to change; they simply were not able to recognise that hydration was a problem in their home. However, as observed with the interventions, the lack of support from the leadership and the operational systems in the home prevented the staff from attending the training sessions to make them appreciate the size of the problem and further develop their understanding. Hence, to enable the staff to gain appropriate skills there is a need to incorporate the training into their working days.

Limited communication skills of the staff also hindered their ability to provide effective hydration care. Using the Drinks Menu exemplifies the staff reluctance to communicate with the residents and facilitate choice, who often quoted lack of time and residents' disabilities as the barriers to communication. Communication was clearly a barrier for many HCAs. In line with the other research on the demographics of the care home workforce (Estabrooks et al, 2015), the first language of the majority of the HCAs was not English, which could potentially hinder the communication with the residents for some staff, especially those who felt less confident about their language skills. However, it can be argued that the biggest barrier was the culture of the home itself, that made it permissible for the staff to reduce the communication with the residents to the minimum. This created a vicious circle where the staff did not develop the skills that would enable them to effectively communicate with the residents and instead, they took it upon themselves to make choices for the residents to avoid the communication. Additionally, via testing of the Refreshment Needs Cards, it was observed that the majority of the communication between the staff was in a verbal form and that staff were not comfortable using the written information. This may explain why they struggled to use the Drinks Menu, which would require them to convey the information in the forms that they are not comfortable with.

The importance of the organisational support was highlighted during the testing of the Drinks Menu, where concerns about the costs of the fruit juices resulted in conflicting messages sent to the staff from the managers, the team leaders and the research team. This resulted in staff being confused whether they should use the menu routinely. This is an extreme example where it could be said that the managers actively prevented the intervention from being implemented. Senior managers are in a position to positively or negatively influence the quality of care by establishing operating systems and prioritising tasks, as well as reinforcing leadership at operational level. Because the Drinks Menu was not embedded into practice, a simple instruction to a few members of staff was sufficient to bring an intervention to a halt. On the other hand, the approved interventions were not easily implemented, but the support from the senior management facilitated their adoption.

On occasions when the managers were participating in the PDSA activity or were present when the plans were announced, the intervention was more likely to be successful. For example, PDT was initially endorsed by the clinical manager and the HCAs were seen to do what they thought the manager wanted them to do. The manager support in the improvement project is essential because it sends a signal to the staff that this is aligned with organisational goals and that the change is expected to be implemented (Fernandez-Caballero et al, 2005). Despite this being one of the key elements for successful change (Langley, 1996), managerial support for the improvement project is frequently not provided in care homes (Szczepura et al, 2008). Hence, this thesis asserts that improving care in care homes requires a top-down approach. This may feel counter-intuitive since the improvement should be a multidisciplinary approach (Damschroder and Hagedorn, 2011), but since the staff were observed to be reluctant to take charge during planning and executing the PDSAs, it is likely that they expected the initiative to come from the top.

Similarly, the presence or lack of the leadership at the operational level also affected the interventions. This was observed during the conduct of the PDSAs as well as from the monitoring monthly fluid intake data. When leadership was present, the interventions were sustained, but when it was removed, they gradually reverted to the old routine. To avoid this problem, consistent role modelling, support and leadership are necessary (Taylor et al, 2014), but as it has been observed during the creation of Refreshment Needs Cards, the improvement activities are not seen as an integral part of the job for the leaders, but instead they are considered an additional task, which was added to the workload and at times also interfered with the everyday activities. Thus, while the leadership is essential on both, strategic and operational level (Health Foundation, 2013), it can be asserted that in this project there was a clear deficit of both, which ultimately affected the success of the improvement activities.

7.4 Reflections on research in care home setting

Research in care home environment has always been considered to be a challenge (Mentes, 2002). From the recruitment process throughout the intervention and data collection, researchers face the barriers that require careful consideration, because they ultimately shape how the study is conducted (Brown-Wilson, 2011). As previously reported in section 1.5, the recruitment was a challenge which was only resolved when it was possible to reimburse the care home for participation. The money was used to pay for staff time spent on the research activities and any expenses that the home incurred, hence the home did not benefit by gaining additional resources. This demonstrates that the managers may feel reluctant to grant access to their facility in fear that the research may result in additional cost that they cannot afford. This was evident during the intervention phase, especially when the cost of juices was concerned. This barrier has not been previously reported by other studies, but considering the shortage of resources it seems likely. Additionally, it is possible that participating in the fellowship associated with a research organisation helped to establish credibility and trustworthiness.

Other barriers to research were encountered during the exploratory phase. Read et al (2004) previously identified that the researcher needs to become familiar with the context of the care home and understand how things happen before the research commences. The research activities that follow should therefore account for the context of the specific home. This may require a more pragmatic, flexible approach when planning the study. As demonstrated in the exploratory and intervention phase, the flexible approach was necessary to be able to gather the required data. The examples of this were the difficulties with running the focus groups and training sessions because the staff rarely found time during their shift to participate and understandably did not want to come on their days off to attend these. As an alternative, the ad-hoc staff interviews and the huddles helped resolve these problems. Another example was the decision to conduct the preliminary observations, which revealed a number of barriers for the residents to drink. If the need for the observations was not identified and these were not conducted, the interventions planned for the PDSAs would have been based on staff perceptions and the opinions of other experts who consider the residents difficult to hydrate. This would have likely resulted in the design of different interventions which would not have much influence on the residents. Similarly, conducting additional research activities such as drinks tasting were also necessary to inform the planning of PDSAs. Hence the flexible, pragmatic approach to research was necessary for the improvement project in this setting. Incidentally, this approach is also endorsed by the principles of IS where involving all stakeholders in finding the barriers and planning the interventions is considered a part of good, if not obligatory, practice (Boivin et al, 2018).

Previous experiences of other researchers showed that it was difficult to obtain an informed consent from the residents to participate in the interviews or the focus groups (Brown-Wilson and Clisset, 2011). The authors reported that this was because the residents either refused to sign or forgot that they previously agreed to do so. Many residents in the study reported in this thesis also refused to participate in the focus groups or formal interviews and were reluctant to sign the consent form. However, they were willing to participate in the informal discussions about hydration care and their drinking habits and provided a verbal consent for the researcher to take notes during these conversations. It is possible that the residents' reluctance reflected the fear that their care would be compromised. Kayser-Jones (2003) previously reported that the residents were scared to complain because they did not want to be perceived as causing trouble and it is possible that they thought that participating in the interviews would have a similar effect.

Staff being suspicious of the researcher has also influenced the research in this thesis. Considering staff as study participants (as they were depicted in the exploratory phase), their actions were similar to those described in other studies, especially the desire to act or say what they thought the researchers wanted to observe (McCurdy and Uldam, 2014). This tendency to 'please' the researcher was challenging during the intervention phase when their role shifted from being the study participants to the co-designers of the interventions. It was evident that the staff did not want to engage in planning and conducting the PDSAs, even if they were willing to participate in them. It was also observed that they did not always provide an honest feedback, particularly about the things that went wrong, which resulted in a number of barriers being identified after the intervention was rolled out across the unit. This shows that despite the efforts to involve the staff in co-designing the interventions, they viewed the research activities as something done to them and most likely considered themselves to be the research participants. It is possible that more could have been done to engage the stakeholders during the project. However, considering that both, the managers and the HCAs were discovered to be unforthcoming with their feedback and concerns much later in the project, it was difficult for the research team to realise that more stakeholder engagement was necessary at the beginning. The relationship between the staff, especially the HCAs, and the researchers has not been explored before, although Mentes (2002) mentioned that staff acceptance and support of the study influence the research outcomes. Healthcare assistants have a low occupational status and they are well aware that their work is seen as inferior by some professionals. Ostaszkiewicz et al (2016) described how staff expressed resentment about other healthcare professionals, especially physiotherapists and occupational therapists, who told them how to physically assist the residents, but never did this work themselves. It is possible that the staff in this improvement project viewed the researcher in a similar light, that is as another person who tells them how to do their job. Additionally, HCAs considered themselves skilled and knowledgeable, hence it is likely that they perceived the improvement project as a criticism of their work rather than an effort to overcome the institutional barriers. Researchers may therefore be seen by HCAs as not only the outsiders but also someone who tries to tell them how to do their job, hence can be viewed by some as *persona non grata* and met with a degree of resentment. While many efforts were taken to engage the staff in the project, it is possible that HCAs displayed this attitude towards the researcher, and this may explain the reluctance of some staff to participate in improvement activities or implementing them into practice. Interestingly, Mentes (2002) identified that the researcher's flexibility and compatibility with staff were frequent facilitators to ensure cooperation. When conducting a project in the nursing care environment, it may therefore be important to recruit research staff who understand how to gain trust of the HCAs.

The majority of the interventions tested in this project addressed the institutional barriers and therefore relied on the behavioural change of the staff involved. Behaviour change is difficult. Public health research focused on changing unhealthy habits often shows how behaviour remains unchanged despite the participants possessing sufficient knowledge to appreciate the need for a change. The question presented by the care home managers 'what's in it for us?' may be even more relevant to the staff, and the concept of 'externality' may help understand the difficulty in changing their behaviour. Externality is a cost (or benefit) incurred by a third party, a concept identified in economics but not previously described in the context of healthcare setting. A good example of externality in healthcare may be the long-standing challenge of hand hygiene promotion (Pitet, 2001), where a simple measure of washing hands may translate to prevention of infections and potentially saving lives. However, the prevention of infection is for the patients who are 'the third party' rather than the healthcare workers who neither benefit nor suffer negative consequences of their actions. Hence, intervention attempting to change the hand-washing behaviour may be particularly difficult because the persons who are required to change do not have an incentive to do so. Similarly, externality may be a major barrier to providing fluids to the residents in the care home because this action has no benefit to the staff who need to change their behaviour but benefits the residents who rely on this change. In fact, Kayser-Jones et al (1999) previously reported that the staff restricted coffee and other drinks to prevent the residents from becoming incontinent, hence it is possible that the staff see the fluid provision as a disadvantage for themselves because by restricting the amounts consumed, they can avoid changing pads for the residents. Managers may be able to influence the change by setting the standards that staff have to meet, although externalities may also prevent them from engaging in improvement. This is because preventing dehydration and its potential outcomes can provide cost benefit to NHS, there appear to be few or no incentives for the care homes to improve care. This is unlikely to change unless the care homes are given motivation for doing so. Care homes strive to provide complex care and frequently do so with a small budget and limited resources, while trying to overcome challenges of rapid staff turnover (Donohue, 2010; Cammer *et al*, 2014). Thus, ensuring adequate hydration may not be aligned with the organisational goals, especially if this requires consumption of the valuable resources. This is an issue for policy makers who should provide the incentives for the care homes to continuously improve the quality of care.

During the intervention phase, staff relied on researchers to plan the interventions, remind and lead the HCAs, as well as collect and analyse the data. It was not possible to carry out any PDSA activity without involvement of research staff. This may be because staff did not see improvement work as essential or possibly because they lacked the confidence to carry it out by themselves. The latter is possible because lack of staff knowledge and skills to carry out improvement activities was evident. This could be expected from HCAs, but it was observed in all staff groups. Of particular issue were PDSA cycles, where HCAs found it difficult to understand why they were expected to go back to an old routine after the testing. They felt that this practice sent mixed messages and they were not sure what they were required to do. In addition to being time consuming, the need to oversee the appropriate conduct of interventions also posed a problem because the researcher had no authority to command staff to carry out the activities, but at the same time was required to take charge. Despite these barriers, PDSA cycles were found to be an effective methodology for implementing changes in a care home. Testing on a small scale enabled identification of the barriers to the conduct of some interventions. This resulted in a small investment of time and resources and helped to identify a number of contextual issues which affected practicality of the interventions. However, as noted above some staff did not provide reliable feedback for the PDSA cycles. This resulted in interventions being escalated or implemented only to identify a number of contextual issues, which prevented the staff from conducting the interventions as intended. It was not possible to identify reasons for this behaviour, but it is likely that it could be a result of social desirability bias (Holbrook *et al*, 2003). Alternatively, the staff simply found it easier to report no problems, so they did not waste their time providing lengthy feedback to the researcher; another example of externality. Additionally, the researchers need to consider how often they will be able to visit the home and how much time they will be able to spend, because this potentially may influence the outcomes of the study.

Many of the barriers listed above prevented a sustained implementation of the interventions into the daily routine. The problems with the sustainability highlight the need for another method to facilitate the implementation of these activities into a routine across the home, which goes beyond the principles of Model of Improvement. Implementation science can help to further this step by putting the successful interventions to use by using specific techniques for integrating them into practice (Nilsen, 2015). A range of methods to implementation such as audit and feedback, education and training, coaching and facilitation and supporting have been used (Koczwara et al, 2018). Some approaches such as stakeholder engagement and improving processes are the same as those used in the IS (Koczwara et al, 2018), but the implementation science draws many of its methods from behavioural science (Glasgow et al, 2012) and focuses more on how to change the behaviours of the stakeholders to produce a sustainable change. This would have been particularly useful in this project, considering the staff and manager resistance to change. A number of implementation frameworks exist, which may be considered appropriate to a care home setting. Arguably, the most common approach is provided by the Promoting Action on Research Implementation in Health Services (PARIHS) framework. The framework is based on three key determinants: characteristics of the evidence, the context and the facilitation (Nilsen, 2015). The facilitation is guided by the evidence and the context (Helfrich et al, 2010), therefore it is open enough to be adopted in the care home environment where flexibility is required. The framework recognises that the context may be a particularly challenging but powerful mediator for implementing the evidence into practice. Three main factors that constitute the context have been identified to promote the uptake, these include the culture, the leadership and the evaluation (Malone, 2004). It is proposed that the organisations should put the emphasis on understanding the processes and systems, hence creating the learning culture that facilitates the change. To be able to do so, appropriate leadership is essential, and a transformative leader who is able to inspire the staff to do these changes is particularly valued. Malone (2004) asserts that the strong context where the staff are valued and the strong transformational leadership is present, is likely to achieve a successful change. Drawing from these principles, it would have been useful for this improvement project to apply PARIHS framework to explore the complexities of the context, especially in the last phase after the interventions were shown to be effective and required an escalation to a wider setting (e.g. other units).

According to the PARIHS framework, whatever the nature of the context, further mechanisms are required to facilitate the change (Helfrich et al, 2010). However, the facilitation is not independent of the context, because the facilitation techniques which are chosen may vary depending on its strength. For example, considering that the context in this care home suggests that the staff are not receptive to change and that there is no presence of transformative leadership, additional support needs to be given to ensure staff see the value of the change and are sufficiently motivated to embrace the improvement. Furthermore, the passive behaviour of the staff in implementing changes suggests that there is a need for the facilitator to empower the staff and enable them to become more proactive in implementing changes on their own. As an example, the facilitator can start by setting up an audit to monitor the conduct of the interventions and may want to identify incentives which can make it worthy for the staff to comply. As the implementation progresses and the interventions become a part of the routine, the incentives can be removed, the monitoring can become less frequent, and the staff can oversee the monitoring on their own. Therefore, one could argue that in this improvement project, the PARIHS framework would have been beneficial because the poor context of the care home could have been overcome by identifying and applying the appropriate facilitation to making change. However, it is also important to consider that the researcher's limited skills to apply the PARIHS framework would have likely been a barrier to implementing a successful change. It can also be argued that the researcher who was an outsider to the care home, with no authority over the staff and managers to influence the change, would have had a very little chance to succeed unless a strong managerial support was given. Additionally, this facilitation would require a substantial amount of time, and the research team did not have the capacity to provide this support at the end of the project.

Considering the issues with sustainability reported in this and another study which aimed to improve residents' fluid intakes (Robinson and Rosher, 2002), there needs to be a 'settling' period in the improvement projects. This period should be used to secure the sustainability of the improvement activities, where the principles of Implementation Science, such as the PARIHS framework can be applied to specifically focus on the change of the staff behaviours.

Chapter 8 Conclusions

The research and reflections presented in previous chapters demonstrated that the fluid intakes in care home residents are insufficient. The problem is a result of the institutional and resident factors, which must be addressed by changing how the hydration care is provided. The results of interventions showed that increasing opportunities to receive drinks, preference compliance and improving the design of the drinking vessels can be effectively increase the fluid intakes of care home residents. To ensure the interventions are successfully implemented, there is a need for strong leadership, which in turn positively influences systems in place, availability of equipment and supplies as well as the staff quality. The conclusions drawn in this chapter have important implications for practice, policy as well as for conducting research in care homes. Thus, the results of this thesis may be relevant to researchers, care home managers and those influencing the policy in care home environment.

8.1 Impact of the findings on current knowledge in the field

An important element resulting from the interventions outlined in this thesis is the provision of an estimate of fluid intakes of the care home residents. The majority of the studies reporting this are old and many were conducted in in the USA (Gaspar, 1988; Adams, 1988; Armstrong-Esther et al 1996; Kayser-Jones et al, 1999). One recent paper in the UK reported the daily fluid intakes of the residents (Jimoh et al, 2015), although this focused on the assessment of self-reported drinks diaries which by necessity implied that participants were able to drink and record their fluid intakes independently and therefore did not represent the typical care home residents such as those who have taken part in the current study. Furthermore, the current research did not rely on staff or the existing records to estimate fluid intakes but derived this from independent direct observation of the residents throughout the day by the researcher and her colleagues. This is also the first study that reports the amount of fluid served to the residents, which provides support for the notion that hydration care in these institutions is not adequate. Hence this study is in contradiction to the current opinion favouring the hypothesis that the underlying reason for dehydration in this population is lack of motivation to drink from the participants themselves (see Ferry *et al*, 2005; Hooper and Bunn, 2014; Hooper, 2016). The results of the current research clearly show that institutional factors, such as the type of drinks and equipment offered, staff skills, knowledge and workload and the daily routines in the care home influence fluid consumption of the residents. Whilst resident factors existed, they only affected some residents. The institutional barriers were more important because they affected all the residents.

Prior to the findings of this thesis, little has been known about institutional factors that influence hydration of the residents, although a series of research by Kayser-Jones team highlighted some problems in the care homes in the USA (Kayser-Jones et al, 1999; 2002; 2003 and 2009). More importantly, the results of the intervention phase provided the evidence that by improving these factors, residents' fluid intake does increase, thus further detracting from the opinion that the resident motivation to drink influenced the amounts they consumed. The change in fluid intakes would not have been achieved if the residents had no desire to drink. The interventions described in this thesis addressed the institutional and resident barriers. Institutional barriers affect all residents; hence the interventions were designed to include all types of the residents. On the other hand, the resident factors only affected some types of the residents and the interventions were designed to address these specific problems and were targeted at specific residents.

The current research also provides evidence that hydration care is a complex issue that is influenced by a number of factors, some of which are beyond the control of the staff who provide hydration care. While it can be said that residents are affected by the quality of care they receive on the unit, this care is largely influenced by other factors that represent the general culture of the care home and the approach of the senior and operational leadership towards hydration care. However, these are also likely a result of the general attitudes of policy makers, influence of society and financial constraints of the care home sector. The consideration of the findings of the current research raises important implications for practice and policy changes.

8.2 Implications for practice

It is widely recognised that hydration has been overlooked by health professionals, policy makers and researchers in favour of nutrition (Simmons and Schnelle, 2003; Water UK, 2005; RCN and NPSA, 2007; Lecko, 2008; Mentes and Wang, 2011; Godfrey *et al*, 2012; Lecko, 2013). The findings of this research show that hydration is also overlooked by the staff in care homes in favour of personal care. The extremely low fluid intakes resulting from inadequate amount of fluids served suggest an urgent need for the homes to change their approach towards hydration care. As the results indicated, hydration care for older people is complex and requires more than the presence of water jugs on resident tables. Many residents come into a home with some level of disability and they rely on staff to provide for all their requirements. Due to a range of different disabilities, residents have different needs and preferences, which may be considered resident factors, but it is still up to the staff to meet them. To further complicate this, the needs may not always be obvious to the staff and may also fluctuate. Hence it is difficult for care homes to provide a one-for-all model of hydration care to meet everyone's requirements.

However, the first step is for the care homes to recognise that the hydration care they currently provide may be inadequate. In fact, convincing the staff that there is a problem may be the first step towards improving the quality of care (Dixon-Woods et al, 2012). The results of this research demonstrate that previous staff beliefs that residents do not want to drink (Mentes *et al*, 2006a, also confirmed in Chapter 4), need to be changed. It is the care home managers' responsibility to acknowledge that the change is necessary and to consider hydration as a priority. Managers are the only people who can influence this change in their homes.

In light of the research presented in this thesis and the current evidence presented in the literature, the following advice can be recommended:

- *Assessing current hydration care*: from the findings shown in the exploratory phase, it can be asserted that the current hydration care is not adequate. The care home managers should critically review the current procedures and be open to the fact that these may not meet the resident needs.

- *Providing adequate amount of fluids*: From the findings presented in section 6.2.1, it can be determined that approximately 25% of the fluids are currently not drunk. Hence, to ensure the minimum 1500ml consumed, this requires at least 2000ml of drinks served to each resident a day. Considering the small volume of the vessels (150ml, section 4.2.3), this translates to at least 14 cups/glasses served.

- *Providing adequate number of drinks*: considering the seven discreet occasions during which drinks can be obtained (section 3.3.3), it is necessary to provide two drinks at each opportunity and possibly supplement these with fluid rich foods. Two interventions have been described in this thesis and both were shown to be successful (section 5.2.3), other potential opportunities include drinks immediately before and after meals, drinks round early in the morning, mid-morning and late in the evening. Managers may choose other approaches trialled in other studies, e.g. a trolley that circulates around the unit throughout the day and reaches each resident approximately once an hour (Spangler et al, 1984), increasing opportunities by providing additional drinks at medication rounds etc. (Mentes and Culp, 2003). Another intervention proposed by the staff member was to ring a bell once every hour to remind the staff about drinks. Since these interventions were not tested in this study, it is not possible to determine whether they can be implemented into practice. Each care home needs to consider their context, choose the interventions that are feasible and adapt them so they can fit their daily practice.

- *Monitoring*: the evidence from this thesis as well as from other studies suggests that this is difficult and maybe even impossible to achieve. Current recommendations suggest that all residents at risk should be monitored, but the findings in this thesis (section 4.2.3) suggest that this means virtually every resident. This would require too much time and effort of the home, especially if the data is entered accurately. This is time that could be better spent on active hydration care activities such as serving drinks and providing assistance. While the thesis asserts that monitoring remains in place because at the moment it is a requirement imposed on care homes (CQC, 2011). Since monitoring was not addressed in this improvement project, no recommendations can be made at this time rather than that managers and other healthcare professionals are aware of the limitations.

- *Preference compliance*: providing preferred fluids may be the single, most effective intervention to encourage the residents to drink. Besides tea and coffee, which seem to be very popular with the residents, the results of the drinks testing suggest that the residents prefer strong-flavoured, sweet drinks such as apple, mango or pineapple juice (section 4.2.3). This is still a largely individual issue and the findings in this care home may not reflect the preferences of other residents. Care homes need to explore the preferences of their residents and accordingly adjust the drinks availability. The home also requires a communication tool such as the Drinks Menu (section 5.2.2), so the staff are aware of the drinks available to them and are able to make the decisions themselves. Staff also need to be made aware that besides the preferences to the types of fluids served, the residents also have preference for the quality of the drinks such as the temperature they are served at, or the amount of sugar and milk added.

- *Drinking vessels*: current drinking vessels do not meet the needs and preferences of the residents. Residents frequently avoid assistive devices and prefer the mugs and glasses that look similar to ordinary crockery but make it easy for them to drink. The mug that best meets residents' needs is lightweight, has a big, wide handle and contains between 250-300ml of fluid (sections 2.3.4 and 5.2.2). Assistive devices can also be provided for the residents who struggle with ordinary crockery, but this needs a careful consideration and possibly an agreement with the resident.

- *Assistance*: residents suffer from different forms of disability and therefore require different types of assistance. This is not always recognised by staff and most likely arises from inadequate skills and knowledge (section 7.2.2). the issue of assistance is probably best addressed by making the staff aware and providing adequate training. The training needs to be delivered by trained professionals, and the managers need to acknowledge that the possession of theoretical knowledge may not always be reflected in practice. Hence the training should have some practical elements and ideally provided repeatedly to avoid bad practice. Additionally, team leaders and managers can role model best behaviours themselves.

- *Assessing the reasons for not consuming sufficient amount*: the resident not consuming the drinks should not be assumed to be unwilling to drink. It is necessary that the staff look for the underlying barriers for the low fluid consumption of the resident such as not being provided with a preferable drink or a cup, finding the drinking vessel difficult to handle, not being given appropriate assistance or issues with toileting/incontinence.

- *Support for the change and effective leadership*: managers need to send a clear message that improving hydration care is a priority. While the systems are being embedded in practice, this message may need to be reinforced repeatedly. The team leader has an important role of allocating the staff to tasks, monitoring that everything goes according to the plan and that staff are held accountable for their actions (section 7.2.2). Specific training may be necessary to enhance the leadership in nurses who often act as the team leaders in the care homes.

- *Financial issues*: Considering financial pressures experienced by care homes, senior managers may feel reluctant to introduce some of the changes proposed in this study. The proposed interventions do not need to be expensive and may be possible with careful consideration and shifting the resources from other places. As an example, while the fruit juices are fairly expensive compared to water or squash, it was observed that the desserts served to the residents were usually not well accepted. These were relatively expensive as they came prepared, but the cheaper, popular alternatives such as ice cream could have been provided instead. This would allow the care home to buy the juices. Additionally, asking the residents what they wanted to drink would ensure that the juices were only served as needed and they would not be wasted (section 7.1.2).

- *Person centred care*: This thesis also highlighted some implications for adopting a person centred care. The term itself implies that residents are receiving bespoke care that is given based on individuals' unique circumstances and characteristics. However, it can be argued that some elements of tested and implemented strategies may be seen as being in contradiction to this philosophy. Providing sufficient opportunities for obtaining fluids is an example that a unit wide approach, which targets all residents at the same time is more feasible, especially considering the problems with monitoring. This thesis suggests that certain parts of care must be routinized to ensure residents' wellbeing. Only when certain standards are satisfied, person centred care can positively affect the residents. This finding may explain why some care homes struggle to implement the person-centred model of care (Rosemond *et al*, 2012). Hence the solution is to recognise which parts of the care need to be routinized and which should be provided on individual level. The differences need to be signposted and embedded into an everyday practice.

8.3 Implications for change of policies

A systematic review on IS in care home settings has shown that implementing change is difficult (Szczepura *et al*, 2008). Authors reported that neither providing performance feedback nor training the staff in relevant methodology resulted in improved care. When improvement was achieved, it was often not sustained. Compliance with evidence-based guidelines was also found to be poor (Szczepura *et al*, 2008). However, it must be acknowledged that the guidelines are rarely specific to care homes, hence it is difficult to determine whether they have any application in this setting (BGS, 2011). The only guidance provided is a set of standards set by CQC, by which the care homes are assessed. However, the guidance does not offer advice on how to achieve these standards. This gives a lot of freedom for care home managers to decide how care is delivered, but there is a risk that processes and tools they choose may not be appropriate. Furthermore, anecdotal evidence provided by care home managers also suggests that assessment by CQC inspectors is subjective and advice given is not consistent and sometimes not practical. Hence there is a need for the policy makers to extend the support to the care homes.

- *Guidelines:* there is a need for the policy makers to develop the guidelines specific to care home environment. These could include the evidence on specific interventions and tools which were shown to be effective in this setting. These guidelines should ideally be acknowledged by CQC, who could also use them for more objective assessment. There is a possibility that insufficient evidence exists for providing care on some aspects of care, but additional advantage may be that guidelines will recognise the existing knowledge gaps and therefore will help to identify research priorities.

- *Support from healthcare professionals:* There is a need for the external healthcare professionals to provide more support to the care homes. The need for the involvement was highlighted throughout the project where the support from SALT, occupational therapists and dieticians was required. Continuous training, myth busting and updates on new developments would help the untrained staff to deliver safer and more appropriate care, who at the moment are frequently left unsupervised and are burdened with overwhelming workloads (Mentes and Tripp-Reimer, 2002). Limited access to external healthcare professionals suggests that care homes are expected to employ the staff who possess the skills and knowledge necessary to provide this specialist care. Care homes are already struggling financially and expecting them to employ other healthcare professionals is unreasonable. Hence there is a need for NHS and governing bodies to recognise this problem and commission appropriate support of healthcare professionals without incurring financial investment for care homes. Establishing meaningful relationships with the care homes has a potential cost benefit for the NHS through prevention of avoidable treatment and hospital admissions.

- *Encouraging care homes to strive for improvement:* There is a need to change the attitude of the care homes towards improving care. To achieve this, care homes need to be more open and be prepared to participate in research and improvement projects. Considering the current reluctance of the care home managers to participate in research, there is a need to initiate improvement beyond the influence of care homes. Imposing penalties for inappropriate care can be one way to achieve this, but many care homes are already struggling, and this could unnecessarily put them in crisis. Evidence from the acute sector demonstrates that setting the targets and penalties for not meeting them, results in negative outcomes (Gubb, 2009). Instead, governing bodies could provide incentives for care homes that participate in research and improvement initiatives. An evaluation of one such scheme in the USA showed the benefit of participation (Rehkamp *et al*, 2016). There were some positive outcomes for care homes, which included reduced staff turnover rates, recognition within the industry and opportunities for free marketing. However, to be able to participate in improvement activity, care homes had to invest their financial and other resources with no guarantee to receive compensation, this could potentially prevent some homes from joining such schemes. It was also apparent that while the overall cost benefit was evident, care homes not only did not gain, but sometimes also lost their revenues (Rehkamp *et al*, 2016). Hence there is a need to design the programmes that will ensure guaranteed incentives for participation.

8.4 Implications for research in care homes

The Care home environment is challenging for researchers to navigate. Access to care homes as described in the previous section is only one of the barriers, which can also include inadequate staffing and high staff turnover, rigid care schedules, staff not complying with research protocols and problems with recruiting participants (Mentes and Tripp-Reimer, 2002; Hall *et al*, 2009; Kaasalainen *et al*, 2010). For these reasons, care homes are frequently ignored and excluded from research activities. Those who conducted research in care homes report that this activity requires considerable investment of time and resources (Mentes and Tripp-Reimer, 2002; Kayser-Jones, 2003; Munroe *et al*, 2011). This thesis confirmed these findings. Staff turnover was a particular challenge and impacted on the sustainability of the implemented interventions. Rigid routines, especially concerning personal care were frequently used as an excuse for poor compliance with the interventions. Additionally, the lack of adherence to allocations and no accountability had an impact on the success of these interventions. This can be perceived as a resistance from staff, and a lack of adequate leadership, which in turn suggests poor buy-in into the project by all staff groups including the senior managers. In general, the attitudes throughout the project were that they could contribute when they had time and resources to do so. The following recommendations are proposed to enhance research and improvement work in care homes:

- *Raising awareness of the importance of research:* Managers may feel reluctant to be involved in research, because they fear to attract the type of negative publicity, that is frequently overemphasised in the media (Tellis-Nayak, 2007), are distrustful of research activity (Mentes and Tripp-Reimer, 2002) and want to avoid unnecessary disruption to care patterns (Wild and Kydd, 2016). These potential barriers can be overcome with raising awareness of the importance of research in this setting and providing sufficient incentives to participate, which shows that research can be mutually beneficial. This requires the researchers to consider which benefits may be important for the care homes. The potential to improve care and possibly gain recognition in the industry may not be sufficient to encourage the care homes to participate.

- *Flexibility:* the results of the exploratory phase and planning the interventions (Chapter 4) identified that a great degree of flexibility is required to collect a reliable data. The researchers need to be open minded about changing the protocols to be able to align their research with the routine in care homes. This may include a different method of data collection, rethinking when the data collection may be possible and adjusting the interventions so that they are feasible to conduct in the specific environment.

- *Involvement:* research in care homes requires an investment of time and effort. This thesis identified that continuous support and frequent visits to the care home were necessary for the conduct of the intervention. It must be recognised that the staff in care homes may lack the skills and confidence to run a research or improvement project by themselves. However, the interventions to become sustained, the staff need to be encouraged to claim the ownership of the project and be responsible for its management and legacy. This may require additional training of staff and therefore further investment into the project, but it one of the reasons the project in this thesis was only partly successful, was due to staff being too reliant on the research team to plan, execute and assess the activities. Furthermore, to enable a smooth execution of improvement activities on the unit, a multidisciplinary needs to be established at the start of the project. This will ensure that all voices are heard and that the planned interventions are at everyone's best interest. Ideally, the project should have been conducted with the research team providing expertise and support, but with care home staff planning, executing and collecting their own data. The benefit of doing this would equip the staff with invaluable skills and enable the care home to carry out improvement projects independently with no or little input from external sources. It may also be worth to consider the sustainability of the potential interventions. The results of this research project suggest that additional time and effort are needed for changing staff behaviours and embedding the evidence into routine practice. It would be most beneficial if the intervention research added the final phase of the study where the principles of the implementation science could be applied to achieve a sustainable change.

8.5 Limitations of the research

A number of limitations have been identified. Setting may be considered the greatest limitation of this study. The work was conducted in one large care home in London and it is possible that this may not be representative of the other care homes. For example, care homes in other areas of the country may not be affected by the high staff turnover rate, which influenced the outcomes of the intervention phase. There is also a tendency for the care homes to be bigger and become a part of a national chain (which is representative of this home), although there is no evidence to suggest that large care homes or those belonging to a chain provide better or worse care when compared to the smaller, private ones (Comondore *et al*, 2009).

The possible limitation of the exploratory phase can be the nature of the focus groups and interviews to be subjective. Results of the focus group with staff demonstrated that staff maintain an idealised view of how hydration care is provided or are reluctant to share any negative views they hold. Social desirability bias is often mentioned in research from varying disciplines (Holbrook *et al*, 2003). This could have potentially affected some of the results, especially the feedback from the interventions and could influence the decision making when planning the improvement activities. This could have been a reason why some interventions were not successful. However, it can also be argued that the focus groups and interviews were necessary to explore how different stakeholders perceived hydration care. Even though their views may not always have been correct, they provided an invaluable insight into why certain parts of care are provided the way they are. The additional data obtained from the observations counterbalanced the potential bias from the interviews and therefore provided a more reliable picture.

The small, stratified sample of the individual observations could have had an effect on the results obtained before and after the improvement activity. Larger sample decreases a level of uncertainty and provides greater power to detect differences. However, due to the nature of this project, obtaining data from larger samples was not possible. Observations of the residents are time consuming and it would be difficult to obtain more data via additional observations at baseline. Eight residents, which may not seem like much also represented a third of the entire unit and it could be argued that even including all residents the sample size would still not be enough. On the other hand, due to the nature of the project, observing the residents outside this unit would could potentially introduce more bias because hydration care may have been different. Routine data collected throughout the project identified similar trends as those observed from the preliminary observations, which provides evidence that sample size did affect the results obtained. Aggregating the routine data provided a much more reliable sample size and still provided similar results.

Setting up more process measures, especially those associated with implemented interventions could have been beneficial. At the moment it can be speculated that inadequate fluid intakes were due to interventions not being fully implemented into practice. Process measures could have helped identify which interventions were not sustained and why, and could possibly allow the team to act on this knowledge. Due to time constraints setting up more process measures would not have been feasible. This issue was partly resolved by data from routine observations, which identified that some interventions were not conducted as intended. Balance measures would have also been beneficial, especially considering the potential risk of over-hydration. Anecdotal evidence provided by nurses suggested that this was not a problem and throughout the project there were no residents who were diagnosed to be overhydrated.

The most reliable method of assessing the effect of the interventions would have been the direct assessment of hydration status. This posed some difficulties, since the only reliable method of assessment is blood osmolality, which is not routinely available in care home settings and would not have been ethical to obtain. Additionally, many residents who were present at the beginning of the project were not there at the end, hence the direct before-after measurement of hydration status would not have been possible. It could be argued that fluid intakes may not reflect hydration status, however, in the light of the evidence that hydration care was influenced by institutional factors, the increase in the amount of fluids served and consumed would have been more appropriate as it reflects the improvement in the quality of care rather than physiological state of the residents that could have been influenced by other factors. Since fluid intakes can fluctuate on a daily basis, monitoring these over time was more reliable than using a before-after comparison.

Another limitation can be associated with data collected on HLE. There were little conclusions that could be drawn because many of these outcomes are not entirely associated with fluid intakes and for some, a firm link has not been established. Challenges linking diseases to fluid consumption have been described in section 2.4.8. Data was collected retrospectively, which made it sensitive to recall bias, while the subjective identification of some conditions possibly coupled with nurses' desire to avoid negative reporting predisposed this data to reporting bias. Sample size could also be mentioned as a potential limitation as a small number of residents on one unit was not likely to show any significant changes.

Finally, researcher positionality must be considered as a potential limitation. Traditionally this concerns qualitative research more than quantitative, although both are possibly affected. Previous knowledge, experience and attitudes can shape the researchers' decision on research conduct, data analysis and drawing final conclusions. This was minimised by creating data tools to capture data subjectively, collecting quantitative data to support the findings and cross-validating results with other researchers involved in this project.

8.6 Strengths of the research

The most important strength of this research was arguably the flexible approach to improvement. Guided by the IS methodology and the pragmatic approach to research, there was a great degree flexibility in obtaining data. Drawing the data from staff, residents and other stakeholders and by different methods allowed the researcher to obtain a complete picture of the problem. Previous studies obtained their data on hydration care from the interviews with staff (Mentes et al; 2006a; Godfrey et al, 2012), interviews with the residents (Godfrey, et al, 2012) or obtaining the information on fluid intakes from other sources (Jimoh, et al, 2015). The strength of this research is that it drew the data from all these sources as well as independently obtaining them via observations of the care home routines and the individual residents. The further strength was also that these observations carried on throughout the entire project, providing even more assurance that these were not just a snapshot of one-off event, but a continuous pattern of events that contributed to low fluid intakes. The continuous presence of the researcher in the care home resulted in staff becoming more relaxed and reduced a potential Hawthorn effect.

The PDSA use was another strength of this improvement project. The PDSAs enabled a quick recognition of successful interventions and the abandonment of the other. The PDSAs also allowed to iron out any small problems that were encountered before the interventions were implemented and escalated. This ensured that all stakeholders were satisfied and that the interventions considered the potential consequences on staff workload and care home resources.

While this study was limited to a large care home setting, the results may be generalisable well beyond it. Considering the suggestions of other researchers that fluid intakes in care homes may be suboptimal (Wolff et al, 2015), and similar concerns being raised for hospitals (Begum and Johnson, 2010) the results of the intervention phase may be relevant to other care settings. The simplicity of these interventions makes them relatively cheap to implement and only requires the team motivation to achieve the change. The potential barriers have been discussed and the teams can recognise which are relevant to them to further guide their improvement.

8.7 Future research

There are several potential directions that can be undertaken following the results of this thesis. These concern new research, quality improvement and innovations that could benefit the residents. The rationale for these is provided below.

Given the limitations of the setting in which this project was conducted, future research needs to focus on assessing hydration in a wider context. Similar observations are required to be conducted in care homes where individuals are less dependent so as to determine fluid intakes in this setting. Different barriers are expected to affect the residents with dementia, and it is likely that resident factors have more influence on fluid intakes, but observations could further identify institutional barriers that prevent them from drinking. It can also be suspected that hydration care in a hospital setting may be similar and this warrants further investigation.

Reliable monitoring of fluid intakes remains a challenge, especially since it has been identified that all residents are at risk of consuming inadequate amounts. A new electronic data record system may provide a feasible solution to this problem, but needs the focus of a separate study, preferably with an involvement of software engineers or other experts in this field. Barriers to overcome would include encouraging staff to input the data immediately after drink provision and differentiating between fluids served and fluids consumed.

This thesis identified that providing an appropriate cup or mug may have a potential in increasing fluid intakes in the residents. This is a new strategy that has not been researched previously and little data exists to support its effectiveness. Hence there is a need to further investigate this approach. More research needs to be done to test different designs of drinking vessels suitable for this population. There is also a need to design an appropriate vessel and introduce it into the market to ensure its steady supply. This also warrants an intervention study to compare fluid intakes of the residents drinking from standard and specially designed equipment. Further qualitative interviews with this population group could also shed insights into barriers associated with drinking equipment and assistive devices.

The introduction of a Drink menu highlighted the importance of preference compliance and its potential in increasing fluid intakes of care home residents. This clearly indicates that lack of thirst can be compensated by providing preferred fluids. Studies before the current research did not investigate the availability of preferable drinks or a wider range of fluids on the perception of thirst in older people. This could also be evaluated in conjunction with visual cues that might encourage people to drink e.g. pictures of the drinks or other people drinking.

Finally, this thesis identified some barriers and facilitators to conducting improvement projects in care homes, but this was not the main focus. Improvement work in this setting is a relatively new topic and little is known about the methodology that could be used to support change. Hence there is a need for future research to identify appropriate methodologies and describe barriers and facilitators for improving care in this setting.

8.8 Conclusions

The research reported in this thesis furthers the knowledge of the complexity of hydration for care home residents. Most residents do not consume adequate amounts of fluids due to the insufficient fluids given to them and those who need assistance and stay in their rooms are particularly disadvantaged. There are a number of barriers that prevent the staff to serve fluids, including insufficient staff knowledge, lack of allocations to hydration care, inadequate monitoring and focus on giving personal care instead. These findings demonstrate that hydration is not given enough attention. Residents also experience additional barriers that affect their enjoyment and ability to drink, such as not being provided with preferable drinks, not receiving assistance they need and not being able to handle the drinking equipment provided to them. This improvement project demonstrated that increasing fluid intakes in care home residents is possible, if adequate number of opportunities to obtain drinks are established and the residents are provided with adequate assistance and preferable fluids. However, these interventions rely on a change of staff behaviour, which may be challenging to achieve. Doing so requires organisational commitment with consistent support from senior managers and a strong leadership at operational level. Care home managers also need to be encouraged to initiate the improvement, which requires input from the policy makers and warrants the exploration of incentives for the homes to drive the change.

References

Ackerman, J.D., Hemphill, R. & Cowan, D. (2011) Lean Is a Tool in the Toolbox, Not the Silver Bullet. *Annals of Emergency Medicine,* 58(4), p.398-399.

Acocella, I. (2012) The focus groups in social research: advantages and disadvantages. *Quality & Quantity,* 46(4), p.1125-1136.

Adams, F. (1988) How much do elders drink? *Geriatric Nursing,* 9(4), p.218-221.

Adatto, K., Doebele, K.G., Galland, L. & Granowetter, L. (1979) Behavioral factors and urinary tract infection. *The Journal of American Medical Association,* 241(23), p.2525-2526.

Akimoto, T., Ito, C., Kato, M., Ogura, M., Muto, S. & Kusano, E. (2011) Reduced hydration status characterized by disproportionate elevation of blood urea nitrogen to serum creatinine among the patients with cerebral infarction. *Medical Hypotheses,* 77(4), p.601-604.

Altieri, A., La Vecchia, C. & Negri, E. (2003) Fluid intake and risk of bladder and other cancers. *European Journal of Clinical Nutrition,* 57(S2), p.S59-S68.

Alzheimer's Society, Royal College of Nursing (2010) *This is me.*

Anglian Water (2009) *Heath on Tap – A Campaign to Promote Good Hydration in Older People in Residential Care from Anglian Water.* Available at: http://www.anglianwater.co.uk/_assets/media/health-on-tap-good-hydration-report.pdf [Accessed: 29 October 2016].

Anonymous. Florida initiative aims to slash unnecessary admissions due to 'catch-all' dehydration diagnosis. (2001) *Clinical Resource Management,* 2(5), p.77.

Arinzon, Z., Feldman, J., Peisakh, A., Zuta, A. & Berner, Y. (2005) Water and sodium disturbances predict prognosis of acute disease in long term cared frail elderly. *Archives of Gerontology and Geriatrics,* 40(3), p.317-326.

Armstrong, L., Maresh, C., Castellani, J., Bergeron, M., Kenefick, R., LaGasse, K. & Riebe, D. (1994) *Urinary indices of hydration status.*

Armstrong, L.E. (2005) Hydration Assessment Techniques. *Nutrition Reviews,* 63(Supplement 1), p.40-54.

Armstrong, L.E. (2007) Assessing hydration status: The elusive gold standard. *Journal of the American College of Nutrition,* 26(5 Suppl), p.575S-584S.

Armstrong, L.E. (2012) Challenges of linking chronic dehydration and fluid consumption to health outcomes. *Nutrition Reviews,* 70(11), p.S121-S127.

Armstrong, L.E., Ganio, M.S., Casa, D.J., Lee, E.C., McDermott, B.P., Klau, J.F., Jimenez, L., Le Bellego, L., Chevillotte, E. & Lieberman, H.R. (2012) Mild dehydration affects mood in healthy young women. *The Journal of Nutrition,* 142(2), p.382-388.

Armstrong, L.E., Maughan, R.J., Senay, L.C. & Shirreffs, S.M. (2013) Limitations to the use of plasma osmolality as a hydration biomarker. *American Journal of Clinical Nutrition,* 98(2), p.503-504.

Armstrong, L.E., Soto, J.A., Hacker, J.,F T., Casa, D.J., Kavouras, S.A. & Maresh, C.M. (1998) Urinary indices during dehydration, exercise, and rehydration. *International Journal of Sport Nutrition,* 8(4), p.345.

Armstrong-Esther, C.A., Armstrong-Esther, D.C., Browne, K.D. & Sander, L. (1996) The institutionalized elderly: dry to the bone. *International Journal of Nursing Studies,* 33(6), p.619-628.

Armstrong-Esther, C.A., Brown, K.D. & McAfee, J.G. (1994) Elderly patients: still clean and sitting quietly. *Journal of Advanced Nursing,* 19(2), p.264-271.

Asplund, R. & Aberg, H. (1991) Diurnal variation in the levels of antidiuretic hormone in the elderly. *Journal of Internal Medicine,* 229(2), p.131.

Asplund, R. & Aberg, H. (1992) Health of the elderly with regard to sleep and nocturnal micturition. *Scandinavian Journal of Primary Health Care,* 10(2), p.98.

Asplund, R. (2004) Nocturia, nocturnal polyuria, and sleep quality in the elderly. *Journal of Psychosomatic Research,* 56(5), p.517-525.

Badr, K.F. & Ichikawa, I. (1988) Prerenal failure: a deleterious shift from renal compensation to decompensation. *The New England Journal of Medicine,* 319(10), p.623.

Barbour, R.S. & Kitzinger, J. (1999) *Developing focus group research: politics, theory and practice.* London: SAGE.

Barbour, R.S. (2005) Making sense of focus groups. *Medical Education,* 39(7), p.742-750.

Barchel D, Almoznino-Sarafian D, Shteinshnaider M, Tzur I, Cohen N & Gorelik O (2013) Clinical characteristics and prognostic significance of serum albumin changes in an internal medicine ward. *European Journal of Internal Medicine,* 24(8), p.772-778.

Basile, D., Anderson, M. & Sutton, T. (2012) Pathophysiology of Acute Kidney Injury. *Comprehensive Physiology,* 2(2), p.1303-1353.

Beck, A.M., Ovesen, L. & Schroll, M. (2002) Home-made oral supplement as nutritional support of old care home residents, who are undernourished or at risk of undernutrition based on the MNA. A pilot trial. Mini Nutritional Assessment. *Aging Clin Exp Res,* 14(3), p.212-215.

Beetz, R. (2003) Mild dehydration: a risk factor of urinary tract infection? *European Journal of Clinical Nutrition,* 57(Suppl 2), p.S52-S58.

Begum, M.N. & Johnson, C.S. (2010) A review of the literature on dehydration in the institutionalized elderly. *The European e-Journal of Clinical Nutrition and Metabolism,* 5(1), p.e47-e53.

Benelam, B. & Wyness, L. (2010) Hydration and health: a review. *Nutrition Bulletin,* 35(1), p.3-25.

Bennett, B. & Provost, L. (2015) What is your theory? Driver diagram serves as tool for building and testing theories for improvement. *Quality Progress,* July, p.36-43.

Bennett, C. (2010) At A Glance' Fluid Balance Bar Chart. London: NHS Institute for Innovation and Improvement.

Bennett, J.A., Thomas, V. & Riegel, B. (2004) Unrecognized chronic dehydration in older adults: examining prevalence rate and risk factors. *Journal of Gerontological Nursing,* 30(11), p.22-28; quiz 52-53.

Berwick, D.M. (2011) Preparing nurses for participation in and leadership of continual improvement. *The Journal of Nursing Education,* 50(6), p.322-327.

Beyea, S.C. & Nicoll, L.H. (2000) Methods to conduct focus groups and the moderator's role. *AORN Journal,* 71(5), p.1067-1068.

Blau, J. (2005) Water deprivation: A new migraine precipitant. *Headache,* 45(6), p.757-759.

Blau, J., Kell, C. & Sperling, J. (2004) Water-deprivation headache: A new headache with two variants. *Headache,* 44(1), p.79-83.

Bloor, M. (2001) *Focus groups in social research.*

Boaden, R., Harvey, G., Moxham, C. & Proudlove, N. (2008) *Quality Improvement: Theory and Practice in Healthcare.* Coventry: NHS Institute for Innovation and Improvement.

Boler, I., Davis, A., Extermann, M. & Overcash, J. (2007) Muscle weakness, dehydration, and confusion, but not anemia and fatigue, are associated with falls in older cancer patients receiving chemotherapy. *Critical Reviews in Oncology Hematology,* 64, p.S36-S36.

Bonner, J. & Harris, W. (1988) *Healthy aging: new directions in health, biology and medicine.* Claremont, CA: Hunter House.

Borghi, L., Meschi, T., Amato, F., Briganti, A., Novarini, A. & Giannini, A. (1996) Urinary volume, water and recurrences in idiopathic calcium nephrolithiasis: A 5-year randomized prospective study. *Journal of Urology,* 155(3), p.839-843.

Bourke, B. (2014) Positionality: Reflecting on the Research Process. *The Qualitative Report*, 19, How To Article 18, p. 1-9.

Bourne, L., Wallker, D.H.T., (2005) Visualising and mapping stakeholder influence. Management Decision, 43(5), p. 649-660

Bowen, D.J., Hyams, T., Goodman, M., West K.M., Harris-Wai, J., Yu, J. (2017) Systematic Review of Quantitative Measures of Stakeholder Engagement. *Clinical and Translational Science*, 10(5),p. 314-336

Boynton, P.M. & Greenhalgh, T. (2004) Hands-on guide to questionnaire research: Selecting, designing, and developing your questionnaire. *BMJ: British Medical Journal,* 328(7451), p.1312-1315.

Braun, V. & Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology,* 3(2), p.77-101.

British Geriatrics Society (2011) *Quest for Quality: Inquiry into the quality of healthcare support for older people in care homes: A call for leadership, partnership and quality improvement.* London: British Geriatrics Society.

Brownie, S. & Nancarrow, S. (2013) Effects of person-centered care on residents and staff in aged-care facilities: a systematic review. *Clinical Interventions in Aging,* 8, p.1-10.

Brown-Wilson, C. & Clissett, P. (2010) Involving older people in research: Practical considerations when using the authenticity criteria in constructivist inquiry. *Journal of Advanced Nursing* 67(3):677-86

Byrne, J., Xu, G. & Carr, S. (2015) Developing an intervention to prevent acute kidney injury: using the Pla, Do, Study, Act (PDSA) Service Improvement approach. *Journal of Renal Care,* 41(1), p.3-8.

Cade, J., Thompson, R., Burley, V. & Warm, D. (2002) Development, validation and utilisation of food-frequency questionnaires – a review. *Public Health Nutrition,* 5(4), p.567-587.

Callum, K., Gray, A., Hoile, R., Ingram, G., Martin, I., Sherry, K. & Whimster, F. (2013) *Extremes of age. The 1999 Report of the National Confidential Enquiry into Perioperative Deaths.* [Online]. Available at: http://www.ncepod.org.uk/1999ea.htm [Accessed: 12/12/2013].

Cammer, A., Morgan, D., Stewart, N., McGilton, K., Rycroft-Malone, J., Dopson, S. & Estabrooks, C. (2014) The Hidden Complexity of Long-Term Care: how context mediates knowledge translation and use of best practices. *The Gerontologist,* 54(6), p.1013.

Campbell, N. (2011) Dehydration: why is it still a problem? *Nursing Times,* 107(22), p.12-15.

Caplan, N. (1979) The Two-Communities Theory and Knowledge Utilization. *American Behavioral Scientist,* 22(3), p.459-470.

Caraceni, P., Domenicali, M., Tovoli, A., Napoli, L., Ricci, C.S., Tufoni, M. & Bernardi, M. (2013) Clinical indications for the albumin use: Still a controversial issue. *European Journal of Internal Medicine,* 24(8), p.721-728.

Care Quality Commission (2010) *Essential standards of quality and safety*. London. Care Quality Commission.

Care Quality Commission (2012a) *Health care in care homes. A special review of the provision of health care to those in care homes.* Care Quality Commission.

Care Quality Commission (2012b) *Time to listen in care homes. Dignity and nutrition inspection programme.* : Care Quality Commission.

Care Quality Commission. Health and Social Care Act 2008 (Regulated Activities) Regulations (2014): Regulation 14, Meeting nutritional and hydration needs. 2014. Available at: http://www.cqc.org.uk/content/regulation-14-meeting-nutritional-and-hydration-needs Last accessed September 2019

Chassagne, P., Druesne, L., Capet, C., Ménard, J. & Bercoff, E. (2006) Clinical Presentation of Hypernatremia in Elderly Patients: A Case Control Study. *Journal of the American Geriatrics Society,* 54(8), p.1225-1230.

Chernoff, R. (1994) Nutritional requirements and physiological changes in aging. 52(suppl):S3– S5. *Nutritional Review,* 52(Supplement), p.S3-S5.

Cheuvront, S. & Sawka, M. (2005) Hydration assessment of athletes. *Sse 97,* 18(2), p.1-12.

Chiasson, J., ArisJilwan, N., Belanger, R., Bertrand, S., Beauregard, H., Ekoe, J., Fournier, H. & Havrankova, J. (2003) Diagnosis and treatment of diabetic ketoacidosis and the hyperglycemic hyperosmolar state. *CMAJ Canadian Medical Association Journal,* 168(7), p.859-866.

Chuang, Y. & Abbey, J. (2009) The culture of a Taiwanese care home. *Journal of Clinical Nursing,* 18(11), p.1640-1648.

Cicmanec, J.F., Shank, R.A. & Evans, A.T. (1985) Overnight concentration of urine. Natural defense mechanism against urinary tract infection. *Urology,* 26(2), p.157-159.

Clark, W.F., Sontrop, J.M., Macnab, J.J., Suri, R.S., Moist, L., Salvadori, M. & Garg, A.X. (2011) Urine Volume and Change in Estimated GFR in a Community-Based Cohort Study. *Clinical Journal of the American Society of Nephrology,* 6(11), p.2634-2641.

Cloutier, D., Cox, A., Kampen, R., Kobayashi, K., Cook, H., Taylor, D. & Gaspard, G. (2016) A Tale of Two Sites: Lessons on Leadership from the Implementation of a Long-term Care Delivery Model (CDM) in Western Canada. *Healthcare (Basel, Switzerland),* 4(1), p.3.

Comas, V. & Polanco, A. (2005) Case-control study of risk factors associated with constipation. The FREI Study. *Anales De Pediatría,* 62(4), p.340-345.

Comondore, V.R., Devereaux, P.J., Zhou, Q., Stone, S.B., Busse, J.W., Ravindran, N.C., Burns, K.E., Haines, T., Stringer, B., Cook, D.J., Walter, S.D., Sullivan, T., Berwanger, O., Bhandari, M., Banglawala, S., Lavis, J.N., Petrisor, B., Schünemann, H., Walsh, K., Bhatnagar, N. & Guyatt, G.H. (2009) Quality of care in for-profit and not-for-profit care homes: systematic review and meta-analysis. *BMJ: British Medical Journal,* 339(7717), p.381-384.

Competition and Markets Authority (2017) Guidance. Care homes market study: summary of final report. Available at https://www.gov.uk/government/publications/care-homes-market-study-summary-of-final-report/care-homes-market-study-summary-of-final-report#fn:3 Last accessed September 2019.

Concannon, T.W., Meissner, P., Grunbaum, J.A., McElwee, N., Guise, J., Santa, J., Conway, P.H., Daudelin, D., Morrato, E.H., Leslie, L.K. (2012) A New Taxonomy for Stakeholder Engagement in Patient-Centered Outcomes Research. *Journal of General Internal Medicine*, 27(8), p. 985–991

Cook G., Brown Wilson C. & Forte D. (2006) The impact of sensory impairment on social interaction between residents in care homes. International Journal of Older People Nursing 1, 216–224.

Copeman, J. (2000) Promoting nutrition in older people in nursing and care homes. *British Journal of Community Nursing, 2000, Vol 5, no 6,* 5(6), p.277-284.

Cowan, D.T., Roberts, J.D., Fitzpatrick, J.M., While, A.E. & Baldwin, J. (2004) *Nutritional status of older people in long term care settings: current status and future directions. ScienceDirect* [Online]. Available at: http://www.sciencedirect.com.ezproxy.uwl.ac.uk/science/article/pii/S0020748903001317.

Crowe, M.J., Forsling, M.L., Rolls, B.J., Phillips, P.A., Ledingham, J.G.G. & Smith, R.F. (1987) Altered water excretion in healthy elderly men. *Age and Ageing,* 16(5), p.285-293.

Culp, K., Mentes, J. & Wakefield, B. (2003) Hydration and Acute Confusion in Long-Term Care Residents. *Western Journal of Nursing Research,* 25(3), p.251-266.

Culp, K., Tripp-Reimer, T., Wadle, K., Wakefield, B., Akins, J., Mobily, P. & Kundradt, M. (1997) Screening for acute confusion in elderly long-term care residents. *The Journal of Neuroscience Nursing : Journal of the American Association of Neuroscience Nurses,* 29(2), p.86.

Cummings, G., Mallidou, A., Masaoud, E., Kumbamu, A., Schalm, C., Laschinger, H. & Estabrooks, C. (2014; 2013) On becoming a coach: A pilot intervention study with managers in long-term care. *Health Care Management Review,* 39(3), p.198-209.

Cupchik, G. (2001) Constructivist Realism: An Ontology That Encompasses Positivist and Constructivist Approaches to the Social Sciences. *Forum : Qualitative Social Research,* 2(1).

Curnock, E., Bowie, P. & McKay, J. (2012) Barriers and attitudes influencing non-engagement in a peer feedback model to inform evidence for GP appraisal. *BMC Medical Education,* , p.12-15.

Curran, E.T. & Bunyan, D. (2012) Using a PDSA cycle of improvement to increase preparedness for, and management of, norovirus in NHS Scotland. *The Journal of Hospital Infection,* 82(2), p.108.

Dahlke, S., Hall, W. & Phinney, A. (2015) Maximizing Theoretical Contributions of Participant Observation While Managing Challenges. *Qualitative Health Research,* 25(8), p.1117-1122.

Damschroder, L.J. & Hagedorn, H.J. (2011) A Guiding Framework and Approach for Implementation Research in Substance Use Disorders Treatment. *Psychology of Addictive Behaviors,* 25(2), p.194-205.

Danone Research and Hydration for Health Initiative (2010) *Hydration in the aging. A review of current knowledge.* [Online]. Available at: www.h4hinitiative.com/toolspublications/publications/monographs.

David, H. A.; Gunnink, Jason L. (1997). "The Paired t Test Under Artificial Pairing". The American Statistician. 51 (1): 9–12.

Davidoff, F., Dixon-Woods, M., Levoton, M., Michie, S. (2015) Demystifying theory and its use in improvement. BMJ Quality and Safety, 24, p. 228-238

Davies, P., Walker, A. & Grimshaw, J. (2010) A systematic review of the use of theory in the design of guideline dissemination and implementation strategies and interpretation of the results of rigorous evaluations. *Improvement Science,* 5(1), p.14-14.

Dawda, P. & Raymond, M. (2016) Measurement for improvement. *Innovait,* 10(1), p.51-56.

de Bucourt, M., Busse, R., Güttler, F., Reinhold, T., Vollnberg, B., Kentenich, M., Hamm, B. & Teichgräber, U.K. (2012) Process mapping of PTA and stent placement in a university hospital interventional radiology department. *Insights into Imaging,* 3(4), p.329-336.

Denny, M. & Dawson, T. (1975) Effects of dehydration on body-water distribution in desert kangaroos. *American Journal of Physiology.,* 229(1), p.251-254.

Deurenberg, P. & Schouten, F. (1992) Loss of total-body water and extracellular water assessed by multifrequency impedance. *European Journal of Clinical Nutrition,* 46(4), p.247-255.

DeWalt, K. & DeWalt, B. (1998) Participant observation. In H. Russell Bernard (Ed.), Handbook of methods in cultural anthropology. In: Walnut Creek: AltaMira Press., p.259-300.

Dill, D.B. & Costill, D.L. (1974) Calculation of percentage changes in volumes of blood, plasma, and red cells in dehydration. *Journal of Applied Physiology,* 37(2), p.247-248.

Dimant, J. (2001) Delivery of Nutrition and Hydration Care in Care homes: Assessment and Interventions to Prevent and Treat Dehydration, Malnutrition, and Weight Loss. *Journal of the American Medical Directors Association,* 2(4), p.175-182.

Dixon-Woods, M., McNicol, S., Martin, G. (2012) Ten challenges in improving quality in healthcare: lessons from the Health Foundation’s programme evaluations and relevant literature. *BMJ Quality and Safety,* 21, p.876–884

Donahue, J. & Lowenthal, D. (1997) Nocturnal polyuria in the elderly person. *American Journal of the Medical Sciences,* 314(4), p.232-238.

Donoghue, C. (2010) Care home Staff Turnover and Retention: An Analysis of National Level Data. *Journal of Applied Gerontology,* 29(1), p.89-106.

Dowd, T. Campbell, J. & Jones, J. (1996) Fluid Intake and Urinary Incontinence in Older Community-Dwelling Women. *Journal of Community Health Nursing*, 13(3):179-186

Dunne, T.E., Neargarder, S.A., Cipolloni, P.B. & Cronin-Golomb, A. (2004) Visual contrast enhances food and liquid intake in advanced Alzheimer's disease. *Clinical Nutrition,* 23(4), p.533-538.

Eaton, D., Bannister, P., Mulley, G.P. & Connolly, M.J. (1994) Axillary Sweating in Clinical Assessment of Dehydration in Ill Elderly Patients. *Bmj,* 308(6939), p.1271.

Eckford, S.D., Keane, D.P., Lamond, E., Jackson, S.R. & Abrams, P. (1995) Hydration monitoring is the prevention of recurrent idiopathic urinary tract infections in pre-menopausal women. *British Journal of Urology,* 76(1), p.90-93.

El-Sharkawy, A., Watson, P., Neal, K., Ljungqvist, O., Maughan, R. (2014) Hydration and outcome in older patients admitted to hospital (The HOOP prospective cohort study). *Age and Ageing,* 2015; 44: 943–947

Emerson, R.W. (2015) Causation and Pearson's Correlation Coefficient. Journal of Visual Impairment and Blindness, 109(3), p. 242-244.

Erkert, J.D. (1988) Dehydration in the elderly. *J Am Acad Physician Assist,* 1, p.261-269.

Estabrooks, C., Squires, J., Carleton, H., Cummings, G. & Norton, P. (2015) Who is Looking After Mom and Dad? Unregulated Workers in Canadian Long-Term Care Homes. *Canadian Journal on Aging-Revue Canadienne Du Vieillissement,* 34(1), p.47-59.

Farrell, J. & Petrik, S. (2009) Hydration and Nosocomial Pneumonia: Killing Two Birds with One Stone (a Toothbrush). *Rehabilitation Nursing Journal,* 34(2), p.47-50.

Fathima, N. (2016) A quality improvement tool - driver diagram: a model of driver diagram to reduce primary caesarean section rates. *International Journal of Research in Medical Sciences,* 4(5), p.1339-1342.

Featherstone, I., Hopton, A. & Siddiqi, N. (2010) An intervention to reduce delirium in care homes. *Nursing Older People,* 22(4), p.16.

Feilzer, M. (2010) Doing Mixed Methods Research Pragmatically: Implications for the Rediscovery of Pragmatism as a Research Paradigm. *Journal of Mixed Methods Research,* 4(1), p.6-16.

Feinfeld, D.A., Bargouthi, H., Niaz, Q. & Carvounis, C.P. (2002) Massive and disproportionate elevation of blood urea nitrogen in acute azotemia. *International Urology and Nephrology,* 34(1), p.143.

Fern, E.F. (1982) The Use of Focus Groups for Idea Generation: The Effects of Group Size, Acquaintanceship, and Moderator on Response Quantity and Quality. *Journal of Marketing Research,* 19(1), p.1-13.

Fernandez-Caballero S, Becic D, Bouras I, Walker D, Sultan P. (2013) Experiences and challenges in achieving sustainable quality improvement in two UK hospitals. *British journal of hospital medicine*, 74(7), p.403

Ferry, M., Dal Canton, A., Manz, F., Armstrong, L., Sawka, M., Ritz, P. & Rosenberg, I. (2005) Strategies for ensuring good hydration in the elderly. *Nutrition Reviews,* 63(6), p.S22-29.

Flower, J. (1999). "In the mush". *Physician Executive*, 25(1), p. 64–66

Francis, R. (2013) *The Mid Staffordshire NHS Foundation Trust public inquiry*. Stationery Office.

Friedman, S.A. & Gladstone, J.L. (1971) The effects of hydration and bladder incubation time on urine colony counts. *The Journal of Urology,* 105(3), p.428-432.

Gage, H., Goodman, C., Davies, S.L., Norton, C., Fader, M., Wells, M., Morris, J. & Williams, P. (2010) Laxative use in care homes. *Journal of Advanced Nursing,* 66(6), p.1266-1272.

Ganio, M.S., Armstrong, L.E., Casa, D.J., McDermott, B.P., Lee, E.C., Yamamoto, L.M., Marzano, S., Lopez, R.M., Jimenez, L., Le Bellego, L., Chevillotte, E. & Lieberman, H.R. (2011) Mild dehydration impairs cognitive performance and mood of men. *British Journal of Nutrition,* 106(10), p.1535-1543.

Gaspar, P.M. (1988) What determines how much patients drink?. *Geriatric Nursing (New York, N.Y.),* 9(4), p.221-224.

Gaspar, P.M. (1999) Water intake of care home residents. *Journal of Gerontological Nursing,* 25(4), p.23-29.

Gault, R.H. (1907) A History of the Questionnaire Method of Research in Psychology. *The Pedagogical Seminary,* 14(3), p.366-383.

George, J. & Rockwood, K. (2004) Dehydration and Delirium — Not a Simple Relationship. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences,* 59(8), p.M811-M812.

Gibbons, M. (2008) Why is knowledge translation important? Grounding the conversation. *Focus: Technical Brief,* 21.

Giddings, L.S. (2006) Mixed-methods research: Positivism dressed in drag? *Journal of Research in Nursing,* 11(3), p.195-203.

Gille, D. (2010) Overview of the physiological changes and optimal diet in the golden age generation over 50. *Eur Rev Aging Act,* 7(1), p.27-36.

Gillham, B. (2008) *Developing a questionnaire.* 2nd ed. London: Continuum.

Glasgow RE, Vinson CMPA, Chambers DDP, Khoury MJ, Kaplan RM, Hunter C. (2012) National Institutes of Health Approaches to Dissemination and Implementation Science: Current and Future Directions. American Journal of Public Health, 102(7), p. 1274-1281.

Godfrey, H., Cloete, J., Dymond, E. & Long, A. (2012) An exploration of the hydration care of older people: a qualitative study. *International Journal of Nursing Studies,* 49(10), p.1200.

Going, S., Williams, D. & Lohman, T. (1995) Aging and body composition: biological changes and methodological issues. *Exercise and Sport Sciences Reviews,* 23, p.411.

Goodman, C., Gordon, A.L., Martin, F., Davies, S.L., Iliffe, S., Bowman, C., Schneider, J., Meyer, J., Victor, C., Gage, H., Gladman, J.R. & Dening, T. (2014) Effective health care for older people resident in care homes: the optimal study protocol for realist review. *Systematic Reviews,* 3(1), p.49-49.

Gopinathan, P.M., Pichan, G. & Sharma, V.M. (1988) Role of dehydration in heat stress-induced variations in mental performance. *Archives of Environmental Health,* 43(1), p.15-17.

Graverholt, B., Riise, T., Jamtvedt, G., Ranhoff, A.H., Krüger, K. & Nortvedt, M.W. (2011) Acute hospital admissions among care home residents: a population-based observational study. *BMC Health Services Research,* 11(1), p.126-126.

Gross, C.R., Lindquist, R.D., Woolley, A.C., Granieri, R., Allard, K. & Webster, B. (1992) Clinical indicators of dehydration severity in elderly patients. *Journal of Emergency Medicine,* 10(3), p.267-274.

Guba, E.G. & Lincoln, Y.S. (1994) Competing paradigms in qualitative research In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 105-117). London: Sage. In:.

Guba, E.G. (1990) *The paradigm dialog.*

Gubb, J. (2009) Have targets done more harm than good in the English NHS? Yes. *Bmj,* 338(jan16 2), p.a3130-a3130.

Gudivaka, R., Schoeller, D. & Kushner, R.F. (1996) Effect of skin temperature on multifrequency bioelectrical impedance analysis. *Journal of Applied Physiology (Bethesda, Md.: 1985),* 81(2), p.838.

Guest, G., MacQueen, K.M. & Namey, E.E. (2012) *Applied thematic analysis.* Thousand Oaks, Calif; London: SAGE.

Guyton, A. (1976) *Textbook of medical physiology.* 5th ed.

Hall, R. (2012) Mixed Methods: In search of a paradigm in Conducting Research in a Changing and Challenging World, Chapter: Chapter 7:, Publisher: Nova Science Publishers Inc., Editors: Thao Le and Quynh Le, pp.71 - 78. In:.

Hall, S., Longhurst, S. & Higginson, I. (2009) Challenges to conducting research with older people living in care homes. *BMC Geriatrics,* 9(1), p.38-38.

Hallett, N. & Hewison, A. (2012) How to address the physical needs of clients in a mental health setting. *Nursing Management (Harrow, London, England : 1994),* 18(10), p.30.

Hammond, F., Saba, M., Simes, T., Cross, R (2000) Advanced Life Support: retention of registered nurses' knowledge 18 months after initial training. *Australian Critical Care*, 13(3), p. 99-104

Harrison, M.H. (1985) Effects of thermal stress and exercise on blood volume in humans. *Physiological Reviews,* 65(1), p.149-209.

Hart M. & Adamek, C. (1984) Do increased fluids decrease urinary stone formation?. *Geriatric Nursing (New York, N.Y.),* 5(6), p.245-248.

Harvath, T., Swafford, K., Smith, K., Miller, L., Volpin, M., Sexson, K., White, D. & Young, H. (2008) Enhancing Nursing Leadership in Long-Term Care A Review of the Literature. *Research in Gerontological Nursing,* 1(3), p.187-196.

Hassall, K.L., Mead, A. (2018) Beyond the one-way ANOVA for 'omics data. BMC Bioinformatics., 19(S7), p.109-126

Haveman-Nies, A., de Groot, L.C. & Van Staveren, W.A. (1997) Fluid intake of elderly Europeans. *The Journal of Nutrition, Health & Aging,* 1(3), p.151.

Havig, A., Skogstad, A., Kjekshus, L. & Romoren, T. (2011) Leadership, staffing and quality of care in care homes. *Bmc Health Services Research,* 11(1), p.327-327.

Health Foundation (2013) Quality improvement made simple: what every board should know about healthcare quality improvement. London: Health Foundation.

Healthcare Improvement Scotland (2011) *Improving nutrition...Improving care* [Online]. Available at: http://www.healthcareimprovementscotland.org/our_work/patient_safety/nutritional_care_resources/improving_nutrition_event.aspx.

Hebert, L., Greene, T., Levey, A., Falkenhain, M. & Klahr, S. (2003) High urine volume and low urine osmolality are risk factors for faster progression of renal disease. *American Journal of Kidney Diseases,* 41(5), p.962-971.

Helfrich CD, Damschroder LJ, Hagedorn HJ, Daggett GS, Sahay A, Ritchie M, et al. (2010) A critical synthesis of literature on the Promoting Action on Research Implementation in Health Services (PARIHS) framework. *Implementation Science*, 5, p.82.

Hewko, S. Cooper, S. Huynh, H., Spiwek, T., Carleton, H., Reid, S. & Cummings, G. (2015) Invisible no more: a scoping review of the health care aide workforce literature. *BMC Nursing*, 14:38

Himmelstein, D.U., Jones, A.A. & Woolhandler, S. (1983) Hypernatremic dehydration in care home patients: An indicator of neglect. *Journal of the American Geriatrics Society,* 31(8), p.466-471.

Hines, P., Holwe, M. & Rich, N. (2004) Learning to evolve - A review of contemporary lean thinking. *International Journal of Operations & Production Management,* 24(9-10), p.994-1011.

Hodak, S.P. & Verbalis, J.G. (2005) Abnormalities of water homeostasis in aging. *Endocrinology and Metabolism Clinics of North America,* 34(4), p.1031-1046.

Hodgkinson, B., Evans, D. & Wood, J. (2001) Maintaining oral hydration in older people: a systematic review. *The JBI Database of Systematic Reviews and Implementation Reports,* 4(1).

Hodgkinson, B., Evans, D. & Wood, J. (2003) Maintaining oral hydration in older adults: A systematic review. *International Journal of Nursing Practice,* 9(3), p.S19-S28.

Holbrook, A., Green, M., Krosnick, J. (2003) Telephone versus Face-to-Face Interviewing of National Probability Samples with Long Questionnaires: Comparisons of Respondent Satisficing and Social Desirability Response Bias. *Public Opinion Quarterly*, 67(1), p.79–125,

Holmgren, J., Emami, A., Eriksson, L.E. & Eriksson, H. (2013) Being perceived as a 'visitor' in the nursing staff's working arena – the involvement of relatives in daily caring activities in care homes in an urban community in Sweden. *Scandinavian Journal of Caring Sciences,* 27(3), p.677-685.

Holzapfel, S.K., Ramirez, R.F., Layton, M.S., Smith, I.W., Sagl-Massey, K. & DuBose, J.Z. (1996) Feeder position and food and fluid consumed by care home residents. *Journal of Gerontological Nursing,* 22(4), p.6-12.

Hong, C.S. (2013) Process mapping: a pathway for efficient service provision. *Nursing & Residential Care,* 15(8), p.558-560.

Hooper, L. (2016) Why, Oh Why, Are So Many Older Adults Not Drinking Enough Fluid? *Journal of the Academy of Nutrition and Dietetics,* 116(5), p.774-778.

Hooper, L., Abdelhamid, A., Attreed, N.J., Campbell, W.W., Channell, A.M., Chassagne, P., Culp, K.R., Fletcher, S.J., Fortes, M.B., Fuller, N., Gaspar, P.M., Gilbert, D.J., Heathcote, A.C., Kafri, M.W., Kajii, F., Lindner, G., Mack, G.W., Mentes, J.C., Merlani, P., Needham, R.A., Olde Rikkert, M.G.M., Perren, A., Powers, J., Ranson, S.C., Ritz, P., Rowat, A.M., Sjöstrand, F., Smith, A.C., Stookey, J.J.D., Stotts, N.A., Thomas, D.R., Vivanti, A., Wakefield, B.J., Waldréus, N., Walsh, N.P., Ward, S., Potter, J.F. & Hunter, P. (2015) Clinical symptoms, signs and tests for identification of impending and current water-loss dehydration in older people. *The Cochrane Database of Systematic Reviews,* 4, p.CD009647.

Hooper, L., Bunn, D., Downing, A., Jimoh, F., Groves, J., Free, C., Cowap, V., Potter, J., Hunter, P. & Shepstone, L. (2016) Which Frail Older People Are Dehydrated? The UK DRIE Study. *Journals of Gerontology Series a-Biological Sciences and Medical Sciences,* 71(10), p.1341-1347.

Howson FFA, Robinson SM, Lin SX, et al. (2018) Can trained volunteers improve the mealtime care of older hospital patients? An implementation study in one English hospital. BMJ Open, 8:e022285

Hu TW, Huang LF, Cartwright WS (1986) Evaluation of the costs of caring for the senile demented elderly: a pilot study. *Gerontologist,* 26(2), p.158-163.

Iacono, J., Brown, A. & Holtham, C. (2009) Research Methods – a Case Example of Participant Observation. *Electronic Journal of Business Research Methods,* 7(1), p.39-46.

Iggulden, H. (1999) Dehydration and electrolyte disturbance. *Nursing Standard,* 13(19), p.48.

Institute for Healthcare Improvement (2012) *Update Antibiotic Stewardship Drivers and Change Package.* Institute for Healthcare Improvement.

Jimoh, F., Bunn, D. & Hooper, L. (2015) Assessment of a self-reported drinks diary for the estimation of drinks intake by care home residents: Fluid intake study in the elderly (FISE). *Journal of Nutrition Health & Aging,* 19(5), p.491-496.

Johnson, J.K., Farnan, J., Barach, P., Hesselink, G., Wollersheim, H.C., Pijnenborg, L., Kalkman, C., Arorah, V., HANDOVER Res Collaborative, HANDOVER Research Collaborative & on behalf of the HANDOVER Research Collaborative (2012) Searching for the missing pieces between the hospital and primary care: mapping the patient process during care transitions. *BMJ Quality and Safety,* 21(Suppl 1), p.i97-i105.

Johnson, R. & Onwuegbuzie, A. (2004) Mixed methods research: A research paradigm whose time has come. *Educational Researcher,* 33(7), p.14-26.

Johnson, R.B., Onwuegbuzie, A.J. & Turner, L.A. (2007) Toward a Definition of Mixed Methods Research. *Journal of Mixed Methods Research,* 1(2), p.112-133.

Kaasalainen, S., Williams, J., Hadjistavropoulos, T., Thorpe, L., Whiting, S., Neville, S. & Tremeer, J. (2010) Creating Bridges Between Researchers and Long-Term Care Homes to Promote Quality of Life for Residents. *Qualitative Health Research,* 20(12), p.1689-1704.

Kaplan, H.C., Provost, L.P., Froehle, C.M. & Margolis, P.A. (2012) The Model for Understanding Success in Quality (MUSIQ): building a theory of context in healthcare quality improvement. *BMJ Quality & Safety,* 21(1), p.13-20.

Karantzoulis, S. & Galvin, J. (2011) Distinguishing Alzheimer's disease from other major forms of dementia. *Expert Review of Neurotherapeutics,* 11(11), p.1579-1591.

Kavouras, S.A. (2002) Assessing hydration status. *Current Opinion in Clinical Nutrition and Metabolic Care,* 5(5), p.519.

Kawulich, B. (2005) Participant Observation as a Data Collection Method. *Forum: Qualitative Social Research,* 6(2).

Kaye, D. (1968) Antibacterial activity of human urine. *Journal of Clinical Investigation,* 47(10), p.2374-2390.

Kayser-Jones, J. (2002) Malnutrition, dehydration, and starvation in the midst of plenty: the political impact of qualitative inquiry. *Qualitative Health Research,* 12(10), p.1391-1405.

Kayser-Jones, J. (2009) Care homes: a health-promoting or dependency-promoting environment? *Family & Community Health,* 32(1 Suppl), p.S66.

Kayser-Jones, J., Schell, E., Lyons, W., Kris, A.E. & al, E. (2003) Factors That Influence End-of-Life Care in Care homes: The Physical Environment, Inadequate Staffing, and Lack of supervision. *The Gerontologist,* 43(Supplement 2), p.76-84.

KayserJones, J., Schell, E., Porter, C., Barbaccia, J. & Shaw, H. (1999) Factors Contributing to Dehydration in Care homes: Inadequate Staffing and Lack of Professional Supervision. *Journal of the American Geriatrics Society,* 47(10), p.1187-1194.

Kayser-Jones, J.S. (1982) Institutional structures: catalysts of or barriers to quality care for the institutionalized aged in Scotland and the U.S. *Social Science & Medicine (1982),* 16(9), p.935.

Kenney, W. & Chiu, P. (2001) Influence of age on thirst and fluid intake. *Medicine and Science in Sports and Exercise,* 33(9), p.1524-1532.

Kerr, M., Bedford, M., Matthews, B. & O'Donoghue, D. (2014) The economic impact of acute kidney injury in England. *Nephrology Dialysis Transplantation,* Ahead of print.

Khorami MH, Hashemi R, Bagherian-Sararoudi R, Sichani MM, Tadayon F, Shahdoost AA & Arezegar SH (2012) The assessment of 24 24-h urine volume by measurement of urine specific gravity with dipstick in adults with nephrolithiasis. *Advanced Biomedical Research,* 1, p.86.

Kilpatrick, K.E., Lohr, K.N., Leatherman, S., Pink, G., Buckel, J.M., Legarde, C. & Whitener, L. (2005) The insufficiency of evidence to establish the business case for quality. *International Journal for Quality in Health Care : Journal of the International Society for Quality in Health Care / ISQua,* 17(4), p.347-355.

Kinoshita, K., Hattori, K., Ota, Y., Kanai, T., Shimizu, M., Kobayashi, H. & Tokuda, Y. (2013) The measurement of axillary moisture for the assessment of dehydration among older patients: A pilot study. *Experimental Gerontology,* 48(2), p.255-258.

Kitson, A., Harvey, G., & McCormack, B. (1998). Enabling the implementation of evidence based practice: a conceptual framework. Quality in Health Care, 7, 149-158

Kitzinger, J. (1995) Qualitative Research: Introducing focus groups. *British Medical Journal,* 311(7000), p.299-302.

Koczwara, B., Stover, A.M., Davies, L., Davis, M.M., Fleisher, L., Ramanadhan, S., Schroeck, F.R., Zullig, L.L., Chambers, D.A., Proctor, E. (2018). Harnessing the synergy between Improvement Science and Implementation Science in caner: a call to action. *Journal of Oncology Practice*, 14(6), p. 335-340

Koester, S. & Hoffer, L. (1994) Indirect Sharing: Additional Risks Associated with Drug Injection. *AIDS and Public Policy,* 9(2), p.100-105.

Kovacs, E.M., Senden, J.M. & Brouns, F. (1999) Urine color, osmolality and specific electrical conductance are not accurate measures of hydration status during postexercise rehydration. *The Journal of Sports Medicine and Physical Fitness,* 39(1), p.47.

Kruger, J. & Dunning, D. (1999) Unskilled and Unaware of It: How Difficulties in Recognizing One's Own Incompetence Lead to Inflated Self-Assessments. *Journal of Personality and Social Psychology,* 77(6), p.1121-1134.

Kruse, R., Mehr, D., Boles, K., Lave, J., Binder, E., Madsen, R. & D'Agostino, R. (2004) Does hospitalization impact survival after lower respiratory infection in care home residents? *Medical Care*, 42(9), p.860-870.

Kuhn, T.S. (2012) *The structure of scientific revolutions.* 4th, 50th anniversary ed. London; Chicago, [Ill.]: University of Chicago Press.

Langley, G. (1996) *The improvement guide: a practical approach to enhancing organizational performance* 1st ed. San Francisco: Jossey-Bass Publishers.

Langley, G., Moen, R., Nolan, K., Nolan, T., Norman, C. & Provost, L. (2009) *The Improvement Guide:a Practical Approach to Enhancing Organisational Performance.* 2nd ed. San Francisco, CA: Jossey Bass.

Laureati, M., Pagliarini, E., Calcinoni, O., Bidoglio, M. (2006). Sensory acceptability of traditional food preparations by elderly people. Food Quality and Preference, 17(1–2), p. 43-52

Lavis, J.N., Robertson, D., Woodside, J.M., McLeod, C.B., Abelson, J., The Knowledge Transfer Study Group, Knowledge Transfer Study Grp & Knowledge Transfer Study Group (2003) How Can Research Organizations More Effectively Transfer Research Knowledge to Decision Makers? *The Milbank Quarterly,* 81(2), p.221-248.

Lecko, C. (2008) Improving hydration: an issue of safety. *Nursing and Residential Care,* 10(3), p.149-150.

Lecko, C. (2013) Hydration - the missing part of nutritional care. *Nursing Times,* 109(26), p.12-14.

Leonard, M. (2004) The human factor: the critical importance of effective teamwork and communication in providing safe care. *Quality and Safety in Health Care,* 13(suppl_1), p.i85-i90.

Lerner, N.B., Resnick, B., Galik, E., Gunther Russ, K. (2010) Advanced Nursing Assistant Education Program. *The Journal of Continuing Education in Nursing,* 41(8), p.356-362

Leung, F. & Savithiri, R. (2009) Spotlight on focus groups. *Canadian Family Physician Médecin De Famille Canadien,* 55(2), p.218.

Liberatore, M. (2013) Six Sigma in healthcare delivery. *International Journal of Health Care Quality Assurance,* 26(7), p.601-626.

Lieberman, H. (2007) Hydration and cognition: A critical review and recommendations for future research. *Journal of the American College of Nutrition,* 26(5), p.555S-561S.

Lilja, M., Bergh, A., Johansson, L. & NygÅrd, L. (2003) Attitudes towards rehabilitation needs and support from assistive technology and the social environment among elderly people with disability. *Occupational Therapy International,* 10(1), p.75-93.

Lin, S. (2013) A Pilot Study: Fluid Intake and Bacteriuria in Care home Residents in Southern Taiwan. *Nursing Research,* 62(1), p.66-72.

Lindeman, R., Romero, L., Liang, H., Baumgartner, R., Koehler, K. & Garry, P. (2000) Do elderly persons need to be encouraged to drink more fluid? *J. Gerontol. Med. Sci,* 55A, p.M361-M365.

Longmore, J.M. (2007) *Oxford handbook of clinical medicine.* Oxford: Oxford University Press.

Lotan, Y., Daudon, M., Bruyère, F., Talaska, G., Strippoli, G., Johnson, R.J. & Tack, I. (2013) Impact of fluid intake in the prevention of urinary system diseases: a brief review. *Current Opinion in Nephrology and Hypertension,* 22 Suppl 1, p.S1.

Luckey, E. & Parsa, J. (2003) Fluid and Electrolytes in the Aged. *Archives of Surgery,* 138(10), p.1055-1060.

Lunn, J. & Foxen, R. (2008) How much water do we really need? *Nutrition Bulletin,* 33(4), p.336-342.

Lynn, J., Nolan, K., Kabcenell, A., Weissman, D., Milne, C., Berwick, D.M., for the End-of-Life Care Consensus Panel & End-of-Life Care Consensus Panel (2002) Reforming Care for Persons Near the End of Life: The Promise of Quality Improvement. *Annals of Internal Medicine,* 137(2), p.117.

Mahowald, J.M. & Himmelstein, D.U. (1981) Hypernatremia in the elderly: Relation to infection and mortality. *Journal of the American Geriatrics Society,* 29(4), p.177-180.

Maitra, K.K. & Junkins, M.D. (2004) Upper extremity movement pattern of a common drinking task in well elderly women: a pilot study. *Occupational Therapy International,* 11(2), p.67-81.

Malone, J.R. (2004) The PARIHS Framework—A Framework for Guiding the Implementation of Evidence-based Practice. *Journal of Nursing Care Quality,* 19(4), p. 297-304.

Mange, K., Matsuura, D., Cizman, B., Soto, H., Ziyadeh, F.N., Goldfarb, S. & Neilson, E.G. (1997) Language guiding therapy: the case of dehydration versus volume depletion. *Annals of Internal Medicine,* 127(9), p.848.

Mansell, I., Bennett, G., Northway, R., Mead, D. & Moseley, L. (2004) The learning curve: the advantages and disadvantages in the use of focus groups as a method of data collection. *Nurse Researcher,* 11(4), p.79.

Manz, F. & Wentz, A. (2003) 24-h hydration status: parameters, epidemiology and recommendations. *European Journal of Clinical Nutrition,* 57(S2), p.S10-S18.

Manz, F. & Wentz, A. (2005) Hydration Status in the United States and Germany. *Nutrition Reviews,* 63(Supplement 1), p.55-62.

Manz, F. (2007) Hydration and disease. *Journal of the American College of Nutrition,* 26(5 Suppl), p.535S-541S.

Marra MV, Simmons SF, Shotwell MS, et al. (2016) Elevated serum osmolality and total water deficit indicate impaired hydration status in residents of long-term care facilities regardless of low or high body mass index. *Journal of the Academy of Nutrition and Dietetics*, 116(5):828-836.

Martini, F. (2004) *Fundamentals of anatomy & physiology.* 6th ed.

Masento, N.A., Golightly, M., Field, D.T., Butler, L.T. & van Reekum, C.M. (2014) Effects of hydration status on cognitive performance and mood. *The British Journal of Nutrition,* 111(10), p.1841.

Mason J. (2002) *Qualitative Researching*. First edition. London: Sage Publications.

Mason, S.E., Nicolay, C.R. & Darzi, A. (2015) *The use of Lean and Six Sigma methodologies in surgery: A systematic review. ScienceDirect* [Online]. Available at: http://www.sciencedirect.com.ezproxy.uwl.ac.uk/science/article/pii/S1479666X14001024.

Mathison, S. (1988) Why Triangulate? *Educational Researcher,* 17(2), p.13-17.

Matthews, S.J. & Lancaster, J.W. (2011) Urinary Tract Infections in the Elderly Population. *The American Journal of Geriatric Pharmacotherapy,* 9(5), p.286-309.

Mays, N. & Pope, C. (1995) Qualitative Research: Rigour and qualitative research. *British Medical Journal,* 311(6997), p.109-112.

Mazza, I. (2012) *Six Sigma management strategy: methods & tools.*

Mazzola, B.L., von Vigier, R.O., Marchand, S., Tonz, M. & Bianchetti, M.G. (2003) Behavioral and functional abnormalities linked with recurrent urinary tract infections in girls. *Journal of Nephrology,* 16(1), p.133-138.

McCurdy, P. & Uldam, J. (2014) Connecting Participant Observation Positions: Toward a Reflexive Framework for Studying Social Movements. *Field Methods,* 26(1), p.40-55.

McGee, S., Abernethy, 3.,W B. & Simel, D.L. (1999) The rational clinical examination. Is this patient hypovolemic? *Jama,* 281(11), p.1022.

McGreevy, J. (2016) Implementing culture change in long-term dementia care settings. *Nursing Standard (Royal College of Nursing (Great Britain) : 1987),* 30(19), p.44.

McIntyre L. (2012) Developing a bundle to improve fluid management. Nursing Times, 108(28), p.18-20.

Mentes, J. (2006a) Oral Hydration in Older Adults: Greater awareness is needed in preventing, recognizing, and treating dehydration. *American Journal of Nursing,* 106(6), p.40-49.

Mentes, J., Culp, K., Maas, M. & Rantz, M. (1999) Acute confusion indicators: risk factors and prevalence using MDS data. *Research in Nursing & Health,* 22(2), p.95-105.

Mentes, J., Wakefield, B. & Culp, K. (2006b) Use of a urine color chart to monitor hydration status in care home residents. *Biological Research for Nursing,* 7(3), p.197-203.

Mentes, J.C. & Culp, K. (2003) Reducing hydration-linked events in care home residents. *Clinical Nursing Research,* 12(3), p.210-225.

Mentes, J.C. & Tripp-Reimer, T. (2002) Barriers and Facilitators in Care home Intervention Research. *Western Journal of Nursing Research,* 24(8), p.918-936.

Mentes, J.C. & Wang, J. (2011) Measuring risk for dehydration in care home residents: evaluation of the dehydration risk appraisal checklist. *Research in Gerontological Nursing,* 4(2), p.148.

Mentes, J.C. (2006b) A typology of oral hydration problems exhibited by frail care home residents. *Journal of Gerontological Nursing,* 32(1), p.13-19.

Mentes, J.C., Chang, B.L., Morris, J. & McCabe, B.W. (2006a) Keeping Care home Residents Hydrated / Commentaries / Response. *Western Journal of Nursing Research,* 28(4), p.392.

Merton, R. & Kendall, P. (1946) The Focused Interview. *American Journal of Sociology,* 51(6), p.541-557.

Michaud, D., Spiegelman, D., Clinton, S., Rimm, E., Curhan, G., Willett, W. & Giovannucci, E. (1999) Fluid intake and the risk of bladder cancer in men. *New England Journal of Medicine,* 340(18), p.1390-1397.

Miescher, E. & Fortney, S.M. (1989) Responses to dehydration and rehydration during heat exposure in young and older men. *American Journal of Physiology - Regulatory Integrative and Comparative Physiology,* 257(5), p.26/5.

Miller, M. (1997) Fluid and electrolyte homeostasis in the elderly: Physiological changes of ageing and clinical consequences. *Baillière's Clinical Endocrinology and Metabolism,* 11(2), p.367-387.

Mohammed, M. & Worthington, P. (2013) Why traditional statistical process control charts for attribute data should be viewed alongside an xmr-chart. *Bmj Quality & Safety,* 22(3), p.263-269.

Morgan, A., Masterson, M., Fahlman, M., Topp, R. & Boardley, D. (2003) Hydration status of community-dwelling seniors. *Aging Clinical and Experimental Research,* 15(4), p.301-304.

Morgan, D.L. (2007) Paradigms Lost and Pragmatism Regained: Methodological Implications of Combining Qualitative and Quantitative Methods. *Journal of Mixed Methods Research,* 1(1), p.48-76.

Moussavi, M., Rodriguez, G., Turkel-Parrella, D., Siddique, U., Carlowicz, C., Botros, D., Ibrahim, M., Gizzi, M. & Kirmani, J. (2012.) The hydration influence on the risk of ischemic stroke outcome (thirst-O) study. *Neurology,* 78 (Meeting Abstracts 1).

Muething, S., Goudie, A., Schoettker, P., Donnelly, L., Goodfriend, M., Bracke, T., Brady, P., Wheeler, D., Anderson, J. & Kotagal, U. (2012) Quality Improvement Initiative to Reduce Serious Safety Events and Improve Patient Safety Culture. *Pediatrics,* 130, p.e423-e431.

Munyisia, E., Yu, P. & Hailey, D. (2011) How nursing staff spend their time on activities in a care home: an observational study. *Journal of Advanced Nursing,* 67(9):1908–1917

Munn, P. & Drever, E. (1990) *Using Questionnaires in Small-Scale Research. A Teachers' Guide.*

Munroe, D., Kaza, P. & Howard, D. (2011) Culture-Change Training: Nursing Facility Staff Perceptions of Culture Change. *Geriatric Nursing,* 32(6), p.400-407.

Needy, K.L., Gokhan, N.M., Bilec, M.M., Ries, R., Horman, M.J., Phelps, A.F. & Enache-Pommer, E. (2008) The Use of Process Mapping to Compare Green Children's Hospital Designs. *IIE Annual Conference.Proceedings,* , p.1220.

Nicolle, L.E., Strausbaugh, L.J. & Garibaldi, R.A. (1996) Infections and antibiotic resistance in care homes. *Clinical Microbiology Reviews,* 9(1), p.1-1.

Niemann, J.T. (2001) The Association Between Orthostatic Hypotension and Recurrent Falls in Care home Residents. *Annals of Emergency Medicine,* 37(3), p.366.

Nightingale, J., Woodward, J.M. & Small Bowel and Nutrition Committee of the British Society of Gastroenterology (2006) Guidelines for management of patients with a short bowel. *Gut,* 55(Suppl 4), p.iv1-iv12.

NIH Technology Assessment Conference Statement (1994) *Bioelectrical Impedance Analysis in Body Composition Measurement.* Bethesda, MD. National Institutes of Health.

Nilsen, P. (2015) Making sense of implementation theories, models and frameworks. *Improvement Science,* 10(1), p.53.

Nolan, M., Davies, S., Brown, J., Wilkinson, A., Warnes, T., McKee, K., Flannery, J. & Stasi, K. (2008) The role of education and training in achieving change in care homes: a literature review. *Journal of Research in Nursing,* 13(5), p.411-433.

Norton, D., McLaren, R. & Exton-Smith, A. (1963) An Investigation Of Geriatric Nursing Problems In Hospital. *Public Health,* 77(5), p.317.

Nose, H., Morimoto, T. & Ogura, K. (1983) Distribution of water losses among fluid compartments of tissues under thermal dehydration in the rat. *The Japanese Journal of Physiology,* 33(6), p.1019-1029.

Nowell, L. (2015) Pragmatism and integrated knowledge translation: exploring the compatabilities and tensions. *Nurs Open,* 2, p.141-148.

O'Brien, C., Young, A.J. & Sawka, M.N. (2002) Bioelectrical impedance to estimate changes in hydration status. *International Journal of Sports Medicine,* 23(5), p.361.

Ogrinc, G., Davies, L., Goodman, D., Batalden, P., Davidoff, F. & Stevens, D. (2015) SQUIRE 2.0 (Standards for QUality Improvement Reporting Excellence): revised publication guidelines from a detailed consensus process. *The Journal of Continuing Education in Nursing,* 46(11), p.501.

Onwuegbuzie, A. J., & Teddlie, C. (2003). A framework for analyzing data in mixed methods research. Handbook of mixed methods in social and behavioral research, 351-383.

Oppliger, R.A. & Bartok, C. (2002) Hydration testing of athletes. *Sports Medicine (Auckland, N.Z.),* 32(15), p.959.

Ormerod, J.K., Elliott, T.A., Scheett, T.P., VanHeest, J.L., Armstrong, L.E. & Maresh, C.M. (2003) Drinking behavior and perception of thirst in untrained women during 6 weeks of heat acclimation and outdoor training. *International Journal of Sport Nutrition and Exercise Metabolism,* 13(1), p.15.

Orvik, A., Larun, L., Berland, A. & Ringsberg, K. (2013) Situational Factors in Focus Group Studies: A Systematic Review. *International Journal of Qualitative Methods,* 12, p.338-358.

Ostaszkiewicz, J., O'Connell, B. & Dunning, T. (2016) ‘We just do the dirty work’: dealing with incontinence, courtesy stigma and the low occupational status of carework in long-term aged care facilities. *Journal of Clinical Nursing,* 25(17-18), p.2528-2541.

Padhy, K.C. (2013) Total Quality Management: An Overview. *Srusti Management Review,* 6(1), p.119.

Parahoo, K. (1993) Questionnaires: use, value and limitations. *Nurse Researcher,* 1(2), p.4-15.

Parke, B. & Hunter, K.F. (2014) The care of older adults in hospital: if it's common sense why isn't it common practice? *Journal of Clinical Nursing,* 23(11-12), p.1573-1582.

Patton, M.Q. (2002) *Qualitative research & evaluation methods.* 3rd ed. Thousand Oaks, Calif; London: Sage.

Pearson, K. (1900). On the criterion that a given system of deviations from the probable in the case of a correlated system of variables is such that it can be reasonably supposed to have arisen from random sampling. Philosophical Magazine, 50(302), p. 157–175

Perla, R.J., Provost, L.P. & Murray, S.K. (2011) The run chart: a simple analytical tool for learning from variation in healthcare processes. *BMJ Quality & Safety,* 20(1), p.46-51.

Perren, A., Markmann, M., Merlani, G., Marone, C. & Merlani, P. (2011) Fluid balance in critically ill patients. Should we really rely on it? *Minerva Anestesiologica,* 77(8), p.802-811.

Phillips, j. & Simmonds, L. (2013) Use of proces mapping in service improvement. *Nursing Times,* 109(17/18), p.24-26.

Phillips, P.A., Bretherton, M., Johnston, C.I. & Gray, L. (1991) Reduced osmotic thirst in healthy elderly men. *The American Journal of Physiology,* 261(1 Pt 2), p.R166-171.

Phillips, P.A., Rolls, B.J., Ledingham, J.G. & Morton, J.J. (1984) Body fluid changes, thirst and drinking in man during free access to water. *Physiology & Behavior,* 33(3), p.357.

Phillips, P.A., Rolls, B.J., Ledingham, J.G.G., Forsling, M.L., Morton, J.J., Crowe, M.J. & Wollner, L. (1984) Reduced Thirst after Water Deprivation in Healthy Elderly Men. *N Engl J Med,* 311(12), p.753-759.

Pialoux, V., Mischler, I., Mounier, R., Gachon, P., Ritz, P., Coudert, J. & Fellmann, N. (2004) Effect of equilibrated hydration changes on total body water estimates by bioelectrical impedance analysis. *British Journal of Nutrition,* 91(1), p.153-159.

Pitet, D. (2001) Improving adherence to hand hygiene practice: a multidisciplinary approach. *Emerging Infectious Disiseas*, 7(2), p.234–240.

Poots, A. & Woodcock, T. (2012) Statistical process control for data without inherent order. *Bmc Medical Informatics and Decision Making,* 12(1), p.86-86.

Popkin, B., D'Anci, K. & Rosenberg, I. (2010) Water, hydration, and health. *Nutrition Reviews,* 68(8), p.439-458.

Popowski, L.A., Oppliger, R.A., Patrick Lambert, G., Johnson, R.F., Kim Johnson, A. & Gisolf, C.V. (2001) Blood and urinary measures of hydration status during progressive acute dehydration. *Medicine and Science in Sports and Exercise,* 33(5), p.747.

Portela MC, Pronovost PJ, Woodcock T, Carter P, Dixon-Woods M. (2015) How to study improvement interventions: a brief overview of possible study types. *BMJ Quality & Safety,* 24(5):325-336.

Pouyet, V., Cuvelier, G., Benattar, L. & Giboreau, A. (2015) Influence of flavour enhancement on food liking and consumption in older adults with poor, moderate or high cognitive status. *Food Quality and Preference* 44:119-129

Powell, R.A. & Single, H.M. (1996) Focus groups. *International Journal for Quality in Health Care : Journal of the International Society for Quality in Health Care / ISQua,* 8(5), p.499.

Quigley, P.A. & White, S.V. (2013) Hospital-Based Fall Program Measurement and Improvement in High Reliability Organizations. *Online Journal of Issues in Nursing,* 18(2), p.19.

Rabøl, L.I., McPhail, M.A., Østergaard, D. et al. (2012) Promoters and barriers in hospital team communication: a focus group study. Journal of Communication in Healthcare, 5, p. 129-139

Raman, A., Newman, A., Tylavsky, F., Schoeller, D., Subar, A., Troiano, R., Schatzkin, A., Harris, T., Bauer, D., Bingham, S. & Everhart, J. (2004) Water turnover in 458 American adults 40-79 yr of age. *American Journal of Physiology - Renal Physiology,* 286(2), p.394-401.

Reed J., Cook G. & Cook M. (2004) Research governance issues in the care home sector. NT Research 9(6), 430–439.

Reed, J. & Card, A. (2015) The problem with Plan-Do-Study-Act cycles. *BMJ Qual Saf,* 0, p.1-6.

Reed, J. & Payton, V.R. (1997) Focus groups: issues of analysis and interpretation. *Journal of Advanced Nursing,* 26(4), p.765-771.

Reed, J.E., McNicholas, C., Woodcock, T., Issen, L. & Bell, D. (2014) Designing quality improvement initiatives: the action effect method, a structured approach to identifying and articulating programme theory. *BMJ Quality & Safety,* 23(12), p.1040-1048.

Rehkamp, N., Davila, H., Abrahamson, K. & Arling, G. (2016) Is there a business case for care home quality improvement? *Nursing Economics,* 34(5), p.224.

Reid, J., Robb, E., Stone, D., Bowen, P., Baker, R., Irving, A.S. & Waller, M. (2004) Improving the monitoring and assessment of fluid balance. *Nursing Times,* 100(20), p.36.

Reimer, H. & Keller, H. (2009) Mealtimes in care homes: striving for person-centered care. *J Nutr Elder,* 28(4), p.327-347.

Rikkert, M.G., Melis, R.J. & Claassen, J.A. (2009) Heat waves and dehydration in the elderly. *British Medical Journal,* 339, p.b2663.

Rittig, S., Knudsen, U., Norgaard, J., Pedersen, E. & Djurhuus, J. (1989) Abnormal diurnal rhythm of plasma vasopressin and urinary output in patients woth enuresis. *American Journal of Physiology,* 256(4), p.F664-F671.

Ritz, P., Source Study & for the Source Study (2001) Bioelectrical impedance analysis estimation of water compartments in elderly diseased patients: the source study. *The Journals of Gerontology.Series A, Biological Sciences and Medical Sciences,* 56(6), p.M344-M348.

Roberts, H.C., De Wet, S., Porter, K. et al. (2014) The feasibility and acceptability of training volunteer mealtime assistants to help older acute hospital inpatients: the Southampton Mealtime Assistance Study. Journal of Clinical Nursing, 23(21-22)

Robinson, S.B. & Rosher, R.B. (2002) Can a beverage cart help improve hydration? *Geriatric Nursing,* 23(4), p.208-211.

Robson, K., Kiely, D. & Lembo, T. (2000) Development of constipation in care home residents. *Diseases of the Colon & Rectum,* 43(7), p.940-943. Rodriguez, G.J., Cordina, S.M., Vazquez, G., Suri, M.F., Kirmani, J.F., Ezzeddine, M.A. & Qureshi, A.I. (2009) The hydration influence on the risk of stroke (THIRST) study. *Neurocritical Care,* 10(2), p.187-194.

Rogers, B. (1987) Ethical considerations in research. *AAOHN Journal : Official Journal of the American Association of Occupational Health Nurses,* 35(10), p.456.

Rolls, B.J., Phillips, P.A. & Phil, D. (1990) Aging and disturbances of thirst and fluid balance. *Nutrition Reviews,* 48(3), p.137-144.

Rosemond, C., Hanson, L., Ennett, S., Schenck, A. & Weiner, B. (2012) Implementing person-centered care in care homes. *Health Care Management Review,* 37(3), p.257-266.

Rosner, B., Glynn, R., Lee, M. (2005) The Wilcoxon Signed Rank Test for Paired Comparisons of Clustered Data. *Biometrics,* 62(1), p.185-192.

Rowat, A., Smith, L., Graham, C., Lyle, D., Horsburgh, D. & Dennis, M. (2011) A pilot study to assess if urine specific gravity and urine colour charts are useful indicators of dehydration in acute stroke patients. *Journal of Advanced Nursing,* 67(9), p.1976-1983.

Royal College of Nursing & National Patient Safety Agency (2007) *Water for Health* [Online]. Available at: http://www.rcn.org.uk/__data/assets/pdf_file/0003/70374/Hydration_Toolkit_-_Entire_and_In_Order.pdf [Accessed: 20 September, 2013].

Rudaitis, S., Pundziene, B., Jievaltas, M., Uktveris, R. & Kevelaitis, E. (2009) Recurrent urinary tract infection in girls: do urodynamic, behavioral and functional abnormalities play a role? *Journal of Nephrology,* 22(6), p.766-773.

Savage, J. (2000) Participative observation: standing in the shoes of others? *Qualitative Health Research,* 10(3), p.324-339.

Scales, K. & Pilsworth, J. (2008) The importance of fluid balance in clinical practice. *Nursing Standard,* 22(47), p.50.

Schlager, T.A., Lohr, J.A. & Hendley, J.O. (1993) Antibacterial activity of the bladder mucosa. *Urological Research,* 21(5), p.313-317.

Schlegel, J.U., Cuellar, J. & O'dell, R.M. (1961) Bactericidal effect of urea. *The Journal of Urology,* 86, p.819-822.

Schols, J.M., De Groot, C.P., van der Cammen, T.J. & Olde Rikkert, M.G. (2009) Preventing and treating dehydration in the elderly during periods of illness and warm weather. *Journal of Nutrition, Health & Aging,* 13(2), p.150-157.

Scotland, J. (2012) Exploring the Philosophical Underpinnings of Research: Relating Ontology and Epistemology to the Methodology and Methods of the Scientific, Interpretive, and Critical Research Paradigms. *English Language Teaching* 5(9), p.9-16

Shanholtzer, B. & Patterson, S. (2003) Use of bioelectrical impedance in hydration status assessment: reliability of a new tool in psychophysiology research. *International Journal of Psychophysiology,* 49(3), p.217-226.

Sheard, D. (2014) Achieving culture change: a whole organisation approach. *Nursing and Residential Care,* 16(6), p.329-332.

Sheehy, C.M., Perry, P.A. & Cromwell, S.L. (1999) Dehydration: Biological Considerations, Age-Related Changes, and Risk Factors in Older Adults. *Biological Research for Nursing,* 1(1), p.30-37.

Sheehy, C.M., Perry, P.A. & Cromwell, S.L. (1999) Dehydration: Biological Considerations, Age-Related Changes, and Risk Factors in Older Adults. *Biological Research for Nursing,* 1(1), p.30-37.

Shepherd, A. (2011) Measuring and managing fluid balance. *Nursing Times,* 107(28), p.12-16.

Shirey, M. (2012) Stakeholder Analysis and Mapping as Targeted Communication Strategy. *Journal of Nursing Administration,* 42(9), p.399-403.

Shirreffs, S.M. & Maughan, R.J. (1998) Urine osmolality and conductivity as indices of hydration status in athletes in the heat. *Medicine and Science in Sports and Exercise,* 30(11), p.1598.

Shirreffs, S.M. (2003) Markers of hydration status. *European Journal of Clinical Nutrition,* 57(S2), p.S6-S9.

Sidenvall, B., Fjellström, C. & Ek, A. (1996) *Cultural perspectives of meals expressed by patients in geriatric care.*

Simmons, S. & Schnelle, J. (2003) Implementation of Nutritional Interventions in Long-Term Care. *Alzheimer's Care Quarterly,* 4(4), p.286-296.

Simmons, S., Lam, H., Rao, G. & Schnelle, J. (2003) Family Members' Preferences for Nutrition Interventions to Improve Care home Residents' Oral Food and Fluid Intake. *Journal of the American Geriatrics Society,* 51(1), p.69-74.

Simmons, S.F., Alessi, C. & Schnelle, J.F. (2001) An intervention to increase fluid intake in care home residents: prompting and preference compliance. *Journal of the American Geriatrics Society,* 49(7), p.926-933.

Smith, S. (2007) Clinical signs of dehydration in children. *Emergency Medicine Journal,* 24(8), p.605-605.

Smith, S.H. (1975) Nil by mouth; a descriptive study of nursing care in relation to pre-operative fasting. *Zeitschrift Fur Krankenpflege.Revue Suisse Des Infirmieres,* 68(8-9), p.246-248.

Snyder, N.A., Feigal, D.W. & Arieff, A.I. (1987) Hypernatremia in elderly patients. A heterogeneous, morbid, and iatrogenic entity. *Annals of Internal Medicine,* 107(3), p.309.

Solberg, L.I., Mosser, G. & McDonald, S. (1997) *The Three Faces of Performance Measurement: Improvement, Accountability, and Research.*

Sollanek, K.J., Kenefick, R.W., Cheuvront, S.N. & Axtell, R.S. (2011) Potential impact of a 500-mL water bolus and body mass on plasma osmolality dilution. *European Journal of Applied Physiology,* 111(9), p.1999.

Spangler, P.F., Risley, T.R. & Bilyew, D.D. (1984) The management of dehydration and incontinence in nonambulatory geriatric patients. *Journal of Applied Behavior Analysis,* 17(3), p.397-401.

Spearman C (1904). "The proof and measurement of association between two things". American Journal of Psychology. 15 (1): 72–101

Speroff, T. & O'Connor, G. (2004) Study designs for PDSA quality improvement research. *Qual Manag Health Care,* 13(1), p.17-32.

Speroff, T. & O'Connor, G.T. (2004) Study designs for PDSA quality improvement research. *Quality Management in Health Care,* 13(1), p.17.

Spigt, M.G., Kuijper, E.C., Schayck, C.P., Troost, J., Knipschild, P.G., Linssen, V.M. & Knottnerus, J.A. (2005) Increasing the daily water intake for the prophylactic treatment of headache: a pilot trial. *European Journal of Neurology,* 12(9), p.715-718.

Spilsbury, K., Hanratty, B. & McCaughan, D. (2015) *Supporting nursing in care homes* [Online]. Available at: http://www.rcnfoundation.org.uk/?a=620718&now=1429088648.

Stauffer, C., van der WEG, B., Donadini, R., Ramelli, G., Marchand, S. & Bianchetti, M. (2004) Family history and behavioral abnormalities in girls with recurrent urinary tract infections: a controlled study. *Journal of Urology,* 171(4), p.1663-1665.

Stevenson, K., Moore, J., Colwell, H. & Sleeper, B. (2005) Standardized infection surveillance in long-term care: Interfacility comparisons from a regional cohort of facilities. *Infection Control and Hospital Epidemiology,* 26(3), p.231-238.

Stewart, J. (2009) *Adding insult to injury: a review of the care of patients who died in hospital with a primary diagnosis of acute kidney injury (acute renal failure).* London: NCEPOD.

St-Onge, M.-. & Gallagher, D. (2010) Body composition changes with aging: The cause or the result of alterations in metabolic rate and macronutrient oxidation? *Nutrition,* 26(2), p.152-155.

Stotts, N.A., Hopf, H.W., Kayser-Jones, J., Chertow, G.M., Cooper, B.A., Wu, H.S. (2009) Increased fluid intake does not augment capacity to lay down new collagen in care home residents at risk for pressure ulcers: a randomized, controlled clinical trial. Wound Repair Regen, 17, p. 780–788

Stratton Johnson, L. (2005) From knowledge transfer to knowledge translation: Applying research to practice. *Occupation Therapy Now*.

Strippoli, G., Craig, J., Rochtchina, E., Flood, V., Wang, J. & Mitchell, P. (2011) Fluid and nutrient intake and risk of chronic kidney disease. *Nephrology,* 16(3), p.326-334.

Su, S., Wang, J., Lu, C. & Guo, H. (2006) Reducing urinary tract infections among female clean room workers. *Journal of Women's Health,* 15(7), p.870-876.

Sudsawad, P. (2007) *Knowledge translation: Introduction to models, strategies, and measures.* Austin, TX: Southwest Educational Development Laboratory National Center for the Dissemination of Disability Research.

Sussman, S., Valente, T.W., Rohrbach, L.A., Skara, S. & Ann Pentz, M. (2006) Translation in the Health Professions: Converting Science into Action. *Evaluation & the Health Professions,* 29(1), p.7-32.

Sussman, S., Valente, T.W., Rohrbach, L.A., Skara, S. & Ann Pentz, M. (2006) Translation in the Health Professions: Converting Science into Action. *Evaluation & the Health Professions,* 29(1), p.7-32.

Sutton, D. (2013) Does hands-free drinking improve patient hydration? *Nursing Times,* 109(29), p.14-16.

Svoronos, T. & Mate, K. (2011) Evaluating large-scale health programmes at a district level in resource-limited countries. *Bulletin of World Health Organisation,* 89, p.831-837.

Szafara, K.L., Kruse, R.L., Mehr, D.R., Ribbe, M.W. & van der Steen, J.T. (2012) Mortality following care home-acquired lower respiratory infection: LRI severity, antibiotic treatment, and water intake. *Journal of the American Medical Directors Association,* 13(4), p.376-383.

Szczepura, A. (2008) *Improving care in residential care homes: a literature review.* York :Joseph Rowntree Foundation.

Tanco, M., Jaca, C., Viles, E., Mateo, R. & Santos, J. (2011) Healthcare teamwork best practices: lessons for industry. *The TQM Journal,* 23(6), p.598-610.

Tanuseputro, P., Chalifoux, M., Bennett, C., Gruneir, A., Bronskill, S.E., Walker, P. & Manuel, D. (2015) Hospitalization and Mortality Rates in Long-Term Care Facilities: Does For-Profit Status Matter? *Journal of the American Medical Directors Association,* 16(10), p.874.

Taplin, D. & Clark, H. (2012) *Theory of Change Basics. A primer on Theory of Change.* New York, NY: ActKnowledge.

Taylor, A.J. & Randall, C. (2007) Process mapping: enhancing the implementation of the Liverpool Care Pathway. *International Journal of Palliative Nursing,* 13(4), p.163-167.

Taylor, H.M. & Sprunt, D.H. (1943) Increased resistance to viral infection as a result of increased fluid in tissues. *The Journal of Experimental Medicine,* 78(2), p.91-97.

Taylor, M.J., McNicholas, C., Nicolay, C., Darzi, A., Bell, D. & Reed, J.E. (2014) Systematic review of the application of the plan-do-study-act method to improve quality in healthcare. *BMJ Quality & Safety,* 23(4), p.290-298.

Taylor, R. (2014) *The essentials of nursing and healthcare research.* Los Angeles: SAGE.

Tellis-Nayak, V. (2007) Cherished myths vs. stubborn facts. *Care homes,* 56(1), p.22.

The Health Foundation (2011). Evidence scan: Improvement Science. Available at: https://www.health.org.uk/sites/default/files/ImprovementScience.pdf. Last accessed September 2019

Thomas, D., Tariq, S., Makhdomm, S., Haddad, R. & Moinuddin, A. (2003) Physician Misdiagnosis of Dehydration in Older Adults. *Journal of the American Medical Directors Association,* 4(5), p.251-254.

Thomas, D.R., Cote, T.R., Lawhorne, L., Levenson, S.A., Rubenstein, L.Z., Smith, D.A., Stefanacci, R.G., Tangalos, E.G., Morley, J.E. & Dehydration, C. (2008) Understanding clinical dehydration and its treatment. *Journal of the American Medical Directors Association,* 9(5), p.292-301.

Thomas, J. & Harden, A. (2008) Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology,* 8(1), p.45-45.

Torres, V. (2009) Vasopressin in chronic kidney disease: an elephant in the room? *Kidney International,* 76(9), p.925-928.

Trebble, T.M., Hansi, N., Hydes, T., Smith, M.A. & Baker, M. (2010) Process mapping the patient journey: an introduction. *BMJ (Clinical Research Ed.),* 341(aug13 1), p.c4078-c4078.

Tyagi, S., Cai, X., Yang, K. & Chambers, T. (2015) Lean tools and methods to support efficient knowledge creation. *International Journal of Information Management,* 35(2), p.204-214.

Van Loan, M.D. & Mayclin, P.L. (1992) Use of multi-frequency bioelectrical impedance analysis for the estimation of extracellular fluid. *European Journal of Clinical Nutrition,* 46(2), p.117.

Visser, M., Deurenberg, P. & van Staveren, W. (1995) Multifrequency bioelectrical impedance for assessing total body water and extracellular water in elderly subjects. *Eur J Clin Nutr.,* 49, p.256-266.

Vivanti, A., Harvey, K. & Ash, S. (2010) Developing a quick and practical screen to improve the identification of poor hydration in geriatric and rehabilitative care. *Archives of Gerontology and Geriatrics,* 50(2), p.156-164.

Vivanti, A., Harvey, K., Ash, S. & Battistutta, D. (2008) Clinical assessment of dehydration in older people admitted to hospital: what are the strongest indicators? *Archives of Gerontology and Geriatrics,* 47(3), p.340.

Voyer, P., McCusker, J., Cole, M., St-Jacques, S. & Khomenko, L. (2007) Factors associated with delirium severity among older patients. *Journal of Clinical Nursing,* 16(5), p.819-831.

Voyer, P., Richard, S., Doucet, L. & Carmichael, P. (2009) Predisposing Factors Associated With Delirium Among Demented Long-Term Care Residents. *Clinical Nursing Research,* 18(2), p.153-171.

Voyer, P., Richard, S., Doucet, L., Cyr, N. & Carmichael, P.H. (2010) Examination of the multifactorial model of delirium among demented long-term care residents: P2104. *Geriatric Nursing,* 31(2), p.105-114.

Wakefield, B.J., Mentes, J., Holman, J.E. & Culp, K. (2009) Postadmission dehydration: risk factors, indicators, and outcomes. *Rehabilitation Nursing : The Official Journal of the Association of Rehabilitation Nurses,* 34(5), p.209.

Wakley, G. (2005) Questionnaires paradigms and pitfalls. *Journal of Family Planning and Reproductive Health Care,* 31(3), p.222-224.

Wallace, J. & Schwartz, R. (1997) Involuntary weight loss in elderly outpatients - Recognition, etiologies, and treatment. *Clinics in Geriatric Medicine,* 13(4), p.717-717.

Walshe, K. (2007) Understanding what works—and why—in quality improvement: the need for theory-driven evaluation. *International Journal for Quality in Health Care,* 19(2), p.57-59.

Walter-Kroker, A., Kroker, A., Mattiucci-Guehlke, M. & Glaab, T. (2011) A practical guide to bioelectrical impedance analysis using the example of chronic obstructive pulmonary disease. *Nutrition Journal,* 10(1), p.35-35.

Wang, J., Su, S. & Guo, H. (2002) Urinary Tract Infection among Clean-Room Workers. *Journal of Occupational Health,* 44(5), p.329-333.

Warren, J.L., Bacon, W.E., Harris, T., McBean, A.M., Foley, D.J. & Phillips, C. (1994) The burden and outcomes associated with dehydration among US elderly, 1991. *American Journal of Public Health,* 84(8), p.1265-1269.

Water UK (2005) *Water for healthy ageing. Hydration Best Practice Toolkit for Care Homes.* [Online]. Available at: http://www.elderabuse.org.uk/Documents/Other%20Orgs/Water%20UK%20-%20Hydration%20kit%20for%20Care%20Homes.pdf [Accessed: 12/12/2013].

Watkins, C., Lightbody, E., Theofanidis, D. & Sharma, A.K. (1997) Hydration in acute stroke: Where do we go from here? *Clinical Effectiveness in Nursing,* 1(2), p.76-83.

Weinberg, A., Minaker, K. & and the Council on Scientific Affairs, American Medical Association (1995) Dehydration: Evaluation and Management in Older Adults. *Journal of American Medical Association,* 274(19), p.1552-1556.

Werner, R.M., Konetzka, R.T. (2010) Advancing Care home Quality Through Quality Improvement Itself. *Health Affairs,* 29(1), Advancing Long-Term Services & Supports

Whitney, E.N. & Rolfes, S.R. (2002) *Understanding Nutrition.* 9th ed. Belmont, CA: Wadsworth/Thomas Learning.

Whyte, D. (2014) Using oral mucosa to assess for dehydration. *Nursing Times,* 110.

Wild, D. & Kydd, A. (2016) Culture change in care homes: a literature review. *Nursing Older People,* 28(7), p.35-39.

Willgerodt, M.A. (2003) Using Focus Groups to Develop Culturally Relevant Instruments. *Western Journal of Nursing Research,* 25(7), p.798-814.

Wolff, A., Stuckler, D. & McKee, M. (2015) Are patients admitted to hospitals from care homes dehydrated? A retrospective analysis of hypernatraemia and in-hospital mortality. *Journal of the Royal Society of Medicine,* 108(7):259-65.

Woodward, M. (2007) *Guidelines to effective hydration in aged care facilities.*

World Cancer Research Fund and American Institute for Cancer Research. (2007) *Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective.* Washington DC :AICR.

Yasumura, S., Cohn, S.H. & Ellis, K.J. (1983) Measurement of extracellular space by total body neutron activation. *American Journal of Physiology - Regulatory Integrative and Comparative Physiology,* 13(1), p.R36-R40.

Young, J. & Inouye, S.K. (2007) Delirium in older people. *Bmj,* 334(7598), p.842-846.

Zeegers, M., Kellen, E., Buntinx, F. & van den Brandt, P. (2004) The association between smoking, beverage consumption, diet and bladder cancer: a systematic literature review. *World Journal of Urology,* 21(6), p.392-401.

Zeman, F. (1991) *Clinical nutrition and dietetics.* 2nd ed. New York: Macmillan Publishing Company.

Zembrzuski, C.D. (1997) A three-dimensional approach to hydration of elders: administration, clinical staff, and in-service education. *Geriatric Nursing,* 18(1), p.20-26.

List of appendices

Appendix 1: Search strategies

Search for hydration and disease

1. Geriatric
2. Aged
3. Old
4. Aging
5. Older adult
6. Senior
7. **1 or 2 or 3 or 4 or 5 or 6**
8. Water
9. Fluid
10. Beverage
11. Drink$
12. $hydration
13. Electrolyte
14. 8 or 9 or 10 or 11 or 12 or 13
15. Loss
16. Intake
17. Consumption
18. Balance
19. Management
20. Maintenance
21. Provision
22. Care
23. Status
24. 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23
25. 14 and 24
26. Thirst
27. Osmolar$
28. Hypernatr$
29. Sodium
30. **25 or 26 or 27 or 28 or 29**
31. Hospital
32. Acute
33. Resident$
34. Nursing
35. Long-term
36. Community
37. 31 or 32 or 33 or 34 or 35 or 36
38. Care
39. Home
40. Facilit$
41. Establishment
42. 38 or 39 or 40 or 41

43. 37 and 42
44. Resident
45. Patient
46. Community dwelling
47. **43 or 44 or 45 or 46**
48. Complications
49. Consequences
50. Outcomes
51. Condition
52. Problems
53. Morbidity
54. Illness
55. Disease
56. Disorder
57. Infection
58. Failure
59. Weakness
60. Impairment
61. Performance
62. $function
63. 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62
64. Cancer
65. Bowel
66. Heart
67. Cardiac
68. Circulatory
69. Lung
70. Pulmonary
71. Respiratory
72. Brain
73. Cerebral
74. Cerebrovascular
75. Urinary
76. Kidney
77. Renal
78. Bladder
79. Oral
80. Muscle
81. Cognitive
82. 64 or 65 or 66 or 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74 or 75 or 76 or 77 or 78 or 79 or 80 or 81
83. 63 and 82
84. Incontinence
85. UTI
86. Blood pressure

87. $tension
88. Stones
89. $ lithiasis
90. Mortality
91. Diabetes
92. Appetite
93. Exhaustion
94. Frailty
95. Constipation
96. Death
97. Seizures
98. Weight loss
99. Myocardial infarction
100. $thermia
101. Quality of life
102. Hypovolemic shock
103. Pressure ulcers
104. Memory
105. Delirium
106. Dementia
107. Confusion
108. Unconsciousness
109. **83 or 84 or 85 or 86 or 87 or 88 or 89 or 90 or 91 or 92 or 93 or 94 or 95 or 96 or 97 or 98 or 99 or 100 or 101 or 102 or 103 or 104 or 105 or 106 or 107 or 108**
110. 7 and 30 and 47 and 109

Search for hydration and aging

1. Fluid
2. $hydration
3. Water
4. Beverage
5. Drink$
6. Electrolyte
7. 1 or 2 or 3 or 4 or 5 or 6
8. $natremia
9. $natraemia
10. Sodium
11. Osmolal$
12. Osmolar$
13. Balance
14. Overload
15. Therapy
16. Hygiene
17. Intake

18. Regulation
19. Status
20. Homeostasis
21. Deficit
22. Optimal
23. Concentration
24. Consumption
25. Loss
26. Behavio$
27. Thirst
28. 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27
29. **7 and 28**
30. Aging
31. Ageing
32. Age$
33. Old$
34. Elderly
35. Geriatric
36. Frail$
37. Senior
38. **30 or 31 or 32 or 33 or 34 or 35 or 36 or 37**
39. $physiology
40. Physiolog$
41. Chang$
42. Morbidity
43. Metabolism
44. Risk factor$
45. Senescence
46. Process
47. Thirst
48. Impact
49. **39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48**
50. 29 and 38 and 49

Search for hydration and interventions

1. Fluid
2. $hydration
3. Water
4. Beverage
5. Drink$
6. Electrolyte
7. 1 or 2 or 3 or 4 or 5 or 6
8. $natremia
9. $natraemia
10. Sodium

11. Osmolal$
12. Osmolar$
13. Balance
14. Overload
15. Therapy
16. Hygiene
17. Intake
18. Regulation
19. Status
20. Homeostasis
21. Deficit
22. Optimal
23. Concentration
24. Consumption
25. Loss
26. Behavio$
27. Thirst
28. 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27
29. **7 and 28**
30. assessment.mp
31. intake
32. support.mp
33. intervention
34. supplementation
35. **30 or 31 or 32 or 33 or 34**
36. **29 and 35**

Appendix 2: Physiology of water homeostasis

The attached article entitled “Review on mechanisms, importance of homeostasis and fluid balances in the elderly” has been published in *Current Research in Nutrition and Food Science* (2016):

Review-on-mechani
sms-importance-of-l

Appendix 3: Methods for assessing hydration status

The attached article entitled "Methods of assessment of hydration status and their usefulness in detecting in the elderly" has been published in *Current Research in Nutrition and Food Science* (2017):

Methods-of-assess
ment-of-hydration-s

Appendix 4: Ethics decision

UNIVERSITY OF
WEST LONDON

College of Nursing, Midwifery and Healthcare
Research Scrutiny & Ethics Sub-committee
Paragon House
Boston Manor Road
Brentford TW8 9GA
Tel: +44 (0)20 8209 4110/4145
email: fhhs.ethics@uwl.ac.uk

Ms Agnieszka Bak
c/o Richard Wells Research Centre
College of Nursing Midwifery and Healthcare
University of West London

12 June 2013

Dear Agnieszka

Re: Application for Ethical Approval No. CRSESC15

Thank you for sending in your application for approval. The Committee has considered this and approved the research without major amendment.

If the research does not progress, or if you make any changes to your research proposal or methodology can you please inform the Committee in writing as this may entail the need for additional review. It is your responsibility, as the principal investigator, to submit a report on the progress/completion of the research twelve months from the date of this letter, or on completion of the research, whichever is the sooner. Please find attached a blank report form to be completed by June 2014.

The Committee wish you well with the research and look forward to your report.

Yours sincerely

Sharon Elliott
On behalf of the College Research Scrutiny & Ethics Sub-committee

Appendix 5: Data collection tools used in exploratory phase

Dehydration Research: Focus Group Topic Guide

Introduction

Who we are + CLAHRC

- About myself
- About CLAHRC
- Service improvement in Bluebell as part of the fellowship
- Service improvement on another unit as part of the bigger project

Purpose of meeting today

- To understand how hydration is managed for residents here.
- To hear your views and learn/understand from you:
  - strategies you use to meet hydration needs
  - what you think makes these successful
  - what do you see as the challenges/barriers

I welcome your views

Will record if OK with you so we can keep a good record of what we discussed

Details will be anonymised and you will see what we write

Confidential – I want you to discuss honestly what does and does not happen so I can understand the problems and look at how to solve them

Any questions?

1. **Can you tell me about your daily routine?**
   - What do you do every day? (seek responses from different staff groups)
   - How (and if) you contribute to fluid provision? (seek responses from different staff groups)
   - What happens to different groups of residents (e.g. those staying in their rooms for a whole day or refusing to participate in activities)?
   - What happens in unusual circumstances (e.g. resident going for hospital appointment)?

2. **How important do you think hydration is?**
   - How important is it comparing to other tasks?
   - How do you know if residents drink sufficient amounts (not too little, not too much)?

- Do you think it is a problem in the elderly?
    - Why do you think this is?
    - How prevalent is this problem?
- Do you think you are confident enough to recognise people at risk factors or signs and symptoms of dehydration?
- Are you aware of consequences of dehydration?
    - Discuss UTI if mentioned

3. How would you know if anybody has any special requirements related to their conditions?

- Are you aware of any specific requirements of your residents?
- Do you feel that people making decisions about special requirements communicate this information with you effectively?
- How are they communicated within the care home/team?

4. How do you think different tasks are prioritised by different people?

- E.g. managers, head office, residents, families, doctors, others?
- Where does hydration fit compared to other tasks (e.g. less/more important)?
- Are there any people that are particularly focused on hydration?
- Do you think you get enough support from your employers/healthcare professionals to provide adequate hydration help?

5. What are the strategies in the home to ensure appropriate hydration?

- Assessment and monitoring
- Particular interventions
- Different types of fluids/equipment

6. Can you identify any barriers/challenges to optimal fluid provision?

- For the members of staff
- For the residents themselves

7. After describing routines, strategies and barriers; what do you think works?

- What doesn't work and why?
- What would you do differently?
- Involvement of other people (families, residents, other staff members)

8. Is there anything you would like to add?

Information sheet and consent form:

I am a PhD student based in the University of West London. My focus of research is optimising hydration in the elderly.

This is a very important issue as it has been recognised that due to physiological and environmental factors, the elderly are very vulnerable to developing dehydration. Links have been made between dehydration and a wide range of health-related problems such as confusion, falls, constipation, urinary tract infections, increased hospital admissions as well as increased risk of death.

The aim of my current research is to determine how hydration is managed in the care homes and what the difficulties are. The exercise will help identify both the barriers to provision of adequate fluids, as well as successful strategies to optimise the fluid intake. This work will inform a design of subsequent studies to implement effective actions to support hydration needs of the elderly in the care homes. This will be achieved using a *service improvement* methodology, which means that I will be working closely with staff, residents and their carers to help design and test the methods of improving hydration.

The research will comprise of the following components:

1. Preparation of *process map*, a pictorial model of current routine practices of hydration care for the residents. This will be accomplished by a series of:
    - Observations of daily routines and fluid/food consumption patterns of the residents;
    - Focus groups with staff to talk about how they approach hydration and what the barriers are;
    - Interviews with residents and the families to explore their perceptions to hydration
    - A onehour session with staff/residents/family to prepare the map supported by feedback from all the above
2. Identifying priorities and activities to be undertaken to improve hydration by designing *action-effect diagram*, based on the findings of the process map
3. Testing these activities on a small scale and evaluating them before they are implemented across the home using a service improvement tool known as *Plan-Do-Study-Act cycle*

If you wish to obtain further information about any aspect of this research, you can contact me via e-mail (aggie.bak@uwl.ac.uk).

If you are concerned with how this research is conducted please contact my PhD supervisor: Prof Heather Loveday (heather.loveday@uwl.ac.uk).

Consent Form

Project: Improving hydration in care home residents

Principal investigator: Aggie Bak, University of West London

☐ I confirm that I understand what this focus group/interview is about and I had an opportunity to ask questions

☐ I understand that my response may be recorded

☐ I understand that my details and responses provided will remain confidential

☐ I understand that my participation is voluntary

Participant name ____

Participant signature ___________________________ Date: _____________________

Unit level interview with unit manager and/or staff

Formal drinking opportunities	**What**	**When**	**Where**	**Who**	**How**
Breakfast					
Lunch					
Dinner					
Afternoon tea					
Afternoon in café					
Morning in café					
Evening snacks and drinks					
Drinks with medication					
Other drinking opportunities	**What**	**When**	**Where**	**Who**	**How**
Giving drinks whenever the residents request					
Drinks with activities					
Responsibilities					
What time are the meals served?					
Who is responsible for individual resident's food and drink intakes?					
Who is responsible for documenting food and fluid intakes?					
How are residents allocated to a particular staff member?					
How many residents are assigned to each staff member?					
Are staff members responsible only for formal drinking opportunities of the resident?					
Is there anybody else giving drinks to residents?					
Can residents/family access the fluids at all times?					
What is a method of communication if					

someone else gives a resident a drink?	
How do you decide who needs to be on fluid/food charts?	
What happens to the old nursing notes? Who takes them? Where are they kept?	
Who reviews the food/fluid charts and decides if residents eat/drink enough?	
How do you decide if somebody needs to be referred to a specialist?	
Who is responsible for making the nourishing drinks recommended by dietician?	
What do you do different for people with diabetes?	
What happens if the resident has two or more needs/ preferences?	
Assessment of needs and preferences	
How are needs/preferences established for residents when they first come to the home?	
Where are these needs/ preferences documented for each resident?	
How are these needs/ preferences communicated with the staff members?	
How are these needs/ preferences communicated with kitchen staff?	
What happens if need is identified but the home has no means to support it?	

What happens if the preference is identified but this is not available in a home?	
How are orders for mealtimes taken?	
How do you know who goes where for mealtimes/ activities?	
What happens when a new need/preference is observed by staff or anybody else?	
What happens when the needs/preferences change?	
How do you know when that happens?	
How often do residents get reassessed?	
What happens to documentation after reassessment?	
How are these changes communicated to other staff members in the unit?	
Communication	
How often are the handovers held?	
How long do the handovers last?	
What is discussed at handovers?	
Who participates in handovers?	
Are the handovers written? Are copies stored long-term?	
How are short-term problems communicated?	
Are short-term problems written anywhere?	
Who is responsible for writing this?	
How do you make orders for the	

mealtimes? Who? When?	
Is this done for all three meals?	
How do you know what the residents need?	
New staff members/agency staff	
How are residents' needs/ preferences communicated with new/agency staff?	
Is the information about residents' needs/ preferences easily available for reference?	
Is there a way for new/agency staff members to recognise residents?	
Special circumstances	
What happens if a resident goes out for a day, e.g. doctor's appointment?	
What happens if residents go out for a day as part of the activities?	
What happens if the families take a resident out for a day?	
What happens on special occasions, e.g. birthdays? Who communicates it?	
Anything to add?	
Unit level interview with catering manager	
Fluid types available	
Hot drinks	
Cold drinks	
Fruit, desserts	
Fluids from foods	
Equipment available for special needs	
Special cups	
Special plates	
Special cutlery	
Straws	

Other	
Equipment available for providing drinks	
What are the types of cups/glasses available?	
Jugs, tea kettles etc.	
Blenders	
Measuring jugs	
Accessories to peel/cut fruit	
Other	
Needs and preferences	
How are preferences communicated to the kitchen staff?	
How are the allergies/food intolerances communicated with kitchen staff?	
How do you receive the orders for the mealtimes?	
How do you cater for people with special needs/ preferences?	
What happens if the resident has two or more needs/ preferences?	
How are the meals planned to take the above into consideration?	
What happens if preferred food/drink is not usually available?	
What happens on special occasions, e.g. Christmas or birthdays?	
Who is responsible for communicating special occasions with the kitchen?	
Who is responsible for making the nourishing drinks recommended by dietician?	
Deliveries	
How often are food/fluids ordered?	
What is the wait for food delivery?	

How often is food delivered?	
Who is responsible for food/fluid orders?	
Who is responsible for crockery/cutlery/equipment orders?	
Who makes decisions about ordering these?	
Distribution	
How are drinks distributed throughout the units? Who is responsible?	
How often does this happen?	
How do you decide how much food to send to the units?	
How do you know how much of each drink to send to the units?	
Who is responsible for ensuring meals are taken to the units?	
How are glasses/cups distributed throughout the units?	
Who is responsible for ensuring crockery/cutlery are taken to the units?	
Who is responsible for bringing crockery/cutlery leftovers from mealtimes up?	
What happens if somebody has their own cup, plate etc.?	
Unit level interview with Activity coordinator	
Activities	
Where are activities held?	
When and how often are they held?	
Who participates in activities? How are the residents chosen?	

Examples of activities held	
Do any staff members help with activities?	
Do you provide any activities that are specifically focused on hydration?	
Fluids available	
How do you ensure residents drink during activities?	
What are the drinks available?	
How do you obtain the drinks for activities? Who is responsible for bringing them?	
How do you obtain the crockery and other equipment for drinks?	
Communication	
How do you know what the residents like to drink?	
How do you know who has special needs e.g. thickened fluids, restriction, diabetic?	
How do you document what drinks have been given to particular residents?	
Fluid/food orders	
How are foods/fluids ordered?	
How do you know how much to order?	
Do you order any special drinks/foods normally not available on a menu?	
Help with fluids	
How do you know who needs help with eating/drinking?	
Are activity coordinators trained in feeding?	

Special occasions	
Birthdays: are you responsible for organising anything?	
Days out: how is fluid provided?	
Café	
How is clean crockery delivered to the café?	
How are drinks/supplies delivered to café?	
Own cups?	

Resident fluid preferences

Resident code:

Questions for resident (*or the family/friends if communicating with resident is not possible*)	
What do you usually like to drink?	
Do you like different drinks at different times of the day e.g. with meals or in the evening?	
Do you like different drinks at different times of the year e.g. cold drinks in summer and hot drinks in winter?	
Would you prefer your drinks to be served before, with or after the meal? Different types at different stages?	
Do you like different drinks on special occasion e.g. birthdays or Christmas?	
Do you like having a drink at certain times of the day?	
Is the quality of the drink important to you e.g. temperature, texture, sweetness etc.?	
Are there any types of drinks that you don't enjoy?	
Do you like your drinks in certain type of glass or cup e.g. beaker or your own mug? Do you like other aids such as straws?	
Do you like any foods that are rich in fluid e.g. yoghurt, ice cream, fruit, jelly, custard?	
Have your drinking habits changed since you came to the home e.g. type of the drinks, times, frequency etc.?	
Do you enjoy drinking? Are you worried about drinking too much e.g. not being able to go to toilet on time?	

Between meals observations

Date:	**Unit code:**	**Location:**
Time in:	**Time out:**	**Staff type/no scheduled for the shift:**

1. Activity	
1.1 What are the number/type of staff present?	**1.2 How many residents are present?**
1.3 Are there any other people present (e.g. family)? If so, what are they doing?	**1.4 Are there any structured activities running? If so, what are the activities?**
1.5 What are the residents doing?	**1.6 What are the staff doing?**
1.7 Additional comments	
2. Fluid availability	
2.1 What types of fluid are available? How are they distributed?	**2.2 How are drinks made accessible to residents (e.g. visible, within reach, light cups, lids off etc.)**
2.3 Have any drinks been prepared in advance?	**2.4 What are the supplies available (e.g. thickeners, sugar, sweeteners)?**
2.4 What are the foods rich in fluids available (e.g. jelly, fruit etc.)?	**2.5 What are the drinks/foods given to the residents?**
2.6 How many residents have drinks in front of them?	**2.7 Do residents have any food/fluid items not provided by the care home?**
Additional comments	
3. Equipment availability	
3.1 What are the number/type of glasses and crockery available?	**3.2 What are the number/type of other equipment available (e.g. jugs, plates, bowls and cutlery)?**
3.3 What are the types of special equipment available (e.g. beakers, straws etc.)?	**3.4 What is the type of electrical equipment available (e.g. blenders, kettles, coffee makers, water fountain)?**
3.5 Additional comments	
4. Help with fluids	
4.1 Have the residents been offered any drinks? How are they asked for fluid preferences?	**4.2 How are special requirements and preferences communicated?**
4.3 How are the drinks prepared and served?	**4.4 How are the residents assisted/ prompted with drinking?**
4.5 Have additional drinks been offered? How are they refilled?	**4.6 How are the fluid intakes documented?**

4.7 Additional comments	
5. Other activities	
5.1 Have there been any food/fluid deliveries to the location? What time? Who delivered them? How were they stored/utilised?	**5.2 How are clean cups/glasses obtained? What happens to the dirty cups/glasses etc. When are they removed/washed? Who does it?**
5.3 Additional comments	

Mealtime observations

Date:	**Unit code:**	**Location:**	**Meal:**
Time in:	**Time out:**	**Staff type/no scheduled for the shift:**	

1. Preparation for the meal

1.1 What is the general environment, e.g. music or TV, cleanness of the room, temperature?	**1.2 How are the tables set up (what are the seating arrangement, table clothes etc.)?**
1.3 What time did the residents start to arrive? How many residents arrived before food arrived? Who brought the residents?	**1.4 How were the residents prepared for the meal (e.g. well positioned, toileted, hands washed, bibs etc.)? What is the routine?**
1.5 What were residents doing before the food arrived?	**1.6 What were staff doing before the food arrived?**
1.7 What drinks have been prepared? Where are they kept?	**1.8 What drinks have been given before the meal? How were they distributed?**
1.9 Additional comments	

2. Serving the meal

2.1 What time was food delivered to dining room?	**2.2 Who brought the food to the dining room?**	**2.3 What time was the first meal served?**
2.4 What time was crockery delivered to dining room?	**2.5 Who brought the crockery to the dining room?**	**2.6 What time was the last meal served?**

2.7 What are the number/type of staff present?	**2.8 What are the fluid rich food items on the menu?**
2.9 How are the residents asked for preferences?	**2.10 How are special diets or preferences communicated?**
2.11 How is the food dished up/served?	**2.12 What drinks are served with the meal? How are they delivered? Are there any residents missing drinks?**
2.13 What order is the food distributed to individual residents?	**2.14 What are staff doing if not serving food or feeding?**
2.15 Additional comments	

3. Consumption of the meal

3.1 How are the residents assisted/prompted with eating and drinking?	**3.2 Are residents asked about/given more drinks? How are they distributed?**

3.3 How are drinks made accessible to residents (e.g. visible, within their reach, light cups, lids off etc.)?	**3.4 Are there any family members helping with feeding/drinking? Have they brought any own food/drink?**
3.5 What are staff doing during the meal consumption?	**3.6 What are the foods and fluids given/consumed?**
3.7 How many staff arrived after the meal started or left before the meal finished? What was the reason?	**3.8 How many residents arrived after the meal started? What was the reason?**
3.9 Additional comments	
4. After the meal	
4.1 What time was the last person finished? Were all residents given enough time to finish their meal?	**4.2 How have the hygiene needs met after the meal (e.g. bibs taken off, mouths wiped, clothes changed)?**
4.3 What drinks were offered after the meal? Where? How were they distributed?	**4.4 What are the residents doing after the meal?**
4.5 What are staff doing after the meal?	**4.6 How was food/fluid intake documented?**
4.7 Additional comments	

Individual observations

1. Resident profile

1.1 Care home code:	1.2 Resident code:	1.3 Gender:

1.4 Does the resident appear to have a physical impairment?

☐ No impairment

☐ Mobile with assistance, able to drink independently

☐ Chair/bed bound but able to drink independently

☐ Fully dependent

☐ Not sure

1.5 Does the resident appear to have a mental impairment?

☐ Yes

☐ No

☐ Not sure

1.6 Which category does the resident seem to fit? (resident may fit into more than one category)

☐ No hydration issues

☐ Can drink

☐ Can't Drink

☐ Won't drink

☐ End of life

☐ *Independent*

☐ *Dysphagic*

☐ *Sipper*

☐ *Forgets*

☐ *Physically dependent*

☐ *Fears Incontinence*

2. Fluids offered: breakfast and mid-morning

2.1 Date	2.2 Time in:	2.3 Time out:	2.4 Staff type/no scheduled for the shift:

Time	Was this a meal time?	Type	Staff	Volume offered	Location	Was assistance provided? If yes, describe	Volume consumed	Comments (including reasons for not consuming the whole amount)

2.5 Fluids offered (ml):	2.6 Fluids consumed (ml):	2.7 Fluids recorded (ml):

3. Fluids offered: lunch and mid-afternoon

3.1 Date	3.2 Time in:	3.3 Time out:	3.4 Staff type/no scheduled for the shift:

Time	Was this a meal time?	Type	Staff	Volume offered	Location	Was assistance provided? If yes, describe	Volume consumed	Comments (including reasons for not consuming the whole amount)

3.5 Fluids offered (ml):	3.6 Fluids consumed (ml):	3.7 Fluids recorded (ml):

4. Fluids offered: dinner and early evening

4.1 Date	4.2 Time in:	4.3 Time out:	4.4 Staff type/no scheduled for the shift:

Time	Was this a meal time?	Type	Staff	Volume offered	Location	Was assistance provided? If yes, describe	Volume consumed	Comments (including reasons for not consuming the whole amount)

4.5 Fluids offered (ml):	4.6 Fluids consumed (ml):	4.7 Fluids recorded (ml):

5. Fluids offered: night time

5.1 Date	5.2 Time in:	5.3 Time out:	5.4 Staff type/no scheduled for the shift:

Time	Was this a meal time?	Type	Staff	Volume	Location	Was assistance provided? If yes, describe	Volume consumed	Comments (including reasons for not consuming the whole amount)

				offered				

5.5 Fluids offered (ml):	**5.6 Fluids consumed (ml):**	**5.7 Fluids recorded (ml):**

6. Resident's records

6.1 Fluids recorded recently	**6.2 Continence**	**6.2 Resident's weight and height**
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	☐Continent ☐Incontinent of urine ☐ Always ☐Incontinent of faeces ☐ Sometimes	☐__________ kg ☐__________ cm

6.3 Evidence of requirements and preferences documented in care plans (include assistance required, referrals to specialists and recommendations)
6.4 Evidence of requirements and preferences communicated (include nursing notes and information sheets in own room/kitchenette, kitchen etc):
6.5 Additional comments if observed:
6.6 Recommendations (include target fluid intake and compare to fluids consumed):

I-Hydrate Generic Observation Schedule

Date:	**Unit:**	**Location in unit:**
Start time:	**Stop time:**	**Number and type of Staff scheduled for the shift:**
Period of observation: ☐ Breakfast ☐ Early morning ☐ Lunch ☐ Mid-morning ☐ Dinner ☐ Mid-afternoon ☐ Evening	**Is this a structured activity?** *If yes, provide details:*	**General environment** ▪ Noise, clutter, smell ▪ Tables/equipment ready (e.g. seating; tablecloths; c

1. Fluid provision

What drinks and supplies are available on the tables/in the room/in the kitchenette?	*Are thickeners, sugar, etc. available?*
What drinking aids are available in the room/in the kitchenette?	*Are special cups, beakers, straws etc. available?*
Are any visitors present?	*What are they doing? Are they assisting with food/fluid? Whom do they help?*
How many staff are present?	*What type? What are they doing? Do they stay in the same room all the time?*
Comment on general efficiency and effectiveness of fluid provision observed	*e.g. toileting/washing during mealtimes, residents/staff not ready, how distributed, time ta equipment/supplies missing*

I-Hydrate observation schedule. V10.3 3rd December 2015

2. Residents

Resident	Drink given (pre-observation)	Drinks given			Fluid rich foods given	Asked for preferences	Requirements met	Assistance given	Comments (inclu *missed opportur*
		1st drink	*2nd drink*	*3rd drink*					

Was any fluid intake documented?	*If so how is this done?*

Individual observations

Date:	Unit:	Location in unit:
Start time:	Stop time:	Number and type of staff s

1. Resident profile

Resident code:	Gender:	Weight:	Height:

Does the resident appear to have any impairment?

☐ No impairment ☐ Mobile with assistance, able to drink independently ☐ Chair bed/bound but abl

☐ Fully dependent ☐ Cognitive impairment ☐ Not sure

Evidence of requirements and preferences documented in care plans (include assistance required, referrals to specialists and recommend

Evidence of requirements and preferences communicated (include nursing notes and information sheets in room, kitchen etc.)

Recent fluid chart records

☐ Date________ Total volume________ ☐ Date________ Total volume________ ☐ Date________ Total vol

☐ Date________ Total volume________ ☐ Date________ Total volume________ ☐ Date________ Total vol

2. Fluids offered

Time	Was this a meal time?	Type of fluid	Staff type offering	Volume offered	Volume consumed	Comments (including reasons for not consuming t

3. Fluids recorded (check records at the end of observation as well as next day)

Time/date records inspected	Time recorded	Type recorded	Volume recorded	Additional comments

Appendix 6: An example of the four-week menu available in a care home.

The menu was revised twice a year to allow for seasonal changes

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
BREAKFAST	Full English breakfast	Kippers and full English breakfast	Scrambled eggs full English breakfast	Full English breakfast	Kippers and Full English breakfast	Full English breakfast
MID MORNING	Sponge cake	Profiler roles with chocolate spread	Treacle roly poly slices	Selection of biscuits	Banana cake	Mini croissants
LUNCH	Meat balls in tomato sauce Or Qourn casserole with boiled potato and baby carrots +steam courgette Apple crumble and custard	Fisherman pie Or Veg casserole with creamed potatoes and green beans + butternut squash cheese cake	Rice and peas Or cheese and onion quiche with French fried chicken and braised cabbage +baby corn Rice pudding	Brown stew lamb Or Veg hotpot and green beans + steam beetroot Creamy semolina	Battered cod Or Veg spring roll with French fries and mushy Peas + sweet corn Eves pudding and custard	Beef and onion pie Or Leak and potato with pie Creamed potato, broccoli and cauliflower Tapioca and jam
MID AFTERNOON	Biscuits and cheese	Lemon cake	Milk cookies	Ring doughnuts	Custard tart	Blueberry muffins
SUPPER	Tomato soup Sandwiches Veg lasagne with coleslaw	Mushroom Soup selection of sandwiches jacket potato and beans or choice of filling	Chicken soup Selection of sandwiches Tuna paste bake With Veg spring rolls	Lentil soup Selection of sandwiches Sardines and toast	Veg soup Selection of sandwiches And toast	Oxtail soup Selection of sandwiches Spaghetti Bolognese Mixed beans salad
EVENING	Fruit salad	Trifle	Vanilla ice cream	Tangerine	Chocolate mouse	Strawberry jelly and cream

MENU – WEEK 3

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT
BREAKFAST	Full English breakfast	Full English breakfast	Scrambled eggs full English breakfast	Full English breakfast	Full English breakfast	Fu b
MID MORNING	Sultana scones	Juicy swirl	Blueberry muffin	Milk cookies	Selection of biscuits	Treac
LUNCH	Rice & peas Cheese & onion quinche With fried chicken and green beans & butternut squash apple pie custard	Meat balls Or Veg pie with seasoned wedges and baby carrots & beetroot rice pudding with jam	Sausage in gravy Or Quorn casserole with boiled potato and buttered cauliflower & steam courgette apple crumble and custard	Curried beef Stew Or veg curry with steamed basmati rice and broccoli & dice Swede strawberry cheesecake	Battered fish with lemon Or Veg spring rolls with French fries and garden peas + sweet corn Creamy semolina	Pork (toma Mash and b corn + s Rhuba
MID AFTERNOON	Sponge cake	Biscuits & cheese	Custard tart	Chocolate éclair	Lemon cake	Sweet
SUPPER	Mushroom soup Selection of sandwiches Tuna pasta bake with green salad	Oxtail soup Selection of sandwiches Cauliflower cheese with crispy bacon	Veg soup Selection of sandwiches Spaghetti Bolognese	Lentil soup Selection of sandwiches Corn beef hash with cos lettuce	Minestrone Selection of sandwiches Macaroni cheese with pork pie	Chick Selec sand Cheese pasty a e
EVENING	Cream caramel	Strawberry angel delight	Jelly and cream	Fresh fruit salad	Baked apple and custard	Tanger cre

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT
BREAKFAST	Full English breakfast	Kippers and full English breakfast	Scrambled eggs full English breakfast	Full English breakfast	Kippers and Full English breakfast	F
MID MORNING	Blueberry muffin	Mini ring doughnuts	Custard tart	Treacle roly poly slices	Sweet finger roll	Curr
LUNCH	Chicken korma Or Quorn casserole With Steamed rice and cabbage semolina + baby corn	Stew beef & dumpling Or Veg casserole With Mashed potatoes and Brussels sprout spotty dick with custard + beet root	Sweet & sour pork Or Leak and potato pie With Boiled potato and sliced carrots pineapple upside down cake and custard + steam courgette	Rice & peas Or Veg curry With Bake chicken broccoli + cauliflower creamy tapioca and jam	Battered cod Or Veg sausages With chipped potato mushy peas and grilled tomatoes poached pears and custard	Lamb Or Chees mushr quinch With Mash p green b buttern Strawbe cake
MID AFTERNOON	Fresh fruit cake	Milk cookies	Sultana scones	Biscuits and cheese	Chocolate éclairs	Juicy sw
SUPPER	Lentil soup sandwiches Fish fingers With Baked beans and toast	Veg soup of selection of sandwiches Chicken nuggets With Beetroot salad	Tomato soup Selection of sandwiches Macaroni cheese Mixed salad	Mushroom soup Selection of sandwiches Jacket potatoes with tuna & cheese melt and baked beans	Chicken soup Selection of sandwiches Hotdogs with buns and mustard sauce or tomato ketchup	Leek Selec sandv Vegetab and t
EVENING	Bread pudding	Banana angel delight	Fruit salad	Trifle	Tangerine +cream	Baked ap custa

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATU
BREAKFAST	Full English breakfast	Full English breakfast	Scrambled eggs full English breakfast	Full English breakfast	Full English breakfast	Full E brea
MID MORNING	Blueberry muffin	Juicy swirl	Mini cupcakes	Cream scones	Lemon cakes	Mini croi
LUNCH	Curried beef stew Or Veg curry With Steamed rice & broccoli Stewed plum & custard	[redacted] chicken Or Veg sausage With Roast potato and braised cabbage Fruit crumble and custard	Shepherds pie Or Veg pie With Seasoned wedges and baby carrots Rice pudding with jam	Pork casserole Or Cheese & tomato quinche Mashed potato and baby corn Eves pudding with custard	Battered cod Or Veg burger With French fries And garden peas Creamy semolina	Chick mushro O Veg With m potato an ve Tapioca
MID AFTERNOON	Sweet finger rolls	Treacle roly poly	Milk cookies	Custard tart	Biscuits and cheese	Ring dou
SUPPER	Leek soup Selection of sandwiches Macaroni cheese Potato salad	Oxtail soup Selection of sandwiches Chicken nuggets With mixed salad	Miner stone soup Selection of sandwiches Stir fry chow mien With Veg and fishcake	Chicken soup Selection of sandwiches Scrambled eggs and toast And Vegetarian spring rolls	Lentil soup Selection of sandwiches Corn beef hash and Green salad	Tomato Selecti sandwi An Veg las
EVENING	Cream caramel	Chocolate mousse	Trifle	Banana angel delight	Bread pudding	Tangerin crear

MENU WEEK 4

Appendix 7: Process Maps

1: Generic map types of drinks observed to be offered at different locations throughout the day:

drinks given
throughout the day

2: Between meals process map:

between meals
process map.pdf

3: Between meals map: the ideal process:

ideal between
meals process map.p

4: Mealtime process map:

real mealtime drink
provision.pdf

5: Mealtime map: the ideal process

ideal mealtime
drink provision.pdf

Appendix 8: PDSA template

I-Hydrate Plan-Do-Study-Act

PDSA title: ☐ New PDSA ☐ Linked to a previous PDSA (title:________)

Plan:

What are we going to do?	Person responsible	When to be done?	Where to be done?	How long?

What prompted this change?
Who are we going to involve?
☐ Staff? If yes, who? ______________________________   ☐ Residents? If yes, who? ______________________________   ☐ Anybody else? If yes, who? ______________________________
How long will the change be tested?
How will the impact of the change be measured?
☐ routinely collected I-hydrate measures ______________________________   ☐ one-off measures ______________________________   ☐ staff feedback ______________________________   ☐ resident feedback ______________________________   ☐ other ______________________________
Predict what will happen when the change is carried out

What will improve?	What could go wrong?
Who will assess what happened?	**Date/time to assess this**

What preparation is needed before the change is tested	Person responsible	When to be done?	Where to be done?	How long?

Date/time of the meeting to review this PDSA:_________

Do:

Date of the test: _____________ Did the test go as planned? ☐ Yes ☐ No

If not, describe what actually happened – was the test carried out as planned?

Report on collected measures	Did anything else happen?

Study:

Describe how the results compared with prediction	How did this compare to previous cycle (if linked)?
What was learnt?	**How could this be done better?**

Act:

What is the next step?		
☐ adapt/develop this PDSA	☐ test this PDSA for longer	☐ test this PDSA on more people
☐ introduce this as daily routine	☐ stop this PDSA	☐ other _____________________

Describe what will happen next

Appendix 9: Hydration posters displayed on units in care home

Helping to hydrate older people

The minimum amount people should drink is 1500ml per day.

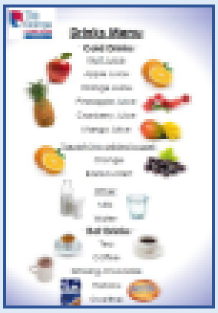
This is around 8 - 10 glasses or cups.

Many older people do not realise that they are thirsty, and may need to be encouraged or assisted to drink. This may mean:

- Offering them a suitable cup or a straw
- Waking them up, or reminding them to drink
- Positioning them so they are able to drink comfortably
- Holding the cup for them or putting the cup in their hands

Everyone has their own drinks preferences...

- Use the drinks menu to provide drink choice
- Offer drinks regularly throughout the day
- Offer both a hot and cold drink



Some foods are also a good source of fluid such as:

- Custard, gravy, ice cream, jelly, cream, fruit, yogurt, porridge, soup

Opportunities for Offering Drinks

For residents to drink **at least 1500ml a day** drinks need to be offered frequently throughout the day.

6 – 8am Early Morning	Offer a hot and/or cold drink
8 – 10.30am Breakfast	Offer a hot and/or cold drink Remember to offer drink refills
10.30 – 12pm Mid-morning	Offer a hot and/or cold drink
12 – 3pm Lunchtime	Offer a hot and/or cold drink with lunch Offer fluid-rich desserts (e.g. custard)
3 - 5pm Mid-afternoon	Protected Drinks Time Try to serve a hot and a cold drink
5 – 7pm Dinnertime	Offer a hot and/or cold drink with dinner Offer soup and fluid-rich desserts
7 – 10pm Bedtime	Offer a drink before the resident is too tired or sleepy

Remember to offer refills of drinks throughout the day

Appendix 10: Drinks Menu

Appendix 11: Refreshment Needs Guides

Refreshment needs

Template no assistance

Last updated: Oct 2016

- **My diet is**:
- **Allergies/Intolerances**:

I need your help with:

- **My cup preferences**:

- **I usually prefer….**

- **I tend not to like…..**

“Refreshment needs“ guides are here!

What does it mean?

The guides will help the staff to quickly check residents’ needs and preferences for food and drink

Check out the colour coding:

Refreshment needs
John
Last updated: Aug 2016

- My diet is: *Normal diet & fluids*
- Allergies/Intolerances: *Diabetic*

I need your help with:
I am able to eat & drink independently
I especially like lots of tea

- My cup preferences:
Standard mugs and glasses

- I usually prefer....
Milky Tea, no sugar
Fresh juice (all types)
Soup
Sandwiches
- I tend not to like.....
Yoghurt
Semolina

No assistance is required

Check for resident’s likes and dislikes as well as allergies and intolerances

Refreshment needs
Doris
Last updated: Aug 2016

- My diet is: *Normal diet & fluids*
- Allergies/Intolerances: *None known*

I need your help with:
I like someone to sit and talk to me when I have a drink - it makes me calm and stops me pouring my drink on the floor.
I eat and drink better if I am not in bed.

- My cup preferences:
Lightweight mug for hot drinks
Plastic cup for cold drinks

- I usually prefer....
Tea with 2 suagrs
Mango juice
Cranberry juice
Orange juice
- I tend not to like.....
Fizzy drinks
Water
Squash
Coffee

Prompting or encouragement is required

Check for resident’s needs, likes and dislikes as well as allergies and intolerances

Refreshment needs
Mary
Last updated: Aug 2016

- My diet is: *Vegetarian diet, normal fluids*
- Allergies/Intolerances: *None known*

I need your help with:
I need help to eat but can drink by myself

- My cup preferences:
My own two-handed beaker

- I usually prefer....
Milky tea with 1 sugar
Orange juice
Water
Fresh fruit - clementines, satsumas, grapes,
Jelly / Ice cream
- I tend not to like.....
Fizzy drinks
Puddings

Assistance with eating or drinking is required

Check for resident’s needs, likes and dislikes as well as allergies and intolerances

Appendix 12: Scores of the tested drinking vessels

Type of vessel	No of tests	Resident ratings: median score (min-max)					Volume (ml)
		Handling	Volume	Feel	Appearance	Total score‡	
Cups and mugs							
Standard cup	*179*	*3 (1-5)*	*3 (1-5)*	*5 (1-5)*	*3 (1-5)*	*14 (5-18)*	*150*
Test mug 1	9	5 (5-5)	3 (2-5)	5 (3-5)	4 (3-5)	16 (13-18)	250
Test mug 2	10	5 (2-5)	3 (2-5)	5 (3-5)	4 (2-5)	15 (13-17)	250
Test mug 3	10	5 (2-5)	3 (3-4)	4 (2-5)	4 (1-5)	15 (10-18)	275
Test mug 4	10	3 (2-5)	3 (3-4)	4 (2-5)	4 (3-5)	15 (10-18)	300
Test mug 5	10	3 (2-5)	3 (3-5)	4 (2-5)	5 (1-5)	15 (9-18)	275
Test mug 6	7	4 (1-5)	4 (1-5)	5 (2-5)	4 (1-5)	14 (7-18)	250
Test mug 7	10	2 (1-5)	3 (2-5)	5 (4-5)	4 (1-5)	14 (9-18)	300
Test mug 8	10	2 (1-5)	3 (3-5)	5 (2-5)	4 (1-5)	14 (6-18)	300
Test mug 9	10	2 (1-5)	3 (3-4)	5 (1-5)	4 (1-5)	14 (8-18)	300
Test cup 1	10	2 (1-5)	3 (2-3)	4 (2-5)	4 (1-5)	12 (9-18)	150
Test mug 10	6	1 (1-5)	3 (1-5)	4 (2-5)	4 (2-5)	12 (8-17)	250
Test mug 11	10	3 (1-5)	3 (2-5)	3 (1-4)	4 (1-5)	12 (5-17)	250
Test mug 12	10	2 (1-5)	4 (3-5)	4 (1-5)	4 (1-5)	12 (4-18)	375
Double handled mugs							
Test mug 13	10	5 (1-5)	3 (3-4)	5 (2-5)	4 (2-5)	16 (8-18)	200
Test mug 14	10	5 (1-5)	3 (2-4)	5 (3-5)	3 (1-5)	16 (8-18)	225
Plastic mugs							
Test mug 15	10	5 (2-5)	3 (3-3)	5 (4-5)	4 (3-5)	17 (15-18)	200
Test mug 16	10	4 (1-5)	3 (3-4)	4 (2-5)	5 (3-5)	17 (11-18)	250
Test mug 17	10	5 (1-5)	3 (3-4)	4 (2-5)	4 (1-5)	14 (10-18)	256
Test mug 18	10	3 (1-5)	3 (2-5)	1 (1-5)	1 (1-5)	8 (5-16)	250
Tumblers							
Standard tumbler	*37*	*3 (1-5)*	*3 (1-4)*	*5 (2-5)*	*4 (1-5)*	*15 (8-18)*	*150*
Test tumbler 1	10	5 (2-5)	3 (3-3)	5 (2-5)	4 (3-5)	17 (12-18)	200
Test tumbler 2	10	5 (1-5)	3 (3-4)	4 (1-5)	4 (1-5)	14 (9-18)	300
Beakers							
Standard beaker	*32*	*5 (1-5)*	*3 (2-3)*	*5 (2-5)*	*4 (2-5)*	*16 (11-18)*	*200*
Test beaker 1	10	5 (3-5)	3 (3-4)	5 (2-5)	5 (2-5)	16 (13-18)	200
Test beaker 2	10	3 (1-5)	3 (3-4)	4 (1-5)	4 (1-5)	13 (6-18)	250
Test beaker 3	10	2 (1-5)	4 (3-5)	4 (2-5)	4 (1-5)	12 (7-16)	325
Test beaker 4	10	2 (1-5)	4 (3-5)	4 (1-5)	3 (1-5)	11 (4-16)	300

* plus the weight of the saucer (220g); ‡ volume scoring: far too little (1), a bit too little (2), just right (3), a bit too much (2)

Appendix 13: Data collection tools used in the evaluation phase

Individual observations

Date	Start/stop time	Unit	No of staff on a shift

1. Resident profile

Resident code:	Gender:	Weight: (check records at the end of observation day)	Height: (check records at the e

2. Fluids offered

Time	Was this a meal time?	Type of fluid	Staff type offering	Volume offered	Volume consumed	Comments (including reasons for not consuming the who

2. Fluids offered (cont.)

Time	Was this a meal time?	Type of fluid	Staff type offering	Volume offered	Volume consumed	Comments (including reasons for no

3. Fluids recorded (check records at the end of observation day)

Time recorded	Type recorded	Volume recorded	Additional comments

Hydration-linked events weekly checklist

Date:

Room no	UTI	Other infection	Delirium/acute confusion	Constipation	Fall	Diagnosis of dehydration	Hospital admission	Empty room
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								

Appendix 14: Research outputs

Journal articles:

Bak, A., Wilson, J., Tsiami, A., Loveday, H. (2018) Drinking vessel preferences in older nursing home residents: optimal design and potential for increasing fluid intake. British Journal of Nursing, 27(22), p. 1298-1304

Wilson, J., Bak, A., Tingle, A., Greene, C., Tsiami, A., Canning, D., Myron, R., Loveday, H. (2018) Improving hydration of care home residents by increasing choice and opportunity to drink: a quality improvement study. *Clinical Nutrition,* [In press)

Greene, C., Canning, D., Wilson, J., Bak, A., Tingle, A., Tsiami, A., Loveday, H. (2018). I-Hydrate training intervention for staff working in a care home setting: an observational study. *Nurse Education Today,* 68. pp61-65

Bak, A., Tsiami, A., Greene, C. (2017) Methods of assessment of hydration status and their usefulness in detecting dehydration in the elderly. *Current Research in Nutrition and Food Science,* 5 (S3).

Bak, A., Tsiami, A. (2016) Review on mechanisms, importance of homeostasis and fluid imbalances in the elderly. *Current Research in Nutrition and Food Science,* 4(S3). pp1-7

Manuscripts under review/in preparation:

Wilson, J., Bak, A., Greene, C., Tingle, A., Tsiami, A., Canning, D., Loveday, H. Exploration of the factors contributing to under-hydration of frail older people in care homes: an observational study.

Conference presentations:

Bak, A., Wilson, J., Tingle, A., Greene, C., Tsiami, A., Canning, D., Loveday, H. Underhydration of residents in nursing care homes: defining the problem and contributory factors. Poster presentation: 2017 Autumn Meeting of the British Geriatrics Society, London, England, November 2017.

Bak, A., Wilson, J., Tingle, A., Greene, C., Tsiami, A., Canning, D., Loveday, H. An exploration of care home residents' drinking vessels and fluid preferences: promoting hydration by defining individual needs and preferences. Poster presentation: 2017 Autumn Meeting of the British Geriatrics Society, London, England, November 2017.

Bak, A., Wilson, J., Tingle, A., Greene, C., Tsiami, A., Canning, D., Loveday, H. Improving hydration of care home residents by addressing institutional barriers to fluid consumption – a quality improvement project. Oral presentation presented as a part of a competition for the Young Researcher Award. Hydration for Health Annual conference, Evian, France, July 2017. Abstract published under the same title: *Annals of Nutrition and Metabolism,* 2018; 72 (suppl. 2) 39-44.

The I-Hydrate project: Optimising hydration of elderly residents in care homes. Oral presentation: Public Health Wales Infection Prevention Society Conference, Cardiff, Wales, June 2017.

Bak, A., Wilson, J., Tingle, A., Greene, C., Tsiami, A., Canning, D., Loveday, H. I-hydrate: Optimising hydration in elderly care home residents. Poster presentation: Collaboration for Leadership in Applied Health Research and Care Northwest London Winter Meeting, London, England, January 2017.

Bak, A., Tsiami, A., Loveday, H., Wilson, J. Why are care home residents not drinking enough? Oral presentation: Joanna Briggs Institute Annual European Meeting, Madrid, Spain, May 2016.

Other outputs:

Bak, A., Wilson, J., Greene, C., Tingle, A., Tsiami, A., Canning, D., Loveday, H. 2018. I-Hydrate, a final project report.